



THE  
PROCEEDINGS  
OF THE  
LINNEAN SOCIETY  
OF  
NEW SOUTH WALES.

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VOL. VIII.  
WITH TWENTY-THREE PLATES.

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FOR THE YEAR 1883.

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# CONTENTS OF VOL. VIII.

## PART I.

	PAGE
On a new and remarkable Fish of the Family <i>Mugilidae</i> from the Interior of New Guinea. By WILLIAM MACLEAY, F.L.S., &c. ...	2
On some points in the Anatomy of the Uro-genital Organs in Females of certain species of Kangaroos (Part 2.) By J. J. FLETCHER, M.A., B.Sc. ... ..	6
On Remains of an Extinct Marsupial. By CHARLES W. DE VIS, B.A.	11
Contributions to the Zoology of New Guinea (Part 6). By E. P. RAMSAY, F.L.S. (Curator of the Museum, Sydney)... ..	15
On some Habits of <i>Pelopæus Lætus</i> and a Species of <i>Larrada</i> . By H. RAWES WHITTELL, Esq. ... ..	29
On the Voracity of a Species of <i>Heterostoma</i> . By H. RAWES WHITTELL, Esq. ... ..	33
On the Fossil Flora of the Coal Deposits of Australia. By the Rev. J. E. TENISON-WOODS, F.G.S, F.L.S., Vice-President Linnean Society, New South Wales. (Plates 1-10A.) ... ..	37
Contributions to the Flora of Queensland. By the Rev. B. SCORTECHINI, F.L.S, ... ..	168
Description of Two New Fungi. By the Rev. C. KALCHIBRENNER ...	175
Notes on the Fructification of the Bunya Bunya in Sydney. By the Hon. JAMES NORTON .. ..	176
Description of some New Australian Fishes. By E. P. RAMSAY, F.L.S., &c. ... ..	177
Notes and Exhibits ... ..	34, 179

25395

## PART II.

	PAGE
Occasional Notes on Plants Indigenous in the Immediate Neighbourhood of Sydney (No. 3). By E. HAVILAND .. .. .	182
On Tooth-marked Bones of Extinct Marsupials. By CHARLES W. DE VIS, B.A. ... .. .	187
On Brachalletes Palmeri an Extinct Marsupial. By CHARLES W. DE VIS, B.A.... .. .	190
On the Habits of the Mallee Hen, <i>Leiopa Ocellata</i> . By K. H. BENNETT ... .. .	193
Notes on a Collection of Fishes from the Burdekin and Mary Rivers, Queensland. By WILLIAM MACLEAY, F.L.S., &c. ... .. .	199
Notes on the Method of obtaining Water from Eucalyptus Roots as practised by the Natives of the Country between the Lachlan and Darling Rivers. By K. H. BENNETT, Esq. ... .. .	213
Notes on a Viviparous Lizard ( <i>Hinulia elegans</i> . By J. J. FLETCHER, M.A., B.Sc. ... .. .	215
Notes on a Lower Jaw of <i>Palorchestes Azael</i> . By CHARLES W. DE VIS, B.A. ... .. .	221
Synonymy of Australian and Polynesian Land and Marine Mollusca. By J. BRAZIER, C.M.Z.S., &c., &c. ... .. .	224
On some Mesozoic Fossils from Central Australia. By the Rev. J. E. TENISON-WOODS, F.G.S., &c. (with Two Plates) ... .. .	235
A Second Half-Century of Plants new to South Queensland. By the Rev. B. SCORTECHINI, F.L.S. ... .. .	242

	PAGE
Contribution to a Knowledge of the Fishes of New Guinea (No. 4). By WILLIAM MACLEAY, F.L.S., &c. ... ..	252
Descriptions of New Genera and Species of Australian Fishes. By CHARLES W. DE VIS, B.A. ... ..	283
Occasional Notes on Plants Indigenous in the Immediate Neighbour- hood of Sydney (No. 4). By E HAVILAND... ..	289
Localities of some Species of Recent Polynesian Mollusca. By J. BRAZIER, C.M.Z.S., &c. ... ..	294
Notes and Exhibits ... ..	197, 217, 280, 296

---

### PART III.

	PAGE
Myology of <i>Chlamydosaurus Kingii</i> . By CHARLES W. D. VIS, B.A. (Plates 14, 15 and 16) ... ..	300
Descriptions of Australian Micro-Lepidoptera. By E. MEYRICK, B.A. Part IX., Oecophoridae ( <i>Continued</i> ) ... ..	320
Some remarks on the action of Tannin on Infusoria. By HARRY GILLIATT, Esq. ... ..	333
On a Fossil Calvaria. By CHARES W. DE VIS B.A. (Plate 17) ...	392
Remarks on a Skull of an Aboriginal from the Lachlan district. By N. DE MIKLOUHO-MACLAY (Plate 18) ... ..	395
On a very Dolichocephalic Skull of an Australian Aboriginal. By N. DE MIKLOUHO-MACLAY (Plate 19)... ..	401
On a Fossil Humerus, By CHARLES W. DE VIS, B.A. ... ..	404
Notes on some undescribed Coleoptera in the Brisbane Museum. By WILLIAM MACLEAY, F.L.S. ... ..	409
Notes and Exhibits ... ..	386, 396, 416

## PART IV.

	PAGE
Occasional Notes on Plants indigenous in the Neighbourhood of Sydney (No. 5). By E. HAVILAND ... ..	421
Temperature of the body of <i>Echidna hystrix</i> . By N. DE MIKLOUHO-MACLAY ... ..	425
Plagiostomata of the Pacific, Part II. (Plate 20). By N. DE MIKLOUHO-MACLAY and WILLIAM MACLEAY, F.L.S., &c. ..	426
Notes on some Reptiles from the Herbert River. By WILLIAM MACLEAY, F.L.S., &c. ... ..	432
Notes on some Customs of the Aborigines of the Albert District. By C. S. WILKINSON, F.G.S., F.L.S. ... ..	436
On the Brain of Grey's Whale (Plate 21). By WILLIAM A. HASWELL, M.A., B.Sc. ... ..	437
On a new genus of Fishes from Port Jackson (Plate 22). By WILLIAM MACLEAY, F.L.S., &c. ... ..	439
Fishes from the South Sea Islands. By CHARLES W. DE VIS, M.A.	445
Some results of Trawl Fishing outside Port Jackson. By WILLIAM MACLEAY, F.L.S., &c. ... ..	457
The "Barometro Araucano," from the Chiloe Islands. By N. DE MIKLOUHO-MACLAY ... ..	462
Far Southern localities of New South Wales Plants. By Baron Sir F. VON MÜLLER, K.C.M.G., F.R.S., &c. ..	467
Descriptions of Australian Micro-Lepidoptera, Part X. By E. MEYRICK, B.A. ... ..	469
Notes on the Geology of the Southern portion of the Clarence River Basin. By Professor STEPHENS, M.A. ... ..	519

CONTENTS.

vii.

	PAGE
Dimensions of some gigantic Land Tortoises. By J. C. Cox, M.D., F.L.S. ... ..	531
Notes and Exhibits ... ..	441, 463, 532
President's Annual Address ... ..	536
Office-Bearers and Council for 1884 ... ..	583
Title page, Contents and Index of Vol. VIII.	





PROCEEDINGS  
OF THE  
LINNEAN SOCIETY  
OF NEW SOUTH WALES.

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WEDNESDAY, 31<sup>ST</sup> JANUARY, 1883.

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The President, C. S. WILKINSON, F.G.S., &c., in the Chair.

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MEMBERS ELECTED.

H. B. Guppy, M.B., R.N., Surgeon, H.M.S. "Lark,"

Mr. Matthew, R.N., H.M.S. "Espiegle,"

Dr. Smith, Brisbane, Queensland.

Theodore Wood, Esq., Virginia, Maryborough, Queensland.

Allison S. L. Wells, Esq., Maryborough, Queensland.

W. H. Ascher, Esq.

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DONATIONS.

"Proceedings of the Zoological Society of London," for 1882,  
Part 3, 8vo. From the Society.

"Fragmenta Phytographiæ Australiæ," Vol. XII., Part xciv.,  
8vo., 1882. By Baron Ferd. von Müller, K.C.M.G. From the  
author.

“Prodromus Ornithologiæ Papuasæ et Moluccarum,” Nos. i.—xv., auctore Thoma Salvâdorico. From the author.

“Journal of Conchology,” Vol. II., Nos. 1 to 12, Vol. III., Nos. 1 to 10; January 1879 to April 1882, with Reprints of Articles on the life history of *Helix arbustorum* and the Mollusca of Bristol and Beverley Districts. From the Conchological Society of Great Britain and Ireland.

“Bulletin de la Société Impériale des Naturalistes de Moscou.” No. 4, 1881, and “Table Générale et Systematique des Matieres contenues dans les premiers 56 volumes (années 1829-1881) du Bulletin de la Société.” From the Society.

“Bulletin de la Société Zoologique de France,” Tomes I.—VI. complete, Tome VII., Livr. 1 and 2. From the Society.

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PAPERS READ.

ON A NEW AND REMARKABLE FISH OF THE FAMILY *Mugilidæ*  
FROM THE INTERIOR OF NEW GUINEA.

BY W. MACLEAY, F.L.S. &c.

Among a large variety of Fishes, both saltwater and fresh, lately brought from New Guinea by Mr. Alex Goldie, is one so abnormal in some respects that I may be excused if I make it the subject of a special paper, leaving the rest of the collection for my “Fourth contribution to a knowledge of the fishes of New Guinea” which I hope to be able to lay before you in the course of a few weeks. The fish in question is undoubtedly of the family *Mugilidæ*, and in fact might almost be included in the genus *Agonostoma*, were it not for a structure of mouth unknown as I believe among fishes. In most teleosteous fishes, at all events in this family, the gill openings are large, and what may be termed

the gill covers extend quite to the symphysis of the lower jaw, leaving a more or less open space on the chin, composed of the integuments surrounding the extremity of the hyoid arch, and forming the floor of the mouth. Of this general form there are modifications in many families of fishes, but I have never before known such a complete departure from the normal type as in the present instance.

Through the kindness of Mr. Haswell, who has made the preparations and drawings for me, I am enabled to illustrate this paper with two woodcuts, which will explain better than any description the peculiarities of the fish. Fig. 1 represents the

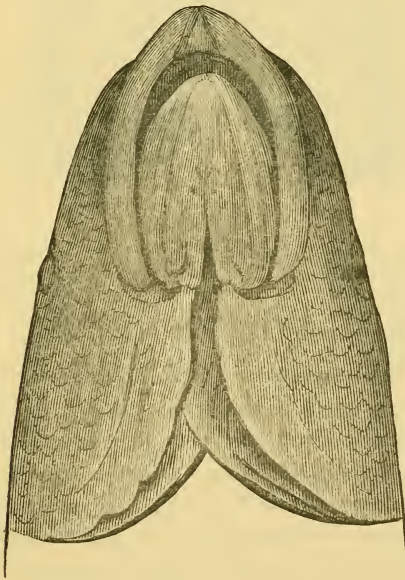


FIG. 1.

under side of the head in the natural state, and Fig. 2 the same with some of the integuments removed and showing the bones. Mr. Haswell has also made for me a good preparation for

comparison, of the mouth, &c., of *Mugil Waigiensis*, which may be taken as a good type of the *Mugilidæ*.

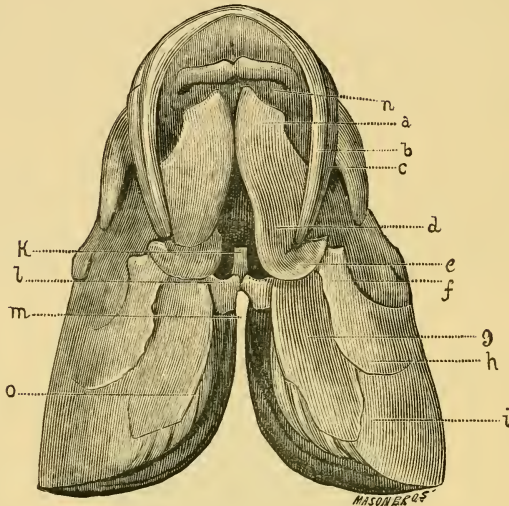


FIG. 2.

- |                                |                            |
|--------------------------------|----------------------------|
| <i>a</i> —Dentary of mandible. | <i>h</i> —Pre-operculum.   |
| <i>b</i> —Premaxilla.          | <i>i</i> —Suboperculum.    |
| <i>c</i> —Maxilla.             | <i>k</i> —Glossohyal.      |
| <i>d</i> —Angular              | <i>l</i> —Basihyal.        |
| <i>e</i> —Articular            | <i>m</i> —Urohyal.         |
| <i>f</i> —Quadrate.            | <i>n</i> —Vomer.           |
| <i>g</i> —Interoperculum.      | <i>o</i> —Branchiostegals. |

The chief and most obvious peculiarity of the fish I am describing is undoubtedly the well marked division across the under surface of the head, from the extremity of the ramus of the mandible on one side to that of the other (shown in Fig. 1), a division, however, which though deep and well defined, is only external, and has no communication whatever with the mouth. An examination of the bones of the head (Fig. 2), shows however that notwithstanding the very abnormal external appearance, the actual divergence from the typical fish skull is less than might have been anticipated, and in fact is not so much a divergence from the type as a variation of it.

The hyoid bones are the least normal; the urohyal (fig 2 *m*) is slight; the basihyal (fig 2 *b*) short; and the glossohyal (fig 2 *k*) very small and slightly longer than broad; the most advanced of these bones, the glessohyal, reaches only to the transverse division at the base of the mandibles, whereas in *Mugil Waigiensis* the basihyal and glossohyal bones are large and prominent, supporting the whole floor of the mouth, and extending almost to the symphysis of the lower jaw. In *Mugil Waigiensis* also the mandibular bones are of a slighter make. I propose for this fish which differs considerably in other points than those I have now mentioned from any of the genera of *Mugilidae* hitherto described, the generic name of

#### AESCHRICHTHYS.

Mouth lateral, extending to the line of the orbit; hyoid bones not extending on the floor of the mouth, an external transverse fossa at the base of the mandibles, lips thick, lower lip rounded in front, teeth on the upper jaw only.

#### AESCHRICHTHYS GOLDIEL.

D. 1/8. A. 3/9. L. LAT. 46. L. TRANS. V. 14.

Height of body about four times in the length, body slightly compressed and convex, head very convex; eye small, without adipose membrane, situated about three of its diameters from the extremity of the snout. Upper lip very thick, extending to the vertical from the posterior third of the eye; the lower lip is narrowly rounded in front, and is edged on each side below by a rigid and grooved margin, which extends as far back as the upper lip, both being there quite separated from the interoperculum, two fleshy caruncles free at the extremity intervene between the mandibular extremities. The teeth in the upper jaw are apparently serrations of the surface of the bone; there are two large osseous lumps on the vomer covered with teeth. The tail is forked, the fins are for the most part blackish, so is the upper part of the head and body, the belly seems to have been yellowish.

Good sized specimens are 18 inches in length.

Mr. Goldie found this fish very abundant in the Goldie River, about 100 miles by its course from its mouth in Redsear Bay, and about 30 miles in a straight line inland from the sea. He and his party used the fish as food for some time and found them excellent, as indeed all the *Mugilidae* are. Very fortunately Mr. Goldie was, at the time he was engaged in collecting these Fishes, short of a sufficient number of other Fish to fill up a cask, and to that circumstance I am indebted for a much larger number of specimens of this Fish, than Mr. Goldie would otherwise have thought of preserving.

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ON SOME POINTS IN THE ANATOMY OF THE URO-GENITAL ORGANS  
IN FEMALES OF CERTAIN SPECIES OF KANGAROOS.—PART II.

BY J. J. FLETCHER, M.A., B.Sc.

The organs of sixteen females referable to the following species' have been examined :—

Rock Wallaby ( <i>Petrogale penicillata</i> )	1 specimen.
Red-necked Wallaby ( <i>Halmaturus ruficollis</i> ),	2 specimens.
Wallaroo ( <i>Osphranter robustus</i> )	4 specimens.
Red Kangaroo ( <i>O. rufus</i> )	2 specimens.
Dorsal-striped Wallaby ( <i>H. dorsalis</i> )	2 specimens.
Black-tailed Wallaby ( <i>H. ualabatus</i> )	1 specimen.
Grey Kangaroo ( <i>Macropus major</i> )	4 specimens.

From fourteen of these specimens, sections were carefully cut, commencing at the last half-inch of the median vagina, and continuing until the appearance of the meatus urinarius. In none of the sixteen specimens is there a direct communication between the median vaginal and the uro-genital chambers, though with the exception of *M. major*, they all belong to species in which the direct communication is known to exist after parturition. This state of things is confirmatory of the view that the direct communication as a rule, is probably completed during pregnancy, or at parturition. But though the direct communication was not met with, there are various shades of approximation to it.

Excluding the specimens of *M. major*, it may be stated generally of the others, that the median vagina came to an end sometimes rather abruptly, but usually in a more gradual manner, and that this never took place until sections showing the uro-genital canal were met with. The sections after the disappearance of the median vagina were carefully counted until the meatus urinarius was met with, and from a comparison of the numbers, it would appear as a rule, that the more nearly full-grown the animal from which the organs came, the fewer the intervening sections, that is, the further back the cavity of the median vagina extends. The ridges in the uro-genital canal are as previously described.

*Petrogale penicillata*.—One specimen from an animal measuring 19 inches. It is very similar to the second specimen of the same species described in my first paper, except that fewer sections—twenty-eight as compared with forty-two—intervene between the disappearance of the median vaginal chamber and the first appearance of the meatus urinarius.

*Halmaturus ruficollis*.—Two specimens from animals, measuring 22 in. and 24 in. respectively, as compared with 25½ in. and 29 in. in the case of two females with young in the pouch, shot in the same locality. A complete longitudinal septum is present in both specimens. In one case the septum does not reach to the end of the chamber, whereas in the other, it still appears in sections which show the uro-genital canal. The sections intervening between the ending of the median vaginal chamber and the first appearance of the meatus urinarius were 47 and 54 respectively.

*Osphranter robustus*.—Four specimens of which two were from animals measuring 28 in. and 30 in. respectively. I have not the measurements of the other two, but judging from the size of the organs, one of them was slightly and the other considerably larger than the two first mentioned. In addition, I have cut sections of specimen (*d*) of my first paper. All five, except in the number of sections which intervene between the ending of the median part of the vagina and the first appearance of the meatus urinarius, do not materially differ from specimen (*c*), described in the same paper.

The sections in question number 30, 46, 17, 11, and 28 respectively, as compared with 33 in specimen *c*. The sections of two of these show the longitudinal septum very well.

*Osphranter rufus*.—Two specimens from animals of which the dimensions are unknown to me, but judging from the size of the organs they were both very large for unimpregnated females, though this may in some measure be due to the fact that the animals were shot just about the commencement of the breeding season. In one case eight sections came between the ending of the median vagina and the first appearance of the meatus urinarius. The other specimen was carefully dissected, and shows the median vaginal chamber extending very far back, and ending blindly just in advance of the meatus urinarius. The two chambers are thus separated merely by the thin intervening portion of the ventral wall of the urogenital canal.

*Halmaturus dorsalis*.—Two specimens from animals of which I have not the measurements. The larger of the two gives sections of about the same size as the specimen of *P. penicillata* above mentioned. The other is evidently from a smaller animal. The sections which intervene between the ending of the median vaginal chamber and the first appearance of the meatus urinarius in these two cases are 13 and 28.

*Halmaturus ualabatus*.—One specimen from an animal measuring about 15 in. This example is similar to the first of the two unimpregnated specimens of *P. penicillata* described in my first paper. The cavity of the median part of the vagina extends very far back, but comes to an end in the usual way, while in sections which show the last part of its course there is seen below and distinct from it, another aperture, and this is found to be in communication with the urogenital canal and the place of communication occupies the usual position of the aperture of the direct communication as seen in animals which have produced young. The two passages overlap to a greater extent than in the specimen of *P. p.* alluded to above, but in both cases if they had been in the same straight line and in the same plane they would



have met, and the direct communication would have been formed. These two specimens would seem to show that the direct communication is completed independently of the median vaginal canal, and by the extension backwards of what has the appearance of being an involution of the urogenital canal. As this condition has been met with in two only out of fifteen specimens (excluding *M. major*) of which sections have been cut, though some of the animals from which they come were nearly adult, it would seem to be brought about, as a rule, probably during pregnancy and only exceptionally earlier as in the two cases in question. All my pregnant specimens so far have been from animals which had previously borne young and so throw no light on this point. The direct communication in virgin animals has been met with previously in two cases, namely by Lister in *H. ualabatus* and Brass in *H. beunettii*.

*Macropus Major*.—Four specimens from animals of which I am unable to give the measurements. From three specimens sections which were cut differ from those considered above, chiefly in the fact that the cul-de-sac came to an end sooner, and always before the urogenital canal appeared in section, in one case this happened thirty-eight sections before the urogenital canal appeared in section, and seventy sections before the meatus urinarius was reached. I am unable to give the number of sections in the other two cases.

*Summary and Conclusion*.—The eighty specimens treated of in this and in my first paper are here considered together.

1. The *post partum* existence of a direct communication between the median portion of the vagina and the urogenital canal has been verified in the case of three species—*Petrogale penicillata*, *Halmaturus ruficollis*, and *Osphranter rufus*.

2. Three species—*H. dorsalis*, *Osphranter robustus* and *Onychogalea frænata* have been added to the list of nine in which such a direct communication is known to obtain. The twelve species then are—*Halmaturus benettii*, *H. ruficollis*, *H. billiardieri*, *H.*

ualabatus, *H. derbianus*, *H. agilis*, *H. dorsalis*, *Petrogale penicillata*, *P. exanthopus*, *Osphranter rufus*, *O. robustus*, and *Onychogalea frænata*.

3. The remarkable condition presented by *Macropus Major* in which, unless very exceptionally, there is no direct communication even after young have been produced has been verified in twenty-eight specimens.

4. In virgin animals of *H. ruficollis*, *H. dorsalis*, *P. penicillata*, *O. robustus*, and *O. rufus* the direct communication did not exist, but in one specimen of *P. p.* and one of *H. ualabatus* the direct communication was in process of formation but still incomplete; and these two specimens seem to show that the aperture of communication arises probably not by a mere rupture of the intervening portion of the wall of the urogenital canal, but by an involution of the latter canal growing backwards to meet the cavity of the median portion of the vagina when the latter has reached its maximum backward extension. My own observations show that it is possible for the direct communication to exist in virgins, while those of other observers show that exceptionally this actually is the case; but more usually it would seem to be formed late in life, probably during pregnancy or at parturition.

The acquisition of this material would have cost me a vast amount of trouble but for the great kindness and ready help of a number of gentlemen, to whom my hearty thanks are due and are hereby accorded. Especially am I indebted to my friend and colleague, Mr. R. T. Baker, for much assistance in the field, and for the diagrams and drawings with which the reading of this paper was illustrated; also to my friend, Mr. E. Morley, for another donation of valuable specimens; also to George Hill, Esq., for an invitation to, and the most hospitable treatment at, his station, Mokai Springs; also to S. Cox, Esq., for an invitation to visit Rawdon; likewise to Messrs. Brown, A. Cox and Belcher for their guidance and help in procuring some good shooting, also to several gentlemen of whose proffered kindness I was unable to avail myself.

Finally, I should be very much obliged to any gentleman who can at any time give me notice of a "Kangaroo Drive" about to take place in any accessible part of the colony.

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## ON REMAINS OF AN EXTINCT MARSUPIAL.

BY C. W. DE VIS, B.A.

It most frequently happens that bones obtained from the Queensland drifts are confusedly scattered specimens, having indeed a certain value of their own, but often demanding of their specifier a large use of that "wise and well-founded conjecture" which is not always within reach. Every association of congruous bones is therefore of value—generally of sufficient value to be placed on record, however mistaken in his conclusions drawn from the bones themselves the recorder may chance to be. A belief in this, has prompted the following observations on a collection of fragments in a precisely similar state of preservation, and evidently belonging to the same individual, obtained together in Gowrie Creek, with much pains and patience by my friend, Mr. Henry Tryon. From these fragments, it has been found possible to reconstruct a few bones in portions, sufficient to guide us among the probable affinities of their whilom owner. Fortunately, one of the relics is a molar tooth—a deciduous grinder of a young animal, the epiphyses of whose long bones were as yet non-adherent. The tooth is 14 lines in length,  $10\frac{1}{2}$  lines in its anterior, and 9 lines in its posterior transverse diameter. Though worn down nearly to a level with the gum, the disposition of the enamel shows that it had two nearly equal transverse lobes, a strong tubercle opposite to the inner entry of the valley, no median or other link, no cingulum and no anterior valon. On the inner half of the hinder edge of the base, a sinus of enamel indicates that an accessory cusp rising therefrom, with an outwardly-directed and expanding concavity, was applied to the hinder lobe posteriorly, much as in the true molars of *Macropus Titan*. The fangs, partially absorbed, are two in number—the upper part of the front surface of the anterior and

larger one, is shallowly excavated for the reception of the neck of the tooth preceding it—the upper part of the hinder surface of this fang is deeply channelled, as though premonitory of its complete division in the true molars. These characters selectively show marks of affinity with *Macropus* and *Palorchestes* on the one hand—with *Nototherium* and *Diprotodon* on the other—collectively, they point to some bilophodont form differing from both the genera named. The suggestion is strengthened by an examination of the accompanying incisors. Of these, five out of six are serially represented, the three of the right side more or less in perfection. The front tooth (*i*) assumes the form of a tusk, but instead of the long, strongly-arched, laterally compressed and deeply channelled fang of a tusk before me, which unmistakably belongs to the *Nototherium* (*Mitchelli*), the present fossil has its fang short, slightly curved, and moderately compressed fore and aft. It is, moreover, conspicuously striated on the upper part of its fore and hind surfaces, and presents at its fracture, an angularly oval, not the bilobed section of the nototherian tooth. Nototherian tusks again are widest in the middle of the fang whence they contract slightly in both directions, the fang before us thickens rapidly from the pulp cavity upwards to its junction with the crown, where it attains a diameter of 13 lines. Of the projecting blade nothing can be said. The outer tooth (*i* 2) is as to its fang similar in proportions and not much less in size, being 12 lines in breadth and 9 lines in thickness. In section it is sub-triangular. On the inner surface of the neck is an elongate concave facet adapted to the convex surface of the intermediate incisor. The blade is produced to an extent of  $15\frac{1}{2}$  lines in the axis of the tooth, forming a long oval strongly concave near the base and thinning suddenly off towards the apex, which appears to have been trenchant. The second or intermediate tooth is comparatively small, its diameter being but 7 lines; it has a sub-triangular and slightly convex working surface, and when in place seems little more than an extension of the base of the outer tooth. On the whole the incisor group may be regarded as notothercid in character; the incisors and molar together as *sui generis*.

*Femur.* Of this bone a moiety of the shaft has been recovered, but unfortunately no portion of the heads. That part of the bone however, which has been restored, comprising the proximal half, perhaps somewhat more, of the shaft, from near the base of the great trochanter on the one side and from the upper part of the lesser one on the other, is a most welcome guide. The lesser trochanter is represented exactly as in the *Diprotodon's* femur by a broad and low convex ridge running along the hinder half of the lower margin of the "neck." Another Diprotodontoid feature is also observable in the present fossil, the scar between the two trochanters. This in *Diprotodon* is a long shallow depression on the anterior side of the shaft close to the lower margin of the neck—in the bone before us it is a semi-lunar rough tract with its lower convex border raised above the surface. Again the scar representing the so-called "third trochanter" in the Kangaroo is present in both femurs, but not in the same position. In *Diprotodon* it appears about the middle of the shaft, in this fossil it is close to the inner edge. A rough tract from the great trochanter downwards alongside the whole outer edge formed by the fore and hind surfaces resembles in a general way the corresponding representative of the *linea aspera* in the *Diprotodon*. The bone as restored measures 13 inches in length and  $2\frac{1}{2}$  inches in its least transverse diameter. The fore and aft diameter of this greatly compressed fossil may not however be trusted, the bone has evidently been subjected to a crushing power which may have flattened it considerably before breaking it up into angular fragments. On the whole it bears a striking resemblance to a *Diprotodon* femur.

*Radius and Ulna.*—Of the Radius and Ulna, of the last-named marsupial or of *Nototherium* the writer knows nothing with certainty. There are bones before him which, from their size alone, might well be referred to one or other of the gigantic genera, but from evidence at hand it appears probable that there is more than one huge form to be distinguished, by their as yet unknown dentition, from those whose teeth have been discovered. It would, therefore, be hazardous to associate the radio-ulnar

joint of the subject before us with those referred to, notwithstanding that it has much greater affinity with them than with that of any macropod or phascolumys. We must be content to notice its distinctive features. The proximal end of the radius in the kangaroo is characterised by a strong inflection of the neck of the bone ulnad, and by the development from its inner side below the neck of a produced tubercle for the insertion of the biceps tendon. In the fossil radius the inflection is but slight, and there is no tubercle whatever, the tendon being inserted on the strongly rugose surface. It has in the first particular more resemblance to the radius of the wombat, but in this animal the tubercle, though lower than in the kangaroo, stands well out from the surface of the bone. In the macropod the interosseous ridge is faintly marked—in the fossil it is conspicuously developed. At four diameters from the head it causes nearly as great a dilatation of the shaft as in *Phascolumys*, but whereas in the latter it forms a sharp edge resulting from the gradual bevelling of the whole shaft towards it, in the fossil it is the edge of a longitudinal ridge pinched out, as it were, from the body of the bone from which it is separated on the outer side by an impressed channel. In a portion of the ulna, consisting of the head minus the olecranon, we remark the absence of the lesser sigmoid cavity and the imperfection of the greater. The median ridge of the latter is completed only at the posterior edge adjacent to the olecranon—in front there is no deflection of the articular surface towards the position which should be occupied by the lesser sigmoid. The insertion of the brachialis anticus is not as in the Macropodidæ into a rough oblique ridge beneath the coronoid process, nor as in *Phascolumys* into a depression on the inner foot of the sigmoid process, but into a deep pit in the front of the upper edge of that process. The outer surface of the shaft, from the broken edge of the olecranon to the lower end of the fragment, is traversed by a broad and rough tract for the attachment of the interosseous ligament.

To sum up—In dentition the animal diverges considerably from *Nototherium*—more so from *Diprotodon*—its divergence is towards

the *Macropodidæ*. In its long bones it approaches very closely to *Diprotodon*, possibly to *Nototherium* also. Its thigh-bone shows that it hardly departed from these in the structure and movements of its hind quarters. It is in short a transition form.

It is to be regretted that the rest of the bones, namely, two ribs, portions of two dorsal vertebræ, part of a pelvis and of a scapula and portions of a tibia and fibula, are too imperfect to afford material for comparative or descriptive notes. It may be convenient that the creature should have a name, and since its remains have carried us from the known to the unknown, the writer would suggest *Sthenomerus Charon*.



#### CONTRIBUTIONS TO THE ZOOLOGY OF NEW GUINEA, PART VII.

By E. P. RAMSAY, F.L.S. (Curator of the Museum, Sydney.)

Since I last laid before the Society some notes on the avi-fauna of New Guinea, I have been fortunate enough to secure large and important collections of birds from the interior portion of the east end of the island, inland from Port Moresby, collected at the foot of, and on the slopes of Mount Astrolabe range. The first portion of these collections was obtained from Mr. Charles Hunstein, and is extremely interesting, showing that as we ascend the mountains to higher altitudes, we meet with species which were previously only known from Mount Afak, in the north-west island, such as *Grallinabrugni*, *Oreocharis*, *Diphylloides chrysoptera*, *Phlogœnas rufigula*, and many others.

There were comparatively few new species in this portion of the collection, but it contained many that were not previously known from that portion of the island; nevertheless I obtained a new species of *Sericornis*, a genus which, as far as I know, had not been previously recorded from New Guinea. The *Grallina* also proved of interest, as one sex only of this species was previously known.

A beautiful pigeon, *Otidiphaps cervicalis*, was found to be plentiful on the slopes of the range, making a second species of this genus. It is very remarkable to observe how closely the avi-fauna of the whole of New Guinea resembles that of Australia. Bower-birds, cat-birds, paradise birds, pittas, hawks, owls, goat-suckers and podargi, ægotheles, swallows and swifts, parrots, fly-catchers, pigeons, a host of genera, and many species are common to both countries—while recently such genera as *Sericornis*, *Orthonyx*, *Climacteris*, *Sitella*, *Eurostopodus*, *Eöpsaltia*, *Drymodes*, *Grallina*, *Aprosmictus*, *Micræca*, and others supposed to be strictly Australian, have also been found there; the same may be said of the mammals, of which several genera, *e. g.*, *Hydromys*, *Dasyurus* and *Antechinus*, are common to both countries.

But to return to our recent acquisitions, I have received from Mr. Wilson of Mason Bros. collections containing over 1,000 skins collected by Messrs. Rolles and Hunstein, and other members of Mr. Goldie's party; I have also been permitted to examine a collection lately added to the extensive collection at Elizabeth Bay, and from these sources, I have drawn up the following list of species not recorded in my previous lists. I was much pleased to find *adult males* of the beautiful Paradise Bird, *Drepanornis d'Albertisi*; as least such we must call it until I can make a careful comparison with the type, although taking the description in detail, it does not altogether exactly agree with Dr. Sclater's description of D'Albertis's original specimens.

An interesting novelty occurs in a very distinct species of *Eurostopodus*. I believe this is the first occurrence of the genus on the island, for there seems to be considerable doubt as to *E. albogularis* (*viz.* Horsf.) ever having been obtained in the Papuan region, although we have recently described a specimen from the Solomon Islands. Another fine novelty is a handsome Paradise Bird, between *P. sanguinea* and *P. raggiana*. This new species, which comes from D'Entrecasteaux Island, I have named in honour of the amiable wife of the Hon. W. Macleay.



MAMMALS.—DENDROLAGUS DORIANUS, *sp., nov.*

General colour uniform dark brown all over, becoming black on the hands and feet, which are fringed with longer black hair; the palms of the hands and soles of the feet covered with depressed, flat, somewhat hexagonal tubercles, a very indistinct dorsal stripe, blackish; tail black, an irregular light rufous or fawn-coloured patch on the tail near the base, the hair of the tail comparatively short, close stiff and harsh to the touch, black or slightly interspersed with a few grisly hairs; hair of body dense, long, apparently of one kind only, erect between the shoulders; shorter on the neck, on the head very short, paler than on the body, and inclined to be woolly; muffle blackish, covered with short depressed whiskers, short, weak, black hairs, margin of nostrils only naked. Ears very short; densely covered at the base, inside and out, with woolly hair like that of the head, of a dark brown, becoming blackish on the tips and margin.

In a female the hair of the tail is very long, mixed with long reddish-brown hairs, and forming a tuft produced beyond the tips. In both adults and young, the fawn-coloured patch on the tail is chestnut. The whole of the hair on the body is reversed, and meeting that of the head, which is directed backwards, forms a ridge between the ears and down the sides of the cheeks, and is similarly directed on the limbs, the hair on the legs and arms being directed forwards as is usual. The limbs are heavy and very strong, the arms rather long, the legs short and stout.

Total length to the root of the tail, 2 feet, 5·5 inches; the tail 24 inches, wrist and hand 2·5 inches, mid finger 1·3 inch, its nail 1·2 inch, along the curve 1·5 inch; forearm, ulna 4·6 inches, radius 5·5 inches, humerus 4·6 inches, scapula to tip of the acromion process, 3·7 inches; tibia (measured outside the skin), 5 inches; foot (measured outside), 4·2 inches. Length of the skull, 5·2 inches; of the zygomatic arch, outside, 2·7 inches, inside 2 inches; across the skull in front, 1·1 inch, base of skull 1·8 inch.\*

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\* The teeth and all the bones of the skull are in a very bad state, being corroded by the liquid in which the skin was preserved; few of the bones can be measured accurately.

Teeth, I.  $\frac{3-3}{1-1}$ , C.  $\frac{1-1}{0-0}$ , Pre M.  $\frac{2-2}{2-2}$ , M.  $\frac{3-3}{3-3}$ .

Distance from the outer margin of the first incisor to the hinder margin of the third molar, 3 inches; from same point to the first pre-molar, 1.4 inch; from same to centre of canine 0.7 inch; extent of the three incisors, 0.55; width of the palate between the pre-molars, 0.9; between the first molars, 0.95 inch; between the third molars, 0.95 inch; extent of the whole series, 1.6 inch. *Mandible*, extent of the whole pre-molar and molar series, 1.6 inch; first (permanent) pre-molar, 0.4; total length of the mandible from the base of the incisor tooth to condyle, 3.4 inches.

Three specimens of this fine species were brought by the natives to Mr. Goldie during his last collecting trip to the ranges behind Mt. Astrolabe.

I have named this species in honor of the Marquis of Doria, from whose papers, with those of Dr. Peters, I have gained valuable information on Papuan Zoology.

*Hapalotis Papuanus*, *sp. nov.* Pl. 11.

Length from tip of snout to root of tail 12 inches, the tail 9.9 inches, fore foot and toes 1.1 inches, hind foot and toes, 2.3 inches, the head 2.7 inches, the ear 1 inch, from snout to eye 1.4 inch, from snout to ear 2.5 inches (measurements taken from dry skin). There are three large tubercles at the base of the fingers, one at the base of the thumb and one opposite it at the root of the little finger (*See plate 11, fig. 1*), on the soles of the hind feet there are seven tubercles, arranged as shown in *fig. 3*.

The tail is bare, scaly, covered with four-sided irregular-shaped scales (*See fig. 5*).

*Head*—distance between the anterior margin of incisor and occipital condyles, 2.75 inches; breadth across basal portion of zygomatic arches, 1.2 inch. Extent of molar series, 0.49 inch; the fore and aft extent of first molar, 0.21 inch, of the second 0.16 inch, of the third 0.1 inch; width of palate between the first molars, 0.4 inch.

*Lower Jaw*—Length of the rami, 1·18 inch ; from base of lower incisor to the first molar, 0·5 inch ; extent of molar series, 0·49 inch ; from third molar to condyle, 0·75 inch ; first molar, 0·2 inch ; second molar, 0·15 inch ; third molar, 0·1 inch.

The fur is blackish down the back, mixed with a few reddish-brown hairs, brown on the sides and white on the belly and on the inner side of the limbs ; feet and hands light brown, sparingly covered with very short hairs ; whiskers very long and black, 4·5. There is also a slight rufescent tinge on the rump and thighs.

### BIRDS.

#### *Pœcilodryas Sylvia, sp. nov.*

Sexes alike in plumage ; general color black, the upper and under tail-coverts, the abdomen and an oblong or semi-lunar shaped patch on either side of the chest white. The first primary and the inner webs of the wing-feathers blackish brown, under wing-coverts at the base of the primaries whitish ; bristles, bill, legs, and feet, black. The bill is strong, the white patch on the sides of the chest silky. Length, 4·8 to 5 inches ; wing, 3·5 ; tail, 2·1 in. ; tarsus, 0·82 ; bill from forehead, 0·65 ; from gape, 0·7 ; height at nostrils, 0·2 ; breadth at nostrils, 0·2. Mount *Astrolabe*.

#### *Myzomela Eques, var.*

*Adult male*.—The whole of the plumage, except the throat and chin, dull dark brown, slightly lighter on the under wing-coverts ; chin and throat rich bright glossy crimson, bill and legs blackish brown.

*The female* like the male, but slightly lighter in color and with no crimson on the chin or throat. Length of skin, 5·2 inches ; wing, 3·1 in. ; tail, 2·65 in. ; tarsus, 0·75 ; bill from the forehead, 0·9, from gape, 0·9.

This species answers to the description of the male of *M. eques*, but the specimen said to be a female has no red on the throat, nor does this female specimen agree with the young of *M. eques* ; it is on the whole a larger bird.

*Erythura trichroa*, var ?

All the upper and under surface grass-green, slightly paler on the under surface, the forehead and sides of the face extending over the ear-coverts blue ; wings blackish brown, outer webs above of the quills margined with green, the inner webs below dull buff ; underwing-coverts buff ; thighs buff ; tail blackish brown ; the centre two feathers and the outer webs of the remainder, except the outermost two, are margined with dull red ; upper tail-coverts dull red ; under tail-coverts green ; bill black ; legs dull brown. Length, 4 to 5 inches ; wing, 2·5 ; tail, 1·9 ; tarsus, 0·7 ; bill, 0·5 ; gape, 0·53.

This species is closely allied to if not identical with *E. trichroa*, Kittl, but my specimens differ from Mr. Wallace's description of *E. modesta* in not having any yellow on the sides of the neck.

*Eurostopodus Astrolabæ*, nov. sp.

Head and neck dark brown, the feathers centred by a lanceolate stripe of black and freckled with ashy ; those on the hind neck margined or tipped here and there with rufous ; small feathers in front of the eye above and below, and on the throat and the ear-coverts black strongly tipped with rufous ; a black streak below the eye, scapulars and adjacent feathers of the interscapular region rich light rufous, heavily blotched exteriorly with black, the rufous portions freckled with narrow zigzag and wavy lines of black ; the larger series of the scapulars blackish with ill-defined rufous cross-bands, the adjacent secondaries blackish-brown, banded only on the inner webs with rufous, the bands reduced to spots and finally lost on the three first secondaries ; primaries blackish brown, the median ones only with one to two rufous dots on the margin of the outer web ; no trace of the white blotch usually found on the wings of other species known. The upper wing-coverts blackish brown tipped with rufous and white ; the back, rump and upper tail-coverts dark brown, marked with ashy and pale rufous, and indistinctly barred with black lateral expansions of the central black line ; tail blackish brown, barred strongly on the inner webs and spotted on the outer, with rufous irregular markings ; the

central two feathers tipped and barred obliquely with black, the interspaces freckled with ashy rufous; the under surface of the tail black, the bars showing conspicuously (the two outermost on either side lost); under tail-coverts black barred with light rufous or deep buff; flanks, belly and breast strongly spotted at the tip of each feather, and barred with light rufous or deep buff, forming scale-like markings; feathers of the chest blackish, alternately barred with irregular wavy lines of rufous and black; throat patch white, the lateral feathers tipped with rufous; under wing-coverts blackish brown, spotted, tipped or barred with rufous, Legs reddish brown; bill black at the tip, brown at base and sides.

Total length about 9·5 in.; wing, 7·6 in.; tail, 5·5 in.; tarsus, 0·55 in.; mid toe, 0·7 in.; bill, from forehead, 0·7 in.; from nostril, 0·3 in.; from gape, 1·1 in.

The chief characteristics of this species are the rufous markings of the throat and chest, the scale-like markings on the abdomen and flanks, and the absence of the usually found large white or rufous spots on the primaries, and the rufous collar. Two specimens only from Astrolabe Range. (*Hunstein & Rolls*).

*Aegotheles? plumifera, sp. nov.*

This bird differs from *Aegotheles Bennettii* in having the face, throat, chest, and flanks washed with rufous brown, barred distinctly with black, an ashy spot at the angle of the mouth; the head is also washed with rufous, the collar ashy white freckled and barred with black; the tail with from 12 to 14 narrow broken bars. Length, 7 in.; wing, 4·5; tail, 4·2 in.; tarsus, 0·8; bill from gape, 1 in. The cheek plumes much elongated, the tips of the feathers decomposed and lengthened; bristles, black, long from 1 in. to 1·5 in. in length.

*Paradisæa Susannæ, sp. nov.*

Bill lead-blue margined and tipped with yellowish white; a narrow band across the forehead bordering the anterior margin of the eye, the whole of the chin and the throat rich metallic green; feathers on the forehead and chin erect and velvety black in

certain lights, but with a slight purplish tinge in others; the remainder of the head, neck, back, mantle, rump, upper tail-and-wing-coverts light glistening orange-yellow tinged with pale chrome-yellow on the head, lightest and brightest on the rump and upper tail-coverts. Tail and wings brown, the outer margins of the secondaries and of the greater series of the coverts washed with yellow like the back; shafts of the quills reddish brown; margins on the under surface and the greater series of the under coverts and adjacent feathers rich pinkish cinnamon brown. The feathers of the chest pinkish cinnamon colour at the base, bluish ashy grey on the surface, abdomen and thighs; dull light grey tinged with pinkish cinnamon; plumes from above the flanks blood red with the ends of the feathers ashy white, a short tuft of anterior plumes of the same tint, but becoming black at the ends of the feathers over the base of the primary plumes and incurved, their points meeting on the abdomen and ending abruptly, not graduated towards the primary plumes. The two centre wire-like tail-feathers black, the webs at the tips brown, the webbed portion at the base metallic green; the green of the throat is separated from the chest by a narrow line of cinnamon buff; legs bluish lead colour with a pinkish tinge when alive. This species is very distinct from *Paradisea Raggiiana*, although the colour of the plumes is almost the same, but the tips of the feathers end in the same way as those of *P. sanguinea*. The velvet green chin-patch extends more than half way down the throat on *P. Raggiiana*. There are no anterior tufts of plumes. The under surface of these tufts are of a fiery red in certain lights.

There is no shoulder bar on the wings of this new species, all the coverts being tinged with yellow; it is a slightly smaller bird and the bill is weaker than in *P. Raggiiana*.

*Adult Female*.—The adult female resembles the young male. In the former the two centre tail-feathers do not reach the length of those on either side of them; wings and tail brown above and below, basal portion of the inner webs of the quills and the under wing-coverts cinnamon buff. All the under surface, except the throat, which is blackish, is of a cinnamon buff deeper in

tint on the flanks and abdomen, the whole surface barred with narrow cross lines of dark brown.

Head dull ochre yellow ; back and all the upper surface brown, washed with a duller shade of the same tint.

*Young Male*.—The young male, somewhat similar, the wire-like tail feathers subject to the same variations in progress towards maturity as those of *P. apoda* and others of this genus ; the bluish ashy grey of the chest shows at an early stage. This magnificent species was first met with by Mr. Rolles, who was fortunate in shooting a pair of fine adult males on the Island of D'Entrecasteaux.

*Rhamphomantis rollesi*, *sp. nov.*

*General color*.—Head and neck, a stripe from the angle of the mouth on the other side of the throat to below the ear-coverts black, with greenish metallic reflections ; a narrow white line from the nostrils to the base of the ear-coverts, throat and ear-coverts, rufous ; under surface of the wings and under wing-coverts pale cinnamon buff ; the remainder of the under surfaces of the body and the under tail-coverts light brown tinged with light cinnamon buff ; all the upper surface rich brown, glossy ; traces of rufous margins on the wing coverts and quills ; under the surface of the tail and anterior portions of the quills brown ; bill black ; legs lead blue.

*Male*.—Length, 7.5 ; wing, 4.2 ; tail, 4 in. ; tarsus, 0.75 ; bill from forehead 0.75 ; from gape, 0.83,

*Female*.—Rich glossy brown all over, strongly washed with rufous on the margin of the feathers ; all the feathers except the quills and tail barred indistinctly with ashy ; throat ashy white barred with blackish brown on the forehead, a narrow white stripe forming shaftlines from the nostrils to below the ear-coverts ; below the eye a narrow ashy white line ; there are a few ashy white freckles on the hind neck ; all the under surface of the body brown washed with rufous buff and having narrow cross lines of a brownish tint ; remains of blackish cross bars on some of the tail feathers ; under wing-coverts and webs of the quills pale cinnamon buff bill blackish brown ; legs lead-blue.

*Female*.—Length, 7·2 ; wing, 4 in. ; tail, 3·7 ; tarsus, 0·75 ; bill from forehead, 0·8 ; from angle of mouth, 0·85.

Only one pair of this species was obtained shot by Mr. Rolles on Mount Astrolabe.

MELANOCHARIS BICOLOR, *Ramsay, P.L.S., N.S.W., Vol. III, p. 277.*

There are several species of this bird in the collection, adult males and females. The whole of the under wing-coverts and axillaries pure silky-white as in the type.

*Sitella albifrons, sp nov.*

All the head and chest silky-white, including the ear-coverts ; the upper tail-coverts white, most of them with a large lanceolate stripe of black down the centre ; tail blackish brown ; under tail-coverts blackish, broadly margined and tipped with white. Feathers of the rump adjacent to the upper tail-coverts white, the outer three feathers of the tail largely tipped with white, the fourth and fifth very slightly ; wings blackish brown, the first five of the primaries with a small spot of white on the margin of the inner webs, which forms a spot of white on the under surface of the wing, indistinct in some specimens, more distinct in others. Small spot of white on the under wing-coverts at the base of the primaries ; the lower part of the chest and the remainder surface of the body silky-white, with a broad streak of blackish brown down the centre of each feather ; back and rump dark brown, the feather centred with a blackish brown stripe ; bill yellow at the base, black at the tip, under wing-coverts blackish brown ; legs and feet yellow. Young birds are much browner and the white portions washed with ashy.

Total length about...	...	4·2
Wing	... ..	3·4
Tail	... ..	1·65
Tarsus	... ..	·6
Bill from forehead	... ..	·5

*Hab.*—Table-lands of Mount Astrolabe, about 3000 feet above the sea level ; met with in flocks among the Eucalyptus trees ; distance from the coast 15 miles. Inland high. (*Rolles.*)



*Ælurædus melanocephalus, sp. nov.*

I have compared a large number of *Ælurædus* from Mount Astrolabe Range, with both *Æ. arfacti* and *Æ. melanotus*, and find that it differs from the first in having the whole of the head, nape, and mantle spotted; from the second, *Æ. Melanotus*, in having a jet black head with small round fulvous spots in the centre of the feathers; lores and ear-coverts black; there are only indications of spots on the wing coverts and tips of secondaries; the whole of the under surface is washed with yellowish ochre, the throat and chest only distinctly spotted. This bird is quite distinct from Mr. Gould's plates of the both above-mentioned species; the under surface of the tail feathers have a decided greenish blue tinge on the margins of the inner webs, the feathers all largely tipped with white.

On comparison with Mr. Gould's plates and Mr. Sharpe's description, (*Cat. of Bds., Vol. VI.*), I think sufficient distinction will be found to warrant this species being separated from all other known species. Total length 11·5, wing 6 in., tail 5 in., tarsus 1·6, bill 1·3, from gape 1·46.

*Hab.*—Mount Astrolabe, N.G. *Hunstein, A. Rolles.*

For the pleasure of describing these species I am indebted to the Hon. William Macleay, who purchased them with a collection of birds of Mr. Goldie.

*Manucodia atra.*

There are two specimens of eggs said to belong to this bird, in length 1·3 in. in breadth; the ground color is a light greenish grey crowded with dots and spots of brown or reddish brown, and dark slate grey.

In a second specimen the ground color is almost wholly obscured by freckles of dull rich brown. (*Mr. Macleay's Coll.*)

*Pæcilodryas albifacies (Sharpe.)*

A neat cup-shaped nest like that of all the genus; it is composed of wiry rootlets, pieces of dry palm leaves, &c. The margins are ornamented with green mosses; it is placed between upright forks of the branches; the inside is very deep, 1·6 in., the whole height

of the nest being 2·6 x 2·3 in. across. The eggs, two in number are of a greenish white, spangled all over with reddish dots and spots, but closer together on the thicker end. (*Mr. Macleay's Coll.*)

*Eupetes (Circeloroma) Ajax.*

Egg oval, rather short, length 1·2 in. x 0·95 in. of a light stone color heavily blotched, spotted, dotted with irregular shaped marks of black, blackish brown and slate grey, one specimen has a large blotch of slate grey on the top of the thicker end. (*Mr. Macleay's Coll.*)

*Paradisea Raggiana.*

The nest is a flat, open, and a rather scanty structure of wiry twigs and roots, it is placed and worked into a platform of vines stretched across a small fork; it is 6 in. across at the widest part, and the inside diameter 3·6 in., the height of the whole structure 3 inches. The egg oval, rather pointed, of a creamy tint, or light buff; there are a few spots on the thin end of a reddish brown; on the thick end the spots are closer together and mixed with dashes and long narrow tear-shaped markings, and longitudinal streaks from the thick end towards the thin, which vary in color from reddish brown to salmon brown, some with a yellowish tint and others of slate grey being obsolete; there are also a few dots and small spots of the same colors sprinkled over the surface of the shell. Length, 1·45 in.; short diameter, 0·95 in.

*Rectus ferruginea.*

The eggs are long ovals of a pinkish chocolate color, sparingly sprinkled with blackish and slate-blue spots and dots on the thinner end, but closer on the thicker end.—(*Mr. Macleay's Coll.*)

*Talegallus pyrrhopygius.*

White like the egg of *Talegallus lathamii*, finely grained, length 3·65 x 2·3.—(*Macleay Coll.*)

*Goura d'Albertisi.*

The eggs are white, long oval in shape; length 2·4 x 1·55 in.—(*Macleay Coll.*)

*Casuarius (beccari ?)*

Egg 5·3 inches by 3·3 in. The ground color is of a dull greenish brown ; the raised irregular surface of a rich deep bright green.—(*Macleay Coll.*)

The following species of birds' eggs were collected by Mr. Hunstein, and kindly forwarded to me by Mr. Wilson, of Mason Brothers :—

*Microglossus aterrimus.*

Taken from a hollow branch or the hollow bole of a large tree at about 25 feet from the ground. There was only one egg on the debris at the bottom of this hollow ; the bird seen to fly from the hole and shot proved to be the female. The tree was situated in the open forest country on the Astrolabe Range. The egg is white, pointed at the thin end, rounded at the thicker end.

Length, 2 inches ; diameter near the thicker end, 1·4 in.

*Otidiphaps cervicalis.*—*Ramsay.*

The nest was a depression in the débris of leaves, which accumulated in the angles formed by the "spurs" or buttresses of scrub trees. Egg only one, bird shot from nest as she flew off. Egg white ; almost a true oval, evenly rounded at both ends, glossy. Length, 1·92 x 1·25 in.

This is very like the egg of a *Podargus*.

*Hab.* Astrolabe Ranges.

*Ptilopus bellus.*—*Sclater.* "Bebora."

The nest is a very scanty platform of sticks through which the eggs can be seen ; it is placed on a horizontal bough about 6 to 10 feet from the ground ; none contained more than one egg. The eggs are very small for the size of the bird ; they are oval and of a dull white or light cream.

Length, 1·2 x 0·9 in. ; 1·1 x 0·86 in. ; length, 1·18 x 0·93 in.

Astrolabe Ranges.

*Macropygia Doreya.*—*Bpt.* "Cua or Kua."

Eggs vary from long ovals to swollen ovals ; dull white.

Length, 1·2 x 0·93 ; 1·23 x 0·87.

*Collyriocinclla rufigaster*.—*Gould*.

The eggs, two in number, like those of the same species from Cape York ; white, thickly sprinkled over the surface with dull slate-coloured and grey freckles, closer towards the thick end, where they form a zone or a crowded patch on the tip.

Scrubs on the Goldie River.

*Ptilopus superbus*.

Eggs—white, oval, length 1·2 x 0·88, 1·23 x 0·87, slightly swollen in the centre.

*Ptilopus pulchellus*.

White, oblong, oval, equally rounded at both ends, length 1·1 x 0·75.

*Carpophaga poliura*.—*Salvad*.

Oval, pointed at thin end, dull white ; length 1·26 x 0·86. Lalokie Scrubs.

*Caprimulgus Macrourus*.

Three eggs, two for a sitting; length A 1·15 x 0·86, B 1·15 x 0·86, from same bird. The 3rd, 1·06 x 0·89c, is a smaller egg, and found by itself, 1·06 x 0·8 All were placed on the ground.

They are of a light creamy, with obscure dull slate grey spots, and a zone of similar spots round the larger end (A). No. 9 B, has no zone., No. 9 c, the smallest, has the spots more evenly dispersed over the surface.

*Drepanornis d' Albertisi*.

The nest is a thin, rather flat structure, built between a horizontal bough in the fork of a thin branch ; it has a slight depression about 1 inch deep, a net-work of wire rootlets are stretched across the fork, and the nest proper built on them ; it is composed of wiry grasses of a light reddish brown color, the platform being of black wiry roots.

The egg is in length 1·37, by one inch in breadth ; it is of a light dull cream color, with a reddish tinge, spotted all over with oblong dashes of reddish brown and light purplish grey, closer on the thick end.

Mr. Hunstein informs me that he shot the female bird on the nest, and that there cannot be any possibility of a mistake as to its authenticity, which judging from the state the egg was in, I can quite believe.

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ON SOME HABITS OF *PELOPEUS LETUS* AND A SPECIES OF  
*LARRADA*.

BY H. RAWES WHITTELL, ESQ.

On the 2nd January, 1880, numbers of a species of hornet, *Pelopæus letus*, took possession of our fireplace for the purpose of constructing their nests. I began to observe their movements, confining my attention principally to one pair; this pair readily decided upon a site, and began to build by securing thereon a shapeless mass of mud about half a square inch in area, which they brought in small portions from the bank of the Darling River, which was close by.

One of them worked out a shallow circular space, similar in shape to a saucer, using its mandibles, tarsi of the first pair of legs, and antennæ in the operation. The loads of mud before deposited almost promiscuously, are now arranged by each one on the edge of this saucer-shaped cavity, pressed into proper shape and thickness, and finished off forthwith. As the cell grows, the upper portion is made to project considerably beyond the lower. This is convenient, owing to the position they assume; always getting beneath the cell, and invariably working from the upper to the lower portion.

The work progresses in this way without interruption until the cell is about half or two-thirds the required depth; when the owners begin to insert their own bodies occasionally evidently to see how the interior is for size. About this time also they begin to draw out the lower portion of the cell, to a more nearly equal distance with the upper, from the base; it is also further strengthened by mud being piled on the top, and at either side. When the hornet finds that the cell is equal, or nearly so, in depth

to its own length, and all parts of the edge are equally distant from the base, it bends in the outer edge until the aperture barely admits of the passage of its own body.

Beneath this cell are built two, or sometimes three others in a roughly horizontal row; then another row containing more cells than the one above it, and so on until the nest has reached the required maximum breadth; when the number of cells in each row diminish, until on the completion of the whole it is in shape a rough oval. The mandibles appear to be the principal building organs, as they are used to press the mud to any required thickness. The anterior tarsi before mentioned and the antennæ are also largely used; the tarsi support the load of building material, which is about the size and shape of a small pea, during transport; they also assist the mandibles in shaping. The antennæ are, no doubt, the final smoothing and polishing instruments; they beat the mud with such velocity as to render their motion almost invisible, and create a loud humming noise.

I may remark here, that in the construction of cells, the antennæ do not appear to be the organs of sensation, which determine when the wall of the cell has arrived at the required thickness. The anterior tarsi, judging from their movements, perform this office; from which it would appear that in *Pelopæus latus* these tarsi are capable of conveying sensation, of a kind usually, I believe, accredited, in all insects, to the antennæ alone.

On one occasion, while the hornets were in search of more material, I pressed a portion of the edge of a cell, in course of construction, out of shape. On the return of the first one the damage was detected, apparently by sight, almost instantly; he seemed for a time quite nonplussed, but presently he deposited and arranged his load in another place and then repaired damages.

Again I repeated this experiment, but on his return this time he showed no hesitation whatever; took in the situation at a glance, as it were: deposited and arranged his load on the intact portion of the edge of the cell, then repaired the damage. He alighted and went to work with such rapidity that I thought the

damage had escaped notice in the latter case, and I was much astonished when, as soon as his organs were at liberty, he went to the other side of the cell and straightened it up.

As soon as each individual cell is completed, work in cell building is suspended until the spiders, which are to nourish the embryo are collected, and the ovum deposited. The number of spiders stored in each cell varies from four to seven, according to their size. The ova are always deposited on the under surface of the abdomen of the first spider placed in the cells, and are firmly attached thereto, the female entering the cell backwards to perform this office. The change from the ovum to the larva is very rapid, but I cannot state with certainty as to the time occupied, possibly within twenty-four hours.

The larvæ of this species appears to live by suction for about fourteen days, devouring all the soft parts of the spiders first; at this age a sharp, strong, pair of mandibles are distinctly seen with which, in almost all cases, every scrap of the store of food both hard and soft which remains is devoured. In the course of a few more days the larva spins for itself a cocoon and enters the pupa state, attaining the imago about twenty-five days from the time the egg was deposited.

I may mention that I sat in the fireplace to conduct my observations. I have frequently watched these and other hornets at work at a distance of from four to six inches from my face.

On the 20th January, 1880, I examined a complete nest of this species containing thirty six cells. The average number of spiders in each cell was five, so that one pair of these hornets destroy one hundred and eighty spiders in one season.

The entrance to each cell is closed immediately the store of food contained is sufficient, and when the last cell is closed, both hornets set to work and cover the whole with a network of mud ridges, giving it decidedly an ornamental appearance.

I have now to refer to a singular circumstance connected with this species, and a species of Larrada probably *Larrada Australis*?

On the 4th January, 1880, on resuming my observations, I saw to my surprise ; that two cells of a nest of *Pelopæus letus* which had been finally closed, and were intact on the preceding day, had been broken open. This nest had been finished for some time, so I was at a loss to account for the re-opening, but the whole was explained when another hornet, *Larrada Australis*, suddenly emerged from one of these cells. This hornet kept running in and out of these cells in a very restless manner, appearing to snatch a mouthful of something each time it entered, I hastily concluded that it must be devouring the food therein, and fearing to lose the specimen I captured and transferred it to my specimen box ; I place it on the table for inspection, together with a specimen of *Pelopæus letus*.

More of the species *Larrada Australis*, came about the nests of *Pelopæus letus* that I was watching, and I observed several more of their cells broken open by the *Larrada*, but I could come to no satisfactory conclusion, as to their real object in pursuing this predaceous course ; until the 18th January, 1880. I then saw one of this species deliberately take possession of a cell of *Pelopæus letus*, on which they were at work. No decided attempt was made by the *Pelopæus*, to regain possession, although this cell contained its own ovum, and three spiders. Both hornets skirmished about for a time, each seeming afraid of the other, at last *Larrada Australis* entered the cell, and settled down to its work without further opposition ; the aperture of this cell being much larger than the one made by *Larrada Australis* itself, admitted of more light, so I determined at the risk of a sting to find out what was going on inside ; I accordingly placed my eye right close to the entrance, and saw that the *Larrada* was dividing the cell into two portions by erecting a wall of mud ; it then became evident to me that this hornet was playing the part of the Cuckoo, by depositing its own egg in the nest of another species, so that its young might be developed at the expense of the labours of another. After this I examined all the cells which had been taken possession of by this hornet, and as I anticipated, I found in every case the ovum of *Larrada Australis*?



therein, and these cells were sub-divided as I had witnessed in the first instance.

There is no possibility of mistaking the ova, that of *Larrada Australis*, being only about half the size of that of *Pelopæus latus*. The *Larrada* does not go to the river for the material used in subdividing the cell, but takes it from any convenient part of the nest it has attacked, moistening it with a secretion of its own, it also, when at work, emits the same sound as *Pelopæus latus*, but so faintly as to be only distinguished at very close quarters.

I could not discover what was done with the ovum of *Pelopæus* but I believe it is devoured by the *Larrada* before it deposits its own. If it were thrown out of the cell I should have seen it done I think, and it was certainly not in any of the cells I then examined, so that the only way it could be disposed of is as I have suggested. If it is eaten by *Larrada Australis*, what purpose does this serve, it is surely not the natural food of this insect?

The locality from which these specimens came, and where my observations were made, is situated in about  $31^{\circ} 30'$  south latitude, and longitude about  $143^{\circ} 30'$  east, and about six miles from the town of Wilcannia on the Darling River.

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#### ON THE VORACITY OF A SPECIES OF HETEROSTOMA.

BY H. RAWES WHITTELL, ESQ.

On the 18th September, 1879, while insect hunting, I turned over a dead log, and beheld to my surprise a lizard (*Diplodactylus*), held fast by a centipede of the genus *Heterostoma*, which was eating it alive. Neither seemed in any way disturbed by my intrusion. I sat down to watch results, and occasionally stirred up the *Diplodactylus* with a stick, which caused it to make feeble and futile efforts to release itself.

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The centipede had secure hold by numbers of its hinder legs to a firm twig ; some of the middle ones held the tail of the *Diplodactylus*, which was severed from the body, leaving but a short stump, and the remainder held its victim securely by the right hind leg and stump of the tail. I next got on all-fours to watch the centipede feeding ; at first I thought it was but sucking the blood, but saw shortly that it was eating the flesh also, and by squeezing the wound with its mandibles, causing a copious flow of blood at moderate intervals ; always eating the flesh between these intervals. After watching them for about a quarter of an hour, I killed the centipede and examined the *Diplodactylus* ; I found, just immediately before and slightly beneath the right hind leg, a shallow circular space a little more than the eighth of an inch in diameter, and about one-sixteenth of an inch in depth, eaten clean away.

The *Diplodactylus* when in the grasp of the centipede seemed stupified, but soon recovered itself after I had liberated it. It was fully four inches in length, and about half an inch in breadth across the body. The *Heterostoma* was about three and a half inches in length, and in breadth of a proportion common to its family.

I may state that I made notes of all my observations at the times they were made, and it is from these notes that my remarks this evening are compiled.

The locality where this observation was made is the same as that given in my preceding paper.

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#### NOTES AND EXHIBITS.

Mr. MACLEAY exhibited a curious horny growth taken from the ear of a sheep at Natal Downs, Queensland. The growth, which seems to have arisen from ear-marking five months previously, was of a long conical shape, resembling horn both in form and texture.

MR. BRAZIER exhibited two specimens of a new genus of Shell from New Guinea, for which he proposed the name of *Brazieria typica*. He intimated that a full description would be given at next meeting.

MR. RAMSAY exhibited two masks, a dagger formed of the spine of a Sting Ray, a knife of Obsidian, and a variety of ornaments, &c., from the Admiralty Islands.



WEDNESDAY, 28TH FEBRUARY, 1883.

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The President, C. S. WILKINSON, F.G.S., &c., in the Chair.

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MEMBERS ELECTED.

Edward C. Fallick Esq., Sydney.  
James D. Cox, Esq., Mudgee.  
P. N. Trebeck, Esq.  
Spencer Clay Burnell, Esq., 174 Forbes Street, Darlinghurst.  
Henry Hamilton Onslow, Esq., Mines Department.  
Frank Meyrick de Meyrick, Esq., Peates Ferry, Hawkesbury  
River.  
J. MacDonald, Esq., Mason Brothers, Sydney.

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DONATIONS.

“Transactions and proceedings of the Royal Society of South Australia,” Volumes II., III., IV., and V., 8vo., 1877-82. From the Society.

A series of papers “On Pre-historic footprints in the Sandstone Quarry of the Nevada State Prison”; “On the fossil jaw of a Mammoth”; and “On the history &c., of Fresh-water Mussels,” 8vo., 1882. From the California Academy of Sciences.

“Smithsonian Contributions to Knowledge,” 9 volumes. 4to. 3 4to. pamphlets.

“Smithsonian Miscellaneous Collections,” 17 octavo volumes, and 4 pamphlets. From the Smithsonian Institution.

“Proceedings of the Boston Society of Natural History,” volume XX., part 4, Vol. XXI., parts 1, 2, and 3, 8vo., 1880-82. From the Society.

“Bulletin of the Museum of Comparative Zoology at Harvard College,” Cambridge, Massachusetts, Vol. VI, No. 11, 8vo., 1881. From the Museum.

“Proceedings of the Academy of Natural Sciences, Philadelphia” Yearly volumes for 1876, 77, 78, 79, —, 81, 8vo. From the Society.

“Memoires de l' Académie Imperiale des Sciences de St. Pétersbourg,” Tomes xxiii. to xxix. and xxx., Nos. 1, 2, and 5, 4to., 1875-82.

“Bulletin de l' Académie Impériale des Sciences de St. Pétersbourg,” Tomes xxi. to xxvii. and xxviii., No. 1, 4to., 1875-82. From the Academy.

“On Chilostomatous Bryozoa from Bairnsdale,” (Gippsland) By Arthur Wm. Waters, F.G.S. From the author.

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PAPERS READ.

ON THE FOSSIL FLORA OF THE COAL DEPOSITS OF AUSTRALIA.

BY THE REV. J. E. TENISON-WOODS, F.G.S., F.L.S., VICE-PRESIDENT LINNEAN SOCIETY, NEW SOUTH WALES.

In the month of August 1880 a paper was read before the Royal Society of New South Wales from Dr. O. Feistmantel, on the fossil flora of Eastern Australia and Tasmania. This essay comprised a most valuable series of observations on all that was known on the subject of our Australian coal plants, for though it only professed to deal with those of eastern colonies, it included the paleontological flora of Victoria as well. It was a brief epitome of all that was then known of our fossil flora. Dr. Feistmantel, however, laboured under the disadvantage of having only the specimens collected from a comparatively restricted area and numerically few. Had he been able to visit the fields from which the specimens were taken he would have observed that the flora of each particular locality included a much larger number of species

than were contained in his lists. He states that his observations were founded on a collection forwarded to him in 1876 by the late Rev. W. B. Clarke, F.R.S., and on another smaller collection sent in 1878 by the same gentleman, and on several specimens sent to him by Mr. C. S. Wilkinson, F.G.S., government geologist of New South Wales. These picked specimens do not give a complete idea of the flora, and it may be safely asserted that comparisons instituted between one locality and another on small collections are more or less fallacious. Since the publication of the papers referred to I have visited a great many of the coal bearing districts in Queensland, and have made extensive collections. I have found that Dr. Feistmantel's list can now be largely extended. I refer to this list in particular because it is the only one of the kind published in English. It is simply a brief summary of a larger work published in German entitled "Palaeozoische und mesozoische Flora des östlichen Australiens,"\* and which is inaccessible to most English readers. It is rarely met in the colony and is not yet in any of our public libraries. In the course of this essay it will be seen how largely I have availed myself of this most valuable work. I propose now to go a little further into the subject, and place within reach of Australian students, not only what relates to Australian coal plants, but also a general view of their scientific classification. At present there is no English modern work which will take the place of Schimper's expensive volumes and plates, and moreover to study the fossil flora of Australia scientifically would require a large and costly library. It is to be hoped that what I now publish will supply the want, while it extends the knowledge of the flora. I shall commence with the History or Literature.

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\* Cassel 4to, published in two parts as portions of a serial work entitled *Paleontologische Beiträge* of which Feistmantel's work forms Part III, 1878, with 18 plates, and Part IV, 1879, with 12 plates. The plates are numbered 1 to 12 in the second part, with a second enumeration (connecting the work with the first part) from 19 to 30. Reference is always made in the essay to the second enumeration. Readers must be on their guard about the typographical errors which are very numerous and not half included in the errata. Dr. Feistmantel being in India was unable to correct the press.

HISTORY.—The first notice of any coal plants of Australia would appear to be by A. Brongniart, who, in his History and Table of Fossil Plants, notices *Phyllothea australis* and some other plants as coming from Australia, but without any further information.\* He also gives a description of *Glossopteris browniana* † also an Australian Fossil.

In the Edinb. New Phil. Journ. for September, 1832 and January, 1833, p. 155, we find a notice of the fossil coniferous woods of Australia by Mr. William Nicholl. The specimens were received from the Rev. C. P. N. Wilton, who collected them from Newcastle, Macquarie Lake and other places.‡

In 1845 Prof. Morris gave the first special notice of Australian Fossil Flora in Strzelecki's Physical Description of New South Wales and Van Dieman's Land.§ In this essay he described fossils from Newcastle, New South Wales, and Jerusalem in Tasmania. In summarizing the result of a study of the carboniferous flora, he thought that at the carboniferous period the Australian plants were perfectly distinct from those of the northern hemisphere. He was the first paleontologist who called attention to the resemblance between the local plants of Australia and those of India. He pointed out that there was not only a remarkable analogy of form in some species, but an actual identity in others. It is to be remarked that Professor Morris's *Pecopteris australis* is now regarded as *Alethopteris* and *P. odontopteroides* as *Thinnfeldia*.

In 1847 Prof. McCoy gave an elaborate report on the Fossil Botany and Zoology of the rocks associated with the coal of

\* Prodrômus d'une Histoire des Vegetaux Fossiles, p. 152, 8vo. Paris, 1828.

† Histoire des Vegetaux Fossiles 2 vols., 4to. Paris, 1828. Vol. 1, p. 322.

‡ See also The London and Edinburgh Philosophical Magazine for 1832 (vol. 1), p. 92, where there is a paper entitled "Sketch of the Geology of six miles of the south-east coast line of the coast of Newcastle in Australia, with a notice of three burning cliffs on that coast. By the Rev. Charles Pleydell Neall Wilton. M.A., of St. John's College, Cambridge. Fellow of the Cambridge Philosophical Society and Chaplain of Newcastle." After this long title it would seem that a foot-note by the Editor saying that the paper was communicated by the author is somewhat unnecessary.

§ London: Longman, 1845, p. 245.

Australia.\* In this report many new species of ferns, &c., are described and figured and their relations discussed at length. The author's descriptions will be considered hereafter, he regarded the plants as of Oolitic age. He summarizes his conclusions thus: "With such evidence as I have mentioned, I do not think it improbable that a wide geological interval occurred between the consolidation of the fossiliferous beds which underlie the coal and the deposition of the coal measures themselves; that there is no real connection between them, but that they belong to widely different geological systems, the former referable to the base of the Carboniferous system, the latter to the Oolite, and neither showing the slightest tendency to a confusion of type."†

From these conclusions, the Rev. Mr. Clarke dissented, and maintained that there is no break whatever between the various beds, but that the fossiliferous rocks are interpolated by the coal beds containing the peculiar plants described. In a paper contributed to the Annals and Mag. of Nat. Hist. for Sept. 1848,‡ he enters into proofs of the correctness of his opinion. These are—

1. That Mr. Jukes, after an examination of the Illawarra coast in 1845, then agreed with him that there was no break in the series.
2. That Professor Dana, though differing from Mr. Jukes, saw in the low cliff at Black Head in the midst of the organic remains as described by M'Coy from that locality, the identical fossilized wood described by Mr. Jukes. It was in and above the coal.
3. At Moree (not far from Raymond Terrace), Mr. Clarke found paleozoic fossils associated with impressions of *Glossopteris lineata*.
4. At Anvil Creek good coal is overlaid by a sandstone containing Spirifers and other fossils described by M'Coy; also at Page River, Mount Wingen.
5. Stems and leaves of ferns occur also in fossiliferous beds on the Allyn and various parts of the Hunter River district.
6. At Parramatta casts of shells have

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\* Annals Mag. Nat. Hist. Vol. xx, p. 145, &c.

† Annals and Mag. Nat. Hist., vol. 20, p. 311.

‡ Remarks on the identity of the epoch of the coal beds and paleozoic rocks of New South Wales, p. 209 of 2nd vol. for 1848.



been found in quarries at the very top of the great sandstone, and between it and the Wianamatta beds, which are in the Illawarra escarpment, full 800 feet above the level. And these Wianamatta beds, at Clarke's Hill and elsewhere in the Cowpasture country abound with ferns. The author concludes by saying, "So long as the fossil wood of the coal measures and leaves and stems of *Glossopteris* occur in the same rock, specimens with the *Spirifers*, *Productæ*, *Cornularia*, &c., which I maintain they do. . . . I must take the liberty of expressing my belief from what I have seen and know from actual and careful and repeated examination of a very extensive region during several years, that there is no break in our Australian series of deposits, and that if the paleozoic fossils are of the lowest Carboniferous age, so the age of the coal plants is nearly identical with it."

In this summary three things will surprise geologists of the present day, namely :—Mr. Clarke states that he has found rock impressions of ferns (*Glossopteris*) and *Spirifer*, *Productus* and *Cornularia* on the same rock specimens. 2. All the formations from the coal to the Wianamatta are included as one. 3. The age assigned is the lowest Carboniferous.

The views of Mr. Jukes here referred to were published in the 3rd vol. of the "Quart. Journ. Geol. Soc. Lond. p. 224. \*

He described a series of deposits near Sydney about 2000 feet thick which he termed paleozoic. The lowest of the series was called Wollongong sandstone, thick bedded, fine grained often calcareous, containing many concretionary nodules from one inch to two feet in diameter. This was 300 to 400 feet thick with *Stenopora*, *Spirifer*, *Productus*, &c. Above these are 200 feet of strata with coal represented as *not likely to be important*. Then shales and sandstone 400 feet. Then 700 to 800 feet of white or light yellow sandstones, varying from fine grained to coarse, containing quartz pebbles, resembling, as Mr. Jukes thought, the millstone grit and lower coal measures of England. On the whole

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\* Notes on the Paleozoic formations of New South Wales and Van Diemen's Land by Professor J. B. Jukes.

are shales 300 feet thick, with a few small fragmentary impressions and pieces of leaves, and occasional fish remains. Mr. Jukes believed that there was a perfect conformability in the whole series, and a gradual transition of their divisions into each other.

About the date of the letter of Mr. Clarke to the *Annals of Natural History* he sent a paper to the Geological Society of London \*

In this he took exception to the statement of Count Strzelecki in his work that there was an entire absence of such plants as *Sigillaria*, *Calamites*, *Lepidodendron* and Conifers in the Australian coal beds. After some remarks on the similarity of our coal beds to those of India he gives the following list of coal plants stated to be found in the carboniferous deposits of New South Wales: *Pecopteris*, *Neuropteris*, *Odontopteris*, *Cyclopteris*, *Sphenopteris*, *Glossopteris*. Genus, intermediate between *Teniopteris* and *Glossopteris*, *Halonina*. Cannæform plants: *Calamites*, *Phyllothea*, *Zeugophyllites*, *Equisetum*, *Lycopodites*. New genus of plants with wedge formed stems: *Lepidodendron*, sometimes *Lepidostrobi*, *Ulodendron*, *Sigillaria*, and *Stigmaria*, *Coniferæ*. He then gives the localities where they are found, stating that *Lepidodendron* occurred on the Paterson and that *Calamites* abound not only at Newcastle but over the Hunter and Illawarra coal regions. He concludes thus "We find also that there is a gradual passage from a fauna usually supposed to belong to the lowest Carboniferous beds of Europe to one still lower in the geological scale in which in Europe no true coal beds have been discovered. And if we adopt the view long ago presented to my mind that the Australian system is the equivalent of the Devonian or embraces that and the Carboniferous formation together, we shall still be met with the fact that Silurian forms are mingled in abundance with a flora supposed to be younger." From this Mr. Clarke suggests that we cannot place our formations on a parallel with any European epoch, but that what was the Silurian

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\* On the Genera and Distribution of Plants in the Carboniferous system of New South Wales. *Proceedings* June 16, 1848, vol. 4, p. 60.

Devonian, Carboniferous in Europe, formed one uninterrupted and conformable series of deposits in Australia.

We suppose that some of the fossil plants indicated in Mr. Clarke's list are instances of mistaken identification, because subsequent investigation has not confirmed their existence. Mistakes as to locality, &c., from which specimens were obtained must explain the assertion that *Lepidodendron*, *Ulodendron*, *Lycopodites*, and *Neuropteris* occur in connection with our coal deposits.

In 1849 Professor Dana published\* a description of some Australian coal plants. It is remarkable that he regards Morris's *Zeugophyllites elongatus* as *Noeggerathia*, a conifer. The descriptions given by Dana are very elaborate, and the discussions equally so, but he does not believe that there is no break between the paleozoic marine fossils and the plant remains. In 1850 Mr. Jukes published his sketch of the physical structure of Australia, in which he repeated the opinions previously put forth as to the general conformability of the coal and other deposits, and that they all formed one great paleozoic formation without any break. Mr. Jukes believed that we had not any mesozoic formations in Australia, either terrestrial or marine. The work did not throw any light on the paleontology of our coal plants, though many are mentioned by name.

Previous to the year 1851 the Rev. W. B. Clarke sent a *Lepidodendron* to Prof. Sedgwick, and in June of that year Prof. McCoy wrote from Cambridge to Mr. Clarke stating that the specimen was *L. tetragonum* of the English coal fields, and adding that it was the first *Lepidodendron* seen from Australia.†

With the exception of the *Lepidodendron* all the species described and published by the above authors were included in the second edition of Dr. F. Unger's *Genera et Species Plantarum Fossilium*. Leipsic, 1850. Many of them in Baron A. de Zigno's *Flora Fossilis Formationis Oolithicæ*. Padua, 1856 to 1860.

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\* United States Exploring Expedition, Vol. X., Geology Appendix, p. 714. Philadelphia, 1849.

† Clarke, *Sedimentary Formations*. 4th edition, 1878, p. 21.

In the latter part of the year 1857 a select commission was appointed by the Parliament of Victoria to examine into the coal fields of that colony. In the evidence published with the report there is much information about coal and the coal plants of Australia, but the opinions given as to the age of both are conflicting. A short time subsequently searches for coal were instituted near Geelong in Victoria, and on the Wannon River in the western part of that colony. The origin of that search was the occurrence of shales with imperfect plant remains in a rock which bore much resemblance to Jurassic strata in Europe. The result of borings was the discovery of fragments of Cycadaceous plants (*Podozamites*), ferns (*Teniopteris*, *Alethopteris*) and at the Wannon a *Unio* (*Unio dacombi*, M'Coy). All these discoveries were recorded in the local papers, the *Geelong Advertiser* and the *Portland Guardian* of various dates in 1859.

In 1860 a long discussion took place between the Rev. W. B. Clarke and Prof. M'Coy as to the age of the beds to which these fossils should be referred. The papers containing this are published in the Transactions of the Royal Society of Victoria for 1860. Prof. M'Coy maintained that the fossils were of Oolitic age, and that as so many were identical with fossils found in the Newcastle seams of New South Wales, the whole should be referred to the same geological horizon. Mr. Clarke combated both conclusions, but the controversy turned more particularly on the significance of *Teniopteris*.

In the following year Mr. Clarke published a paper on the relative position of certain plants in the coal bearing seams of Australia.\* The occasion of the paper was statements by Count de Zigno that—1. Mr. Clarke had reported the discovery of *Sigillaria*, *Lepidodendron* and *Stigmaria* in the coal beds of New South Wales. 2. That these determinations had not been verified. 3. That instead, a series of ferns had been found, which with types analogous to those of India, recalled the Jurassic flora of Scarborough†.

\* Quart Jour. Geol. Soc., London. Vol. 17, p. 354.

† Some Obs. on the Flora of the Oolite, Quart. Journ. Geol. Soc., London. Vol. 16 (1860), p. 111.

In reply Mr. Clarke refers to Mr. Selwyn's opinion, that true Carboniferous or Devonian plants occurred in Eastern Victoria and Tasmania immediately underlying the coal-bearing beds and conformable to them. He reiterates that such fossils as he specified had been found in New South Wales, Queensland and Victoria, and gives the localities. He repeats that they are in beds which are conformable to the coal measures—an error which will be subsequently referred to. He also states that the Carboniferous marine fauna of New South Wales including such forms as *Pachydomus*, *Spirifer*, *Orthoceratite*, is intercalated with beds containing *Glossopteris*, *Vertebraria* and *Phyllothea*—a statement which all subsequent observation has confirmed in New South Wales, Queensland and Tasmania. *Tæniopteris daintreei* of M'Coy, was not described until many years after, but references are made to it and the associated plant remains in the Inter-Colonial Exhibition Essays of Prof. M'Coy\* and in a note on the same subject in the Annals Mag. of Nat. Hist. for 1862. In 1865 some mention is made of plant remains by Mr. C. S. Wilkinson, in his Geological Report of the Cape Otway district.†

A further contribution to the knowledge of the subject was made by Mr. W. Keene, Inspector of Coal Mines for New South Wales, in a paper on the Coal Measures of that colony, read before the Geological Society of London.‡ In the following year Mr. Selwyn, the Government Geologist of Victoria, published an Essay on the Geology and Physical Geography of the Colony of Victoria, in which there were also references to the plant remains.§ At page 20 he says, "I am inclined to believe that the Victorian 'carbonaceous' series is newer than and above the Sydney sandstone."|| It may, perhaps, represent what Mr. Keene, in his paper on the Coal Measures of New South Wales

\* On the Ancient and Recent Nat. Hist. of Victoria, by Prof. M. Coy. Melbourne, 1861.

† Geological Survey of Victoria. Melbourne, 1865.

‡ Quart. Journ. Vol. xxi. May, 1865.

§ Melbourne : Inter-Colonial Exhibition Essays, 1866. Small 8vo.

|| By this term Mr. Selwyn probably indicated the Hawkesbury sandstone, which he supposed to be the same as the coal-bearing strata. It is, however, distinct, often unconformable and, as I believe, an eolian deposit.

(in the Quarterly Journal of the London Geological Society, May, 1865) designates "False Coal Measures" (Wianamatta strata of Clarke). In any case all the evidence hitherto obtained, both paleontological and geological, tends clearly to show that the "carbonaceous," or coal-bearing rocks of Victoria, are newer than paleozoic, and that a great break or unconformity exists between them and the beds that contain *Lepidodendron* and other paleozoic plants in eastern Gippsland."

I need not follow the coal controversy through all the different publications in which it appeared, nor need I give here more than a very brief summary of its stages. The position of Professor M'Coy was, that he did not believe that the beds which furnished the paleozoic marine shells, and those in which *Glossopteris*, *Vertebraria* and *Phyllothea* occurred, were one geologically. He thought that there must be break between them which would give a paleozoic age to the shells and an Oolitic age to the coal plants. Mr. Selwyn's investigations in Tasmania, gave support to this theory. That gentleman in his report, stated he thought that the Jerusalem beds with *Thinnfeldia*, *Zeugophyllites* and *Alethopteris* were conformable to the beds containing true carboniferous marine fossils. He subsequently found that they were unconformable. Mr. Clarke maintained that there was no unconformability in New South Wales. This appears in various papers and letters, notably one on the coal seams of Stony Creek, West Maitland district New South Wales.\* As early as 1863 Mr. Daintree had (August 29), written to the Editor of the "*Yeoman and Advertiser*" in Melbourne, stating that having examined the beds at Russell's shaft, Stony Creek, he was convinced that *Glossopteris*, &c., were really intercalated with marine strata containing paleozoic fossils, about whose Carboniferous character there would be no possible doubt. This fact was confirmed in the many subsequent publications of Mr. Clarke, principally letters to the local journals, and his little work on the Sedimentary formations of New South Wales. I must refer my readers to the work itself for details of

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\* Trans. Roy. Soc., Victoria, 1864, Art 6.

the various arguments. The first edition was published in 1867, as an essay in the Catalogue of the Natural and Industrial Products of New South Wales, forwarded to the Paris Exhibition of 1867.\*

But probably the most important advance in the knowledge of Australian Coal Plants was that made by the publication of Daintree's Essay on the Geology of Queensland.† In this Mr. Daintree points out the distinction which must be made between coal plant beds containing *Glossopteris* and others with *Teniopteris*. The former he stated is in Australia, paleozoic and the latter mesozoic, and that the two kinds of fossils are never mingled in the same beds. The selection of *Teniopteris* is unfortunate because it is not common and probably included distinct genera according to the classification then adopted. *Thinnfeldia* is a much better typical fossil of the mesozoic beds, and it is never found associated with *Glossopteris*. It is very common and prevails everywhere in Oolitic plant beds. In an appendix to the paper Mr. Carruthers figured and described some Devonian, Carboniferous and Oolitic plants. He did not however, agree with Mr. Daintree in separating the coal formations of Australia into epochs represented by *Glossopteris* and *Teniopteris*, but thought they might belong to one great period not earlier than the Permian. But Mr. Daintree pointed out that in West Maitland, New South Wales, *Glossopteris* was found in beds distinctly underlying some containing *Spirifer* and other forms which were certainly Carboniferous. This observation has since as already stated been abundantly confirmed, but it was lost sight of at the time. To Mr. Daintree's investigations must be assigned the credit of co-relating the Jerusalem (Tasmania) beds, with those of Ipswich in Queensland, in which no *Glossopteris* is found or the associated marine Carboniferous fauna.

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\* A second edition was prepared for the Report of the International Exhibition at Sydney in 1870, and on the Industrial Progress of New South Wales for the same year. A third edition was printed for the Philadelphia Exhibition in 1875, and a fourth and last edition for the year 1878, when the veteran geologist was in his 80th year.

† Quart. Jour. Geol. Soc., Lond. vol. 28, 1872, pp. 271, 356.

In the Progress Report of the Geological Survey of Victoria for 1874, Mr. Brough Smyth, at p. 24, states that he found associated together *Pecopteris (Alethopteris) australis*, one of the characteristic forms of the Jurassic coal beds of Australia, with *Glossopteris browniana*. This identification was confirmed by Professor M'Coy. On the strength of this, Mr. Smyth considered that the whole of the coal of New South Wales and Tasmania is mesozoic, adding, "In New South Wales and Tasmania the coal-bearing rocks lie on limestones, and the fossil fauna contained in these limestones may without doubt be regarded as belonging to the marine paleozoic Carboniferous period," p. 26. In making this statement, Mr. Brough Smyth contradicted all the observations of those who stated that the coal not only lay upon the marine Carboniferous fauna, but was intercalated between. In a geological map published subsequently, he reiterates the above opinion by coloring all the Newcastle coal deposits as carbonaceous, and not carboniferous. No facts were given to confirm these opinions except the discovery of *Glossopteris* as above stated.

In 1876, there appeared in the Geological Magazine\* an article from the pen of Dr. Feistmantel on the Gondwana series of India. Speaking of the fossils of the Damuda group, he says—"From the occurrence of the genus *Glossopteris* in these beds they were for a time brought into connection with Australian coal measures, and declared paleozoic." He points out the error of this because, 1, in the Damuda group *Glossopteris* is associated with Triassic plants which do not occur in Australia at all. 2. Because in India *Glossopteris* is never associated with marine paleozoic fossils which do occur in Australia. He adds that "*Glossopteris* grew first in Australia" during the Carboniferous epoch, survived in India, passing perhaps through China when India was in connexion with the European Triassic Continent. (Note at p. 490.)

With reference to *Phyllothea*, he says—it is known in Australia mostly only from the Newcastle coal-field above the marine fauna and from mesozoic rocks in Victoria together with *Teniopteris*, &c.

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\* First article in the November number, p. 481.



*Phyllothea* (Brongniart) however, is best developed in Europe in the Italian Oolite, in which one form has all the genuine characters; and nothing of this kind is known anywhere in Carboniferous strata. I may add that the difference in form between *Phyllothea australis* and some *Calamites*, is trifling, and it would not be any great violation of the generic characters of either, to call the *Phyllothea* referred to, an Australian *Calamites*. I do not think that the Newcastle species is the same as the one found in the shale of the Hawkesbury sandstone. This will be explained further on.

In 1876 Dr. Feistmantel published some notes on the age of some of the Fossil Floras in India\* In this and subsequent publications of the Indian Geological survey he reviewed the question of the age of our coal plants, some more of which had been found unrepresented in the Indian beds. His observations on this subject were continued to the present year, and were scattered through numerous publications, notably the Records of the Geological Survey (Paleontologia Indica, three volumes of which refer to the fossil flora), and the journal of the Asiatic Society. More complete references will be found in the course of this monograph in connection with the plants he dealt with.

From the year 1874 until the present day Professor M'Coy of the Melbourne University, has published various parts of a Prodomus of the Paleontology of Victoria. In these he has figured and described many of the coal plants of Victoria, though payable seams of coal have never been found in that colony. The fossils there published are species of Cycads, Ferns, and Lycopods, The figures and descriptions leave nothing to be desired, and the subject has been treated in an excellent manner. In dealing with such forms as *Pecopteris* (*Alethopteris*) *australis*, *Teniopteris daintreei*, and *Podozamites*, the author justly refers the beds in which they occur to the Oolitic period. He considers them of the same age as those of Newcastle, New South Wales, even though

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\*Records Geol. Survey India, IX, Parts 3 & 4, also Jour. Asiatic Soc., vol. 45.

these fossils have never been found in the Newcastle beds. But one *Glossopteris* had been found associated with the same fossils in Tasmania, and as *Glossopteris* is the common form in Newcastle he thus correlates the whole.

In 1878 the Rev. W. B. Clarke published the 4th edition of his *Sedimentary Formations of New South Wales*. This was decidedly the most valuable of all this geologist's writings because of the appendices with which it was illustrated. In Appendix XIII, a list is given of all Australian fossil coal plants known to the author. In Appendix XVIII, there is a tabular view of the schemes of arrangement by different authors of the paleozoic fossils of the New South Wales sedimentary rocks. Mr. Clarke's final view was confined to regarding all above the Newcastle series as "supra-carboniferous." There is in Appendix XX, a correlation of Australian fossils, exclusive of marine, by Dr. O. Feistmantel, from a MS. letter of February 1878. There are also extracts from letters of the same paleontologist pointing out the resemblances and differences between the Australian and Indian coal beds, the latter being regarded by him as probably of Triassic age.

In the same year, 1878, Mr. W. T. Blandford, F.R.S., deputy superintendent of the Geological Survey of India, published a paper entitled "The paleontological relations of the Gondwana System," a reply to Dr. Feistmantel.\* In this paper Mr. Blandford controverts the age assigned by Dr. Feistmantel to some subordinate members of the Gondwanas, and lays much stress on the paleozoic age of the Australian coal, which has fossils in common with the Indian beds, and which consequently should be considered paleozoic also.

In this year also appeared at Cassel, the first part of the work of Dr. Feistmantel on the Australian Paleozoic and Mesozoic Floras. This has been already referred to. The second part appeared in the end of 1879, and in 1880 the same author gave an abstract of his views to the Royal Society of N.S.W., in a paper mentioned previously.

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\* Records of the Geol. Survey of India, No. 1, 1878, Vol. XI., p. 145, &c.

In 1879 there appeared in Brisbane, Queensland, published by the Government printer, a report of Mr. R. L. Jack, Government Geologist, on the Bowen River Coal Fields. In this the author enumerates *Glossopteris browniana*, *Phyllothea hookeri*, and other plants intercalated with beds containing *Spirifer*, *Productus*, and other Brachiopoda, besides corals, and encrinites of recognized Carboniferous age.

The report of Mr. C. S. Wilkinson, the Government Geologist, for 1880, contains references to fossils from coal formations in the northern portions of the colony of New South Wales.

I have not included in this list the catalogue of Australian fossils by R. Etheridge, jun., and of the works in which they are mentioned, but it will be useful to consult it where a good knowledge of the synonymy can serve as a guide.

In 1881, the third volume of the Fossil Flora of the Gondwana system appeared. In this, Dr. Feistmantel gives his final views of the relations of the upper Newcastle seams. He regards them as mesozoic (lower Trias), and very nearly on the same horizon with the Bacchus Marsh sandstone, and the Indian Kaharbari coal beds.

This includes nearly all the literature of the subject of any importance. There have been a few more recent discoveries of additional species of coal plants made by myself, which have been recorded in the Transactions of the Royal Society and Linnean Society of New South Wales for last year.

#### AUSTRALIAN COAL FORMATIONS.

*Upper Devonian*.—Iguana Creek, North Gippsland, Victoria. Red rubbly rock with slate-colored calcareous veins and patches, overlaid by claret-colored micaceous grits, and hard olive flags with plant impressions of *Archæopteris howitti*, *Sphenopteris iguanensis* and *Cordaites australis*. The whole group is composed of—1, coarse conglomerates; 2, sandstones; 3, shales. They lie unconformably on the middle Devonian, and pass quite conformably into the lower Carboniferous.\*

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\* See Report of Progress Geological Survey of Victoria, No. III, 1876, p. 237. In this report there is a most elaborate description of the Devonian rocks of North Gippsland by Mr. Alfred Howitt.

## LOWER CARBONIFEROUS.

*Queensland.*—Slates and breccias, with yellow, pink, and brown sandstones and quartzites, containing plant impressions and casts of *Lepidodendron nothum*, *L. veltheimianum*, *Calamites radiatus*, *C. varians*, *Cyclostigma australe*. Conoona River, Broken River, Mt. Wyatt, Medway River, Bobuntangen.

*New South Wales.*—Back Creek (Barrington Diggings), Manning River; Goonoo Goonoo Creek; Smith's Creek, near Stroud, Rouchel River, Canowindra, Cowra.

*Victoria.*—Red and yellow micaceous carboniferous sandstones, lying unconformably on the upturned edges of true Devonian rocks, with *Lepidodendron australe*, Avon River, Gippsland, five miles above Bushy Park.

## PERMIAN ?

*Queensland.*—Bowen River, a tributary of the Burdekin, ferruginous sandstones with coal seams, *Glossopteris browniana*; blue shale with *Glossopteris*, *Phyllothea*, and other plant remains, intercalated with marine beds containing *Productus clarkei*, *Strepatorhynchus crenistria*, *Fenestella*, &c., and dioritic laccolites, which have destroyed the coal.

*New South Wales.*—Arowa, with *Rhacopteris inequilatera*, *Glossopteris lineata*; Greta Creek and Anvil Creek, (both close to each other) with *Annularia australis*, *Glossopteris primæva*, *G. browniana*, *G. elegans*; *Nöggerathiopsis prisca*; all underlying marine beds, with *Spirifer glabra*, *Aphanaia mitchelli*, *Productus*, *Conularia*, &c. Sandstones, conglomerates, sometimes of large size and rounded pieces of shale, blue and black ironstone bands and coal seams; Stoney Creek with *Glossopteris browniana* var. *præcursor*; Wingen.

*Victoria.*—Not known.

*Tasmania.*—The Mersey coal field, Don River, Spring Bay, Valley of the Derwent. Various species of *Glossopteris*, *Phyllothea hookeri*, *Vertebraria australis*.

## NEWER COAL. TRIAS ?

*Queensland.*—Dawson River basin, Comet River? I have seen no fossils from this locality, but I visited a coal seam near Blackwater which appeared to be continuous with the Dawson basin. The most of the country is overlaid by trap of tertiary origin. Tolmies Range or plateau, raises the Comet basin 600 feet above the Dawson. The sandstones are of the nature of the Dawson and Newcastle basin. I should think borings might meet with coal seams anywhere between the Dawson and Comet, where thick beds of trap rock do not offer an obstacle. Cooktown? Oakey Creek.

*New South Wales.*—Newcastle, ferruginous sandstones with coarse waterworn conglomerate; at the base finer conglomerates ( $\frac{1}{2}$ -inch pebbles) occasionally blue shales, with *Phyllothea australis*, *Vertebraria australis*, *Glossopteris browniana* and six other species, *Sphenopteris lobifolia*, var. *exilis*, *Caulopteris adamsi*, *Nöggerathiopsis media*. Mulimbula, near Newcastle, with the same species and *Zeugophyllites elongatus*; Raymond Terrace, same as Newcastle. Blackman's Swamp, west of Sydney, *Glossopteris browniana*, *G. teniopteroides*, *G. Wilkinsoni*; Bowenfels, species of *Glossopteris* and *Vertebraria* with *Gangamopteris clarkei*, *Brachyphyllum australe*; Guntawang (193 miles west of Sydney), *Gangamopteris angustifolia*; Illawarra, *Glossopteris* many species, and *Nöggerathiopsis spathulata*.

*Victoria.*—Bacchus Marsh sandstones with *Gangamopteris angustifolia*, *G. spathulata*, *G. obliqua*. These beds are classed by Feistmantel with the Newcastle beds on the evidence of these fossils. No others have been found.

*Tasmania.*—The upper and lower coal have not been distinguished in Tasmania, though doubtless both are represented.

## RHÆTIC OR LOWER LIAS.

*Queensland.*—Burnett River.

*New South Wales.*—Talbragar River, Ballinore, near Dubbo, with *Walchia milneana*, *Merianopteris major*, *Alethopteris currani*, Clifton, Darling Downs.

*Victoria* and *Tasmania* not known

## UPPER LIAS ?

Queensland, Burrum River, near Maryborough. I have seen no well preserved plant remains from these beds, but they seem to me to be beneath the Ipswich coal seams and above those of Burnett river (60 miles away). Darling Downs near Toowoomba, underneath basaltic rock, the same flora as above with *Sagenopteris rhoifolia*, Talgai with *Otozamites mandeslohi* and *Sagenopteris rhoifolia*, and near Leyburn.

## JURASSIC.

Queensland.—Ipswich coal basin has an area extending about 50 miles round Moreton Bay. Fossils—*Equisetum rotiferum*, *Phyllothea concinna*, *Vertebraria equiseti*, *Sphenopteris elongata*, *aneimioides*, *flabellifolia*, *A. fl. var. erecta*, *Trichomanides lacum*, *T. spinifolium*, *Thinnfeldia indica* or *media*, *T. australis*, *T. odontopteroides*, *T. falcata*, *Cyclopteris cuneata*, *Alethopteris australis*, *Teniopteris daintreei*, *T. carruthersi*, *Angiopteridium ensis*, *Podozamites lanceolatus*, *Brachyphyllum mamillare*, *Cunninghamites australis*.

New South Wales.—Clarence River. *Teniopteris daintreei*, *Alethopteris australis*. Carbonaceous shales, conglomerates, and sandstones of great thickness but no coal of value.

Victoria.—The shales belonging apparently to this formation occupy (according to the late Government geologist, Mr. A. R. C. Selwyn, F.R.S.\*) four distant areas. Wannon and Glenelg, 349 square miles, Cape Otway, including Barrabool Hills and Indented Heads, 1882 square miles; Cape Patterson to Traralgon and Latrobe Valley, 1436 square miles, Welshpool 315 square miles. Very few sections have yet been found that show clearly the relation of this carbonaceous formation to the older strata upon which it rests. In a few instances it is clearly seen to have been deposited on granite, the detritus of which, not much waterworn, enters largely into the composition of some of the beds. In one case in the Valley of Latrobe, near Traralgon, it is found resting on the upturned edges of the auriferous Silurian rocks, and the

\* See notes on Phys. Geo., &c., of Victoria, p. 17.

lower beds of the carbonaceous formation consist of thick masses of an angular brecciated agglomerate of small fragments apparently derived from the adjacent Silurian strata. A great similarity in general mineral and lithological character obtains throughout these rocks in the several districts. Alternating masses of hard and thick bedded sandstone and argillaceous shale, occur in all parts of the series, and occasionally thin bands of hard grey or brown calcareous rocks are met with, so that there are no distinctive or characteristic groups of beds which would render their co-ordination possible in widely separated localities. The prevailing color of the strata, especially of the sandy beds, is a dull greenish gray, occasionally passing into brown. The shales are commonly dark grey, blue or almost black; and the latter often contain a good deal of sulphide of iron. Not unfrequently large portions of thick branches or trunks of trees are met with, horizontally imbedded. Calcareous spar occurs either in veins or forming a thin coating on the faces of the joints, and concretionary nodules of carbonate of iron. The beds are often spread horizontally over large areas, with never a greater dip than 20 degrees. There is much diagonal or false bedding. Thin and variable seams of coal are found of poor quality, and never permanent as far as they have been explored. The fossils are *Phyllothea concinna*? *Podozamites barclayi*, *P. longifolius*, *P. ellipticus*, *Tæniopteris daintreei*, *Alethopteris australis*, *Sphenopteris* sp.

*Tasmania*.—Jerusalem basin, with the above fossils and *Thinnfeldia odontopteroides*, *Zeugophyllites (Podozamites) elongatus*.

Spring Hill.—The same fossils. Mr. Brough Smyth, found *Glossopteris browniana* associated with the same fossils, from some of these beds. Position uncertain.

*Queensland*.—Desert sandstone, an eolian formation, in isolated patches all over the colony. Fossils: Coniferous wood converted into brown coal and jet. Lies above Jurassic coal.

*New South Wales*.—Hawkesbury sandstone, a similar formation all over the colony, but principally massed in the Blue Mountains. Fossils: *Thinnfeldia odontopteroides*, *T. indica*? (Dubbo). Equisetaceous stems. Lies above Triassic coal.

*Victoria*.—I am strongly inclined to think that some of the carbonaceous beds of Victoria represent these beds.

*Tasmania*.—Not known. I have not included any of the Wianamatta beds in this list, as I am uncertain of their true position. They appear to contain the same flora as the Hawkesbury rocks, and cannot be distinguished from them.

#### POSITION UNCERTAIN.

*Queensland*.—Plant beds at Rosewood, west of Rockhampton, with *Ptilophyllum oligoneurum*, *Vertebraria towarrensis*, *Sequoiites (?) australis*, *Pecopteris*, *Equisetum* and *Ptilophyllum* have hitherto been known only from India.

*General Summary*.—It will be seen from the foregoing history of the literature of our plant fossils, that the controversy was narrowed in the end to very small limits. It was simply this :—Are the characteristic plants of the Newcastle coal found under the marine paleozoic fossils. Unless we reject all evidence, we must come to the conclusion that they are. Secondly, the question is :—Have these plants a mesozoic facies? We must certainly answer in the affirmative. This is to say one species, *Glossopteris browniana*, is found in beds as high as the Jurassic in India, and is a common fossil in lower mesozoic formations there. The genus is also well represented in the mesozoic rocks. The other instance of mesozoic forms in the Newcastle beds are doubtful. *Vertebraria* is probably the root of an Equisetaceous plant, and these roots present much the same appearance in every formation, and, therefore, are not important in this question. *Phyllothea* is probably the plant of which *Vertebraria* is the root. The *Phyllothea* of the Newcastle coal is closely allied to *Equisetum* but with very long terete leaves round the sheath. This is the only way we have of identifying it. Stems alone without the leaves are such as might belong to several different plants. It may be safely affirmed that the Newcastle species of *Phyllothea* is confined to the upper and lower coal, and that any identification above that depends upon the stems which may have belonged to



other species. Finally there is a conifer named *Brachyphyllum australe* found at Bowenfels, with *Glossopteris browniana*. The genus is mesozoic, but this species differs in important particulars from the mesozoic form.

So the question narrows itself into the occurrence of *Glossopteris browniana*. It is found in India in the Lias and Jurassic beds, but only one instance has been related of its occurrence in the Jurassic in Australia. That is Mr. Brough Smyth's instance from Jerusalem in Tasmania. On the other hand we have a well marked Oolitic flora in the beds just named in Ipswich, Queensland, and in many places in Victoria. The fossils of this formation, such as *Thinnfeldia*, *Alethopteris*, *Tæniopteris*, *Equisetum* and *Podozamites* are never found in any of the Newcastle series. There is no confusion of type whatever between the two formations except in the case of *Gl. browniana*. We may explain this by supposing one of the two things. 1. The persistence of this type through a very long period of time in Australia, where we have the traces of its earliest existence, and finally dying out in India. 2. Or we may suppose that the coal of Australia represents an accumulation during a vast unbroken period, beginning in the Permian and terminating in the Jurassic epoch. If this has been the case, there are wanting many leaves of the history. The break is very nearly complete between our Trias and Jurassic.

Dr. Feistmantel, whose experience among the coal plants of Europe, India, and Australia is very great, is inclined to regard our upper Newcastle beds as Trias. The marine fossils beneath them are more Carboniferous than Permian, and though the coal plants are evidently different, they are not like the Carboniferous. It is hard to account for this anomaly. In the present day, the Australian Flora is several epochs behind Europe; then it must have a little in advance.

The eastern side of Australia from north to south is very rich in coal, and, what is unusual, the Jurassic beds produce abundance of good fuel in compact workable seams. The resources in this

respect of New South Wales and Queensland are comparatively inexhaustible. These mineral riches must surely lead in a remarkable degree to great future commercial prosperity.

#### LIST OF FOSSILS.

Before commencing the diagnosis I should state something as to the manner in which the coal fossils occur in the various beds. As a rule, though plant impressions are abundant above and below every coal seam, they are seldom perfect enough for determination. There is an exception to this in the case of *Glossopteris browniana*. It is most abundant on the shale above all the coal seams about Newcastle, and always beautifully preserved in black coal impressions on a blue ground showing the net venation well. There are also brown impressions on a buff-colored rock. In the Ipswich coal seams (Queensland) the plants are often most abundant in a black shale. It is in this manner *Podozamites distans*, is often found, and *Thinnfeldia*. But the latter with other ferns are found as yellow, red, or pale brown impressions on a hard blue slaty rock. In this the venation is rarely well preserved. The red impressions are entirely formed of per-oxide of iron easily falling into powder, in which nerve marks are never preserved. This is common at Rosewood (Ipswich).\* At the same place there is a dull yellow very soft clay with numerous black impressions of plants, well preserved but brittle. In the Bundaberg coal seams the fossils are black shining imprints on a hard blue shale. At Tivoli the plants are in a soft grey shale with cuts like clay or breaks into fine powder. The *Vertebraria* fossils in this are only impressions of the same colour with rarely a little coal entangled in the marks; the other fossils consist of impressions of plants of a pale brown. At Darling Downs, near Toowoomba, the fossils are all in limonite or ironstone concretions, evidently derived from a volcanic rock. They are either leaf

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\* I must put readers on their guard about this name. There are two places called Rosewood in Queensland, and both distinguished by rich plant beds. They are nearly 400 miles apart—one is a railway station about 10 miles from Ipswich, the other on the railway 25 miles from Rockhampton.

impressions of a bright red colour on a brown stone, or bright yellow on a red ground. At Rosewood, Rockhampton, the impressions are in a hard siliceous chert without a trace of carbonaceous matter. In this the impressions are sharp and very hard with the venation beautifully displayed.

In the determination of plants I have followed closely the system and nomenclature of Schimper in his *Paleontologie Vegetale*. Some of the plant remains have involved me in considerable doubt, but in giving names and descriptions I am far from supposing that my views of their character will be accepted by more experienced fossil botanists. I think, however, something has been done when a name and a diagnosis has been recorded, so that similar fossils may be recognized elsewhere.

## LIST OF FOSSILS HERE DESCRIBED.

## EQUISETACEÆ.

*Phyllotheca australis*. Brongn.

*P.* ——— *ramosa*. M'Coy.

*P.* ——— *hcokeri*. M'Coy.

*P.* ——— *concinna*. nobis.

*P.* ——— *carnosa*. nobis.

*Equisetum rotiferum*. nobis.

*Vertebraria equiseti*. nobis.

*Vertebraria towarrensis*. nobis.

*V.* ——— *australis*. M'Coy.

*Calamites radiatus*. Brongn.

*C.* ——— *varians*. Germar.

*Annularia australis*. Feistm.

*Sphenophyllum* sp.

## FILICES.

*Sphenopteris lobifolia*. Morris.

*S.* ——— *alata*. Brongn.

*S.* ——— var. *exilis*. Brongn.

*S.* ——— *hastata*. M'Coy.

*S.* ——— *germanus*. M'Coy.

- Sphenopteris plumosa*. M'Coy.  
*S.* ——— *flexuosa*. M'Coy.  
*S.* ——— *iguanensis*. M'Coy.  
*S.* ——— *elongata*. Carruthers.  
*S.* ——— *crebra*, nobis.  
*S.* (*Aneimioides*) *flabellifolia*. nobis.  
*S.* (*Aneimioides*) var. *erecta*. nobis.  
*S.* ———, *glossophylla*. nobis.  
*Trichomanides laxum*. nobis.  
*T.* ——— *spinifolium*. nobis.  
*Trichomanides baileyana*, nobis.  
*Aneimites iguanensis*. M'Coy.  
*Archæopteris howitti*. M'Coy.  
*A.* ——— *wilkinsoni*. Feistm.  
*Rhacopteris inæquilatera*. Goepfert.  
*R.* ——— *intermedia*. Feistm.  
*R.* ——— *röemeri*. Feistm.  
*R.* ——— *septentrionalis*. Feistm.  
*Neuropteris* (*Aneimidium* ?) *australis*, nobis.  
*Thinnfeldia media*. nobis.  
*T.* ——— *australis*. nobis.  
*T.* ——— *odontopteroides*. Morr.  
*T.* ——— *falcata*. nobis.  
*Odontopteris microphylla*. M'Coy.  
*Cyclopteris cuneata*. Carruthers.  
*Pecopteris tenuifolia*. M'Coy.  
*Alethopteris australis*. Morr.  
*A.* ——— *currani*. nobis.  
*A.* ——— *concinna*. nobis.  
*Merianopteris major*. Feistm.  
*Tæniopteris daintrei*. M'Coy.  
*T.* ——— *carruthersi*. nobis.  
*Macrotaeniopteris wianamattæ*. Feistm.  
*Angiopteridium ensis*. Oldham.  
*Glossopteris browniana*. Brongn.  
*G.* ——— *linearis*. M'Coy

- Glossopteris ampla* Dana  
*G.* ——— *reticulata*. Dana.  
*G.* ——— *elongata*. Dana.  
*G.* ——— *cordata*. Dana.  
*G.* ——— *tæniopteroides* Feistm.  
*G.* ——— *wilkinsoni* Feistm.  
*G.* ——— *elegans*. Feistm.  
*G.* ——— *primæva*. Feistm.  
*G.* ——— *clarkei*. Feistm.  
*Gangamopteris angustifolia*. M'Coy.  
*G.* ——— *spathulata*. M'Coy.  
*G.* ——— *obliqua*. M'Coy.  
*G.* ——— *clarkeana*. Feistm.  
*Sagenopteris rhoifolia*. Presl.  
*S.* ——— *tasmanica*. Feistm.  
*Gleichenia dubia*. Feistm.  
*G.* ——— *lineata*. nobis  
*Jeanpaulia bidens*. nobis.  
*Caulopteris adamsi*. Feistm.

## LYCOPODIACEÆ.

- Lepidodendron australe*. M'Coy.  
*L.* ——— *nothum*. Unger.  
*L.* ——— *veltheimianum*. Sternb.  
*Cyclostigma australe*. Feistm.

## CYCADACEÆ.

- Podozamites barkleyi*. M'Coy.  
*P.* ——— *ellipticus*. M'Coy.  
*P.* ——— *longifolius*. M'Coy.  
*P.* ——— *lanceolatus*. Lindley & H.  
*Zeugophyllites (Podozamites?) elongatus*. Morr.  
*Ptilophyllum oligoneurum*. nobis.  
*Otozamites mandeslohi*. Kurr.  
*Nöggerathiopsis spathulata*. Dana.  
*N.* ——— *prisca*. Feistm.  
*Cordaites australis*. M'Coy.

## CONIFERÆ.

*Brachyphyllum australe.* Feistm.

*B.* ———— *mamillare* var. *crassum.* nobis.

*Sequoiites?* *australis,* nobis

*Walchia milneana.* nobis

*Cunninghamites australis.* nobis.

*Araucarites polycarpa.* nobis.

It will be seen from the foregoing list that some European and Indian forms have been added to the Australian coal flora. This is especially observable in the Jurassic beds. *Brachyphyllum mamillare* var. *crassum* and *Podozamites lanceolatus*, Europe. *Angiopteridium ensis* and *Merianopteris major* of India, are instances, and no doubt others will be found. The occurrence of the genus *Ptilophyllum* in Australia is very remarkable. It will be seen that our continent is particularly rich in species of *Thinnfeldia* and Ferns of a similar type in the Jurassic rocks, while we are equally rich in species of *Glossopteris* in the earlier periods. Altogether the fossil botany of Australia reveals a former connection of its flora with Europe through India, when the vegetation of the earth was much more uniform than it is now.

## EXPLANATION OF TERMS USED IN THE DIAGNOSIS OF FOSSILS.

*Rhizome.*—The fleshy, scaly, prostrate stem, producing roots from the under side, and fronds from the upper, beginning with the

*Stipes* or main stem, which generally branches into sub-divisions, each of which is called a *Rachis*. The frond may be one entire leaf, when it is called *simple*, or once sub-divided (*pinnate*), twice, thrice, or more often (bi-pinnate, pinnatifid, multifid, &c.).

In compound fronds the primary divisions are called the *pinnæ*, and if more than once divided the ultimate divisions are termed *pinnules*.

*Costa.*—The midrib of simple fronds or *pinnæ* or *pinnules*.

*Veins.*—The secondary nerves which emerge from the *costa*.

*Venules.*—First sub-divisions of the veins.

*Veinlets.*—Secondary sub-divisions.

In some families the costa is central, and in others it is not in the centre and is called lateral.

*Evanescent.*—Not reaching the apex or margin.

#### EQUISETINÆ.

The plants which compose this class (says Schimper) are only at present represented by one genus, that of the *Equisetums* or Horse-tails, which itself is not directly related to any other type of vascular cryptogams. There exists but one genus in the present day with only a few species, which are united together by very concise characters, and they do not pass by any degrees into any other genus. These plants play a very insignificant part in the world's vegetation just now, but in the coal period and lower mesozoic it was not so. Both in species and individuals the *Equisetaceæ* played a most important part. In fact the great mass of the coal is supposed to have been formed by them.

The fossils are divided into two orders, the *Equisetaceæ* and the *Calamiteæ*. The former is thus defined: herbaceous or arborescent plants; stems rising from an underground articulate branched rooting rhizome, nearly always fistular. *Rhizome*—underground, jointed, branched, rooting. *Stems*—jointed, nearly always hollow. *Joints*—separated by a diaphragm. *Leaves*—connate into a sheath, rarely separate at the ends, forming a cylindrical covering often grooved lengthwise, externally permeated by a double series of alternating lacunæ. *Branches* arising beneath the base of the verticillate sheath, simple, in whorls, or wanting. *Reproductive organs*—arising from a lobed fugacious prothallus. *Fructification*—in a terminal spike. Receptacles pedicellate, verticillate under hexagonal shields. *Sporangia*—in groups round the perpendicular pedicels, opening laterally.

The greatest development of this *family* is in the Carboniferous and Permian formations. There it is represented by a great number of genera and species which have no forms at all like them in the present vegetation, such as *Calamites*, *Asterophyllites*

and *Sphenophyllum*.\* They are the coal-forming plants of the Carboniferous period and some of the names are used by Prof. Geinitz as typical of certain zones. There is no evidence of the existence of any of the three named genera after the Permian period. Dr. Feistmantel is of opinion that even the genus *Equisetum* was present in the coal formation. Of its presence in the mesozoic strata he says there can be no doubt, but in that case it is associated with genera which are not found in the coal measures.

The mesozoic *Equisetaceæ* are confined to the genera *Equisetum*, *Schizoneura* and *Phyllothea*. *Schizoneura* has not yet been found in Australia: of *Phyllothea* I shall treat subsequently. *Equisetum* is a genus which has not hitherto been found in Australian coal deposits; I have now to record its occurrence abundantly at the Walloon mine, Ipswich, Queensland.

Before describing the species it is necessary to remark that Messrs. Morris and Oldham did not consider that they were justified in using the word *Equisetum*, as they were not sufficiently sure of the identity between the fossil and living genera. They employed the term *Equisetites* (Flora Rajmahalensis tab. II and XXXV.), but gave only a figure without any description. Saporta and Schimper, and according to Feistmantel, many others, use the word *Equisetum*, which I employ in the sense they do.

As the genus *Equisetum* or Horsetail (French *Prêle*, German *Schachtelhalm*), is not known in Australia, a few words about it may be useful. They are leafless branched plants, with a striated stem in the outer sheath of which a very large quantity of silica is secreted. The stem is easily separated into joints, where it is found that each joint has a whorl of teeth forming a sheath. It is fistular, having many longitudinal cavities in its circumference, but is coated externally with a layer of hard woody tubes, from

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\* These are the views of Brongniart, Suckow, Feistmantel and others but Prof. Williamson and Prof. Renault (Paris) both regard the two last named genera as nearer Lycopods than any other plant. See Feistmantel, "Jurassic Flora of the Rajmahal group, p. 10 (62)."



which plates of a similar nature project towards the centre partially dividing the longitudinal cavities, much like the divisions in many reeds, canes, and grasses, except that they are not quite closed. There are no leaves, properly speaking, but the shoots are repeatedly divided with whorls of branches and branchlets at the articulations. The fructification is in a terminal spike, consisting of numerous closely packed peltate scales, bearing capsules (sporangia) of one kind underneath, very much like the peltate fructification of Liverworts (*Marchantia*). The sporangia are from six to nine to each peltate scale of the fruit spike and they are placed round the margin of the mushroom like top of the scale, parallel with its stalk. The spores in the sporangia are very minute and numerous, and they split when exposed into four elastic filaments called elaters, which is what happens in the Liverworts.

This peculiar kind of jointed leaf is not unlike the *Casuarina*, or sheoak of the colony, and the heads of fructification resemble some Cycads, but the resemblance is merely external, for the plants have little else in common. But on the other hand the natural affinities of the plants are with Ferns, and the spores germinate like them, producing a prothallus which bears archegones and antheridia. The structure of the root and stem is very different from that of Ferns. In an early stage there is a central column of cellular tissue in the rhizome, from which eight plates radiate, being connected with an external cylinder of the same nature, having between them distinct cavities, which is the structure observed in many fossil *Calamites*. But the vessels are annular and not scalariform as in Ferns.

The Horsetails are found in most parts of the world except Australia and New Zealand. As a rule they grow in moist or marshy places, but some flourish well in loose shifting sands, and one is said to grow to a height of between 20 and 30 feet (*E. giganteum*). They never reach the size of our fossil Horsetails.

The closest resemblance exists between the fossil and living genera. The mode of fructification of *Calamites binneyi*, Carr. is

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similar in plan to that of the living *Equisetum arvense*, L., but there are two elaters instead of four, and the peltate scales are protected by paleaceous glumes.

The genus *Equisetum* is thus defined by Linnæus\*.

EQUISETUM (No. 1284).

*Fructificationes in spicam ovato-oblongam digestæ. Singula orbiculata basi dehiscens pluribus valvulis, apice plano peltato connexis.*

This, it will be perceived, makes no reference to the form of the plant, but only to the spike and the sporangia. It was included amongst the Filices.

The definition of Schimper † remedies this. It is "*Fructus spicæformis cylindraceus, oblongus, seu ovatus, sporangiorum receptaculis peltoidis. Folia in vaginam connata.*"

There are nearly twenty species of this genus described from Mesozoic strata, besides some of modern age. The Mesozoic forms are from the Trias, Lias and Oolite, the latter principally.

EQUISETUM ROTIFERUM, n.s., pl. vi., fig. 5, 6. Stem cylindrical, closely and faintly grooved, joints approximate below, distant above. Leaves carinate, connate into a sheath, the teeth of which are short, flat, rounded, of equal width throughout, adpressed to the stem. The diaphragmata of the joints and leaf scars of the branches are very distinct, round, with radiate lacunæ, varying from 18 to 30, and a central orifice. Fructification unknown.

Very abundant in the grey fire clays above the first seam at the Walloon mine near Ipswich, Queensland ‡ The casts of the diaphragmata are especially numerous, and have a singularly

\* *Genera Plantarum*, p. 554. Edit. cur. Reichard, Frankfort on the Maine, 1778.

† *Paleontologie vegetale*, Vol. I., p. 259.

‡ The Walloon mine is about 10 miles west of Ipswich and rather more than that distance from the Bundamba and other seams, which are the oldest Ipswich coal mines, and the seams from which most of the fossils previously described have been taken. The relations between the two beds have not been ascertained, but I have no doubt that they all belong to one carbonaceous deposit, and there seems to be no break.

pretty and ornamental appearance. The following is the explanation of their structure: In the stems of Equisetaceæ there is a double series of lacunæ or longitudinal empty spaces, the exterior of which corresponds to the external ribs, and the interior to the grooves. In Lindley and Hutton's Fossil Flora, vol. 3, p. 186 (plate 180), there is a figure of one of these diaphragmata magnified. It was described by them as *Equisetum laterale*, though with the observation that the authors were by no means sure that it was an *Equisetum*. "What is most remarkable," say the authors "at irregular distances between the articulations are found little round disks with lines radiating from a common centre, something in the way of the phragma of a *Calamites*. These disks which look like the scars left behind the branches that had fallen off, are not stationed at the axils or articulations, but appear at uncertain intervals along the internodes, and are found less frequently on the stem than loose in the shale, without any apparent connection with the plant. This is a singular fact, and would lead one to think that the disks hardly belong to the stems with which they are found associated.

With regard to the same I translate the following from Schimper (vol. 1, p. 285). "The radiating disks that are seen in so many specimens above the articulations, and which have given the species its name, have been figured and described by authors without explanation, or as the scars of the branches. But they are only the impressions of the diaphragmata, either reversed or somewhat pressed out above. The same thing is constantly seen in *Annularia* and even in *Equisetum*, amongst others in *Equisetum münsteri*, where the large circular impressions have been equally taken for branch scars. The description given by the authors of the fossil flora agrees well with the character of diaphragmata, and not with those of scars. M. Andre \* figures a diaphragm surmounting a reversed diaphragm. Many of these disks are scattered over the same piece of stone. M. Andre considers these as isolated

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\* Foss. Flora Siebenburgens u. des Banates, plate VI. *Equisetites lateralis*.

scars. But we never see isolated scars, whereas isolated diaphragmata of *Equisetum* of all sizes are very common in the upper Lias of France and Germany (Grès bigarré and Keuper)." But the most convincing thing of all is that we find such diaphragmata loose in the stems of living *Equiseta*. In places where these plants grow abundantly in the loose damp mould around the roots abundance of these disks of every character may be seen.

In the present species it will be noticed that there is only one circle of radiated lacunæ, and a central tube which corresponds to the second. In the figure of Lindley and Hutton there are two concentric circles and no central hollow. In the figures given by Feistmantel of *Equisetum rajmahalensis*\* (*Equisetites*, Morris and Oldham), at fig. 3 there is represented a diaphragm which is on the same plan as our fossil. There is an outer radiating circle of lacunæ and an inner central hollow. The species are, however, different. The outer ring of lacunæ was in this fossil small and bead-like, and it does not appear in the impressions, because it is along the outer line of spaces that the separation of the diaphragm took place. Traces of it may be seen in those specimens which are well preserved, and where the diaphragm is seen in position, which is rare. One such instance is given in fig. 2 of Feistmantel's plate, already referred to.

The size and shape of these diaphragmata show what were the dimensions and form of the stems. They were perfectly round, and the internal furrows were close together, about 25 in a stem two-thirds of an inch in diameter. There are stems broader than that, but they have been flattened out. In the largest specimen in my possession there are three or four internodes, and some of them are as long as twice the width of the stem.

The line of division between the connate teeth of the sheath can be traced to the base of the internode. The leaves are thus seen to be longer than the width of the stem, and they are marked at their margins by a fine raised line. They are of equal width for

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\* Memoirs of the Geological Survey of India. Paleontologia Indica. Fossil Flora of the Gondwana system. Oldham and Feistmantel, Vol. I., plate 11, fig. 3.

their whole extent, and the free ends are obtusely pointed, rounded or even flat ; but this may depend on the state of preservation of the specimens, for none of the fragments were well preserved. The color of the fossils being so near to that of the shale, made it more than usually difficult to determine the more delicate details of structure.

From all the specimens I have seen, I cannot come to any other conclusion than that the stems were smooth and not fluted in any way, except on the outside of the spathe or sheath above the diaphragm, where the separate teeth make divisions or grooving.

Other parts of this plant, such as the rhizome, roots and fructifications have not been found with certainty, and therefore no well-founded comparison can be made. It is very near to *E. rajmahalensis*, which is also considered to be closely allied to *E. münsteri*, Stbg. In this species, the stem does not seem to be fluted in some specimens, but there is a manifest difference in the diaphragmata, and the teeth of the spathe are keeled, which is not the case in our fossil. *E. münsteri*, is now recognized as identical with many subsequently named species, such as *E. moniliformis* Prsl., *E. alternatus*, Prsl, *Calamites liaso-keuperianus*, Braun. It is very common in the Rhætic strata of Europe, but also ascends into the Lias. *E. rajmahalensis*, is referred by Feistmantel to the Liassic period.

In the rocks of the same period of Europe we have, *E. gamingianum* Etting., and *E. ungeri*, Etting., both of which have smooth stems, but the first has very narrow teeth, and the second has them, though broad, produced into a long rigid subulate point. I do not think it necessary to institute any other comparisons, with such species such as *E. arenaceum*, as they diverge widely from our type.

#### PHYLLOTHECA Brongt.

In the same family of *Equisetaceæ*, is placed the genus *Phyllothea*, which is distinguished from *Equisetum* by the sheath being prolonged into long linear leaves. The distinction may be better borne in mind by the following table.

*Equisetum*.—Sheath undivided, terminating in short adpressed teeth.

*Phyllothea*.—Sheath terminating in long linear narrow teeth, diverging from the stem in whorls.

Brongniart in his definition, speaks of them as simple straight articulate stems, surrounded at regular intervals by sheaths applied to the stem as in *Equisetum*, but terminating in long thread-like leaves, which replace the short teeth of the Horsetails. These leaves are erect, or more often spread out horizontally, or even reflected. The leaves are linear, acute, without any distinct neuration, and at least, twice as long as the sheath. The sheaths themselves show faint longitudinal grooves which disappear towards the base, and which seem to correspond to the intervals between the leaves, as the grooves on the sheaths of *Equisetum* correspond to the intervals between the teeth. The stem in the space, which separates the teeth, appears smooth, but on the fragments of larger ones which probably belonged to older individuals of the same plant, there are regular striæ, almost like those seen on *Calamites*.

In Lindley and Hutton's Fossil Flora (Vol. II., p. 89) the following passage occurs:—"A little known plant called *Phyllothea australis*, found in the coal of New South Wales, is described by M. A. Brongniart as consisting of simple, straight, articulated stems, surrounded at intervals with sheaths pressed close to the stem, as in *Equisetum*, but terminated by long linear leaves, which stand in the place of the short teeth of the sheath of *Equisetum*. We have ascertained from the examination of specimens communicated by Prof. Buckland, that in some respects M. Brongniart's description of *Phyllothea* is inaccurate, and that the leaves instead of springing from the edge of a sheath arise immediately from the stem, as in the fossil under consideration (*Hippurites gigantea*), so that the two would appear to be nearly allied. But in addition to the whorl of distinct leaves, in *Phyllothea* there is a sheath originating within them, and closely embracing the stem, to which it gives the appearance of the barren shoot of an *Equisetum*, with its whorls of slender branches on the outside of a toothed sheath."

Prof. M'Coy \* confirms the original observation of Brongniart, and shows how the mistake of Lindley and Hutton had arisen. There can be little doubt that the sheaths are as Brongniart originally stated. But Prof. M'Coy also pointed out another peculiarity in *Phyllothea*, which was that the branches instead of arising outside the sheath, as in *Equisetum*, arise from within, and are therefore in a certain sense axillary. According to T. Schmalhausen's figures † of the Siberian forms, the branches originated above the articulation of the stem. Prof. M'Coy also thought that he perceived some remains of an inflorescence like *Casuarina*, but this has not been confirmed by any botanist.

The relations of *Phyllothea* are of the closest kind with *Equisetum*, from which the genus cannot be said to differ in any thing except the form of the leaf. Associated with *Phyllothea sibirica* are small radiating ribbed disks, like those previously described in our own *Equisetum rotiferum*. The species is distinguished by shorter and less reflexed leaves than other species, rendering the resemblances to *Equisetum* still closer. It was described and figured by Prof. O. Heer, in 1876 and 1878, from specimens collected in the Government of Irkutsk, Siberia, from Jurassic beds. ‡

The genus is most numerous and widely distributed in the Jurassic beds, but it ranges down to the paleozoic formations, and probably the oldest rocks in which it has been found are the Newcastle beds. There are eleven species described, but of these some are mere varieties. Thus the three Australian plants are but two. There are two mentioned as from India, and seven from Siberia, all from Jurassic beds, but in widely separated localities.

The Indian specimens of *Phyllothea* are confined to two species, *P. indica*, Bunbury, and *P. robusta*, Feistmantel. The first is from Nagpur, but the specimens are few and incomplete. They are fragments of foliated stems and branches. These

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\* Ann. of Nat. Hist., Vol. XX., p 153.

† Beiträge zur Juraflora Russlands, Mém. de l'Acad. Imp. des Sciences de St. Petersburg, 7th series, Pl. XXVII., pp. 12, 46, 62.

‡ See Nachträge zur Juraflora von Irkutsk p. 4. Flora Floss, Arctica, vol. V.

are partial sheaths, and the leaves are somewhat short (rarely exceeding two-thirds of an inch), but generally longer than the sheaths, at first erect, then spreading out, and at last reflexed. The sheaths are furrowed, the furrows corresponding with the leaflets, and therefore numerous, but no specimen has been found complete enough to determine the exact number. This species is more worthy of attention as it closely resembles the Australian plant. The second Indian one, *P. robusta* Feistm., is entirely different, with short spatulate leaves \*

All the Indian and Australian species of *Phyllothea* and some of the Siberian ones have one important character in common, and that is that the stems are ribbed, and the ribs and furrows are not alternating but in juxta-position. In this they differ from *Calamites*.

Three species of *Phyllothea* have been described, viz. :—*P. australis*, Brongniart, *P. ramosa*, M'Coy, *P. hookeri*, M'Coy. All these apparently are reduced to one by Feistmantel,† but I shall give the diagnosis of all.

*P. australis*, Brongniart, Prodr. p. 152 and 175. Stem erect, simple or branched, joints somewhat approximate, leaflets twice as long as the sheaths, narrow, erect, or reflected.

See M'Coy loc. cit., p. 156 ; Morris in Strzelecki, p. 250 ; Dana, United S. Explor. Exp. Geol., p. 710.

The observations of Brongniart on this plant, refer to the genus which he created to receive it. He pointed out at the time, the close affinity between the fossils and those of *Equisetum*, from which it was always to be distinguished by the foliaceous appendages to the sheaths.

\* See Nagpur Plants, Quart. Jour. Geolog. Soc., London, vol. XVII (1862), p. 355, Pl. 10 and 11. Ramiganj Plants, Feistmantel, Jour. Asiatic Soc., Bengal, vol. 45, p. 346-347. Paleontologia Indica, fossil flora of the Gondwana Syst., vol. 3. Flora of the Damuda and Panchet divisions, pp. 65 to 69, plate 12A.

† Notes on the Fossil Flora of E. Australia, Proc. Roy. Soc. N. S. Wales, 1880. Sydney, Govt. Printing Office.



*P. ramosa* M'Coy. *loc. cit.* Stem branched smooth or striated, sheaths half the length of the internodes, leaves thin linear flat, twice to three times the length of the sheath, with a very fine indistinct midrib.

The specimens figured by M'Coy had branches arising from nearly every joint. He states that the stems were perfectly smooth, being striated only at the joints with a delicate striation in some species down the internodes. Subsequent examination of many specimens has not confirmed this distinction. The stems are always striated, but the appearance of this seems to depend entirely on the state of preservation.

*P. hookeri* M'Coy *loc. cit.* Pl. XI. fig. 4, 5, 6, 7. Stem simple coarsely sulcated and ridged longitudinally; sheaths very large, loose, subinfundibuliform, each sheath extending from one articulation to the next, so as to conceal the stem, leaves about twice the length of the sheaths, thick, narrow, with a strong prominent midrib.

"This species, says the author, is easily known from the two former by its great loose sac-like sheath, completely concealing the stem, its long, thick, strongly ribbed leaves and by its stem when stripped of its sheath being coarsely and regularly sulcated, precisely as in *Calamites cistii*. Although abundant, I have never seen the trace of a branch. Some of the flattened stems attain a width of two inches."

A large collection of specimens shows such gradations of one form into another of all these species that it becomes impossible to separate them. *P. hookeri* is no more than a luxuriant growth of *P. australis*, and possesses no character which is not attributable to mere richness of growth.

It should be remarked that the plant has been quoted from a great number of places where the identification has been made from stems alone. This is very misleading. Dr. O. Feistmantel has been careful to point out\* that without leaves it is always unsafe to make any such identification. He says—"There occur

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\* Paleon, Indica. Foss. Fl. vol 3. Damuda and Panchet Div. p. 63.

(Damuda division) with the leaved stems many without leaves or partly so. Most of these stems were generally designated as *Phyllotheca*. My opinion, however, is that they mostly belong to *Schizoneura*." When we have leaved specimens closely associated with such stems their similarity quite justifies us in placing them with *Phyllotheca*. But when the stems have been found in widely distant localities and from certainly different horizons, such as Mount Victoria, Dubbo, Geelong, Clarence River and Ipswich, near Brisbane, I think that without the distinct *Phyllotheca* leaves we are not justified in saying that the stems are Equisetaceous. For my own part, after a careful search, I have never found any true and characteristic *Phyllotheca* in the Ipswich coal beds, though such plants are always stated to be there; and I have myself taken it for granted that the stems I found belonged to that genus. In the Proceedings of the Linnean Society, N.S.W., vol. vii., p. 95, I have quoted *Phyllotheca (indica ?)* as from the Cooktown and Burrum River coal beds, and I now wish to state that, after a careful examination, there is no evidence that these specimens belong exclusively to *Phyllotheca*.

As far as my knowledge goes, perfectly reliable species of *Phyllotheca* are rarely found except in Lower Australian or Paleozoic coal measures. In Queensland, the Ipswich coals are characterized by *Equisetum*. I do not say that *Phyllotheca* does not occur amongst the strata indicated; but except in the Hawkesbury shales no leaved specimens have been found to place the matter beyond a doubt.

*P. indica* and *P. hookeri* are quoted by Mr. Jack as occurring in the Bowen River (Q.L.) coal beds, associated with Paleozoic fossils.\*

*P. australis* F. M'C (sic) is quoted by Mr. R. Brough Smyth, in the Progress Report of the Geology of Victoria,† as from the Bellerine beds, near Geelong, which, according to Prof. M'Coy, are Upper Mesozoic. No description is given, nor figures. The specimens seen by me had no leaves upon them.

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\* Rep. on the Bowen River Coal Field. Parliamentary Paper, Queensland, 1879, p. 33.

† Melbourne, 1874, p. 35.

*Phyllothea concinna*, n.s., plate IX., fig. 2. Stems neatly striated with 15 to 18 ribs terminating in linear leaves which, though slightly curved, do not spread, but lie almost parallel to the stem.

Common in the shales of the Hawkesbury sandstone at Sugar-loaf Hill, and along the canals and tunnels of the waterworks.

I distinguish this species (1) by the broad stems, (2) the closeness and neatness of the ribs, (3) the leaves scarcely spreading, (4) leaves not half the length of *Phyllothea Australis*.

*Phyllothea carnosa*, n.s., plate 9, fig 2. I name thus a species of which I have seen only one faint impression from the Walloon Mine. It is imperfect, but shows a close succession of verticillate leaves, which radiate very slightly from the stem. They are close obtuse, about half a millimetre wide and 5 long. They form 5 cup-shaped divisions on a stem 35 mill. long and 10 wide. It seems allied to *P. robusta* of the Indian Lias (See Feist. Gond. Syst., Vol. III., p. 68, pl. xiv. A, bis, fig. 1 and 2.) This is also closely allied to *P. schtschurovski*, of the Siberian Jura. The shale specimen from which the figure was taken has fallen to pieces.

#### VERTEBRARIA.

This peculiar plant was erected into a genus by Prof. Royle in his Botany and Nat. Hist. of the Himalaya Mounts.\* It was for two fossil plants from Burdwan, but no description or definition is given. Prof. Morris in his examination of the Australian coal plants, in Strzelecki's work already referred to, mentions (p. 253) the occurrence of the same fossils (*Vertebraria indica* and *V. radiata* among the Newcastle coal plants. Prof. McCoy was the first to give any definition of the genus. Prof. Dana subsequently described two of the same fossils from Australia under the name of *Clasteria*.

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\* Illustrations of the Botany and other branches of Nat. Hist. of the Himalayan Mountains and of the Flora of Cashmere. By Dr. Royle, F.R.S., 4to. London, 1833 to 1838. Page XXIX, Pl. H. 11, figs. 1 to 7. See also Feistmantel's Jour. As. Soc., vol. 45. p. 347.

The plants have the appearance of jointed stems, with generally a line of division down the centre. The joints on each side of the division do not correspond with one another, and they are very irregular in size and shape. In transverse sections these stems are cylindrical, and then the central division is seen to be one of a series of radiate longitudinal partitions which divide the stem into eight or nine cuneiform portions. Prof. M'Coy stated that it was suggested to him by an eminent botanist that the cylindrical fossil might be considered a stem, the central axis being the pith, and the radiating divisional lines the medullary rays, and the intervening cuneiform masses the wedges of wood. Prof. M'Coy however would not accept this view, as he justly says from the ease with which the fractures took place along these lines of division, and the evenness of the surfaces produced. He noticed also something like a fine neuration in the transverse wedge shaped masses, showing clearly dichotomous veins. From these circumstances he was disposed to view the plant as closely allied to *Sphenophyllum*, in which there is a jointed stem surrounded by vertical whorls of six to eight wedge shaped leaves with dichotomous veins. He thought that the main difference between *Sphenophyllum* and *Vertebraria* consisted in the greater approximation of the whorls of leaves in the latter, the internodes being so very short that the whorls of leaves are brought into contact, or nearly so. He therefore provisionally defined the genus thus:— "Stem slender, surrounded by densely aggregated whorls of verticillate cuneiform leaves, having a dichotomous neuration."\* To the above he continues "we might add that the number of leaves in a whorl depends on the species, and that from the whorls being so close as nearly to touch each other, the fossils have the appearance of lengthened cylinders, breaking readily in a horizontal and vertical direction, the former coinciding with the surfaces of the leaves, the latter coinciding with the vertical prolongations of the lines separating the leaves of each whorl, the former producible in indefinite number, at distance of about a line from each other ;

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\* Loc. cit., p. 146.

the latter having only a small definite number, depending on the number of leaves in a whorl. The leaves themselves are flat, rather thick, dilated at the top in such proportion that there is no space left between the edges of the adjacent leaves. It is very possible that together with *Sphenophyllum* these may have been freshwater aquatic plants allied to the recent *Marsilea*, in which we see a quaternary arrangement of cuneiform leaves, with dichotomous veins, but the affinity is not very strong."

Prof. McCoy considered that the Australian specimens were distinct from either of those figured by Prof. Royle, and he named them *Vertebraria australis*, giving the following diagnosis:—"Leaves constantly eight in each whorl." He adds that the fragments were of various lengths, with a pretty uniform diameter of about seven lines. The radiating dichotomous veins are never strongly marked, apparently from the original softness of the texture of the leaf. In many cases we observe between them, an obsolete concentric plication, probably from the same cause, and which may explain the nature of certain vertical striæ, visible on the perpendicular fracture, crossing the horizontal lines which mark the edges of the leaves."

This ingenious explanation of the nature of *Vertebraria*, did not meet with general acceptance. Not only was there no analogy for anything like these cylindrical masses of leaves, but the divisions themselves did not resemble any known leaf.

Prof. Dana confessed his inability to suggest any explanation of these singular forms. He says: "we do not pretend to understand their nature, or explain by any hypothesis, their structure. They are broad linear, three-eighths to seven-eighths of an inch wide, with the sides parallel, and from the appearance of the fossil, it is apparent that they must have been hollow, as remains of both an upper and an under integument can be distinguished. They consist of two unsymmetrical longitudinal halves, In one specimen, each half has a transverse elevation at distant intervals, and between these elevations, a transverse depression. The elevations and depressions are unlike in their length of interval in the two halves. In another specimen the structure is different,

the stem appears to be broken across either one or both halves, at intervals of half to one inch; and on close examination, it is found that a carbonaceous film here intersects the stem (or one-half of it) extending into the clay beneath, and causes the appearance of fracture. Besides the stem is angularly depressed at intervals along the centre. On another example figured, the stem looks as if crumpled into a series of large angular depressions. The name *Clasteria* (from *κλαστος* broken) alludes to this broken appearance. It is especially remarkable that the stem which has the form first referred to at one extremity, changes to the second, showing that although so different, all these forms are parts of one and the same individual. The impressions are very thin, as in *Phyllotheca*. The idea of their having some connexion with seed-bearing vessels or pods, is suggested by the form, but no analogy can be appealed to by the writer to sustain it.\*

Sir Charles Bunbury was the first to suggest the true nature of these forms.† He showed how one of these fossils must be the root or rhizome of some plant. Dr. O. Feistmantel‡ pointed out another important fact in connection with *Vertebraria*, that it was not found associated with any other plant. He pretty clearly proved that all *Vertebraria* are roots, and that most probably they were roots of an Equisetaceous nature. He adds these important remarks.§

“*Vertebraria* is in India a wide-spread fossil, both as regards vertical and horizontal distribution. I think there is only one species of *Vertebraria* in India, i.e., *V. indica*, Royle, while *V. radiata* is a cross-section of *V. indica*. There are two varieties so to speak. One which appears a more tender plant and is more branched, and another variety, which represents rather the stems. This latter is more generally distributed, while the former appears to be more common in the Kamthi representative of the Ramiganj group, although the other form also is not absent. The Australian

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\* Append. Geol. U.S. Explor. Exped. p. 719.

† Quart Jour. Geol. Soc. loc. cit.

‡ Jour. Asiatic Society of Bengal., loc. cit.

§ Pal. Indica, loc. cit., vol. 3., part 2. p. 71.

form shows the closest analogy to our Indian *Vertebraria*. About the identity of the genera there is no doubt; the species are perhaps different, Dana's *Clasteria* is nothing else but *Vertebraria*. It represents the longitudinal section of the same plant of which *V. australis* as figured by M'Coy, formed the transverse section, an analogous case to that of India where *V. indica* was the longitudinal section and *V. radiata* the transverse section of the same plant, In Australia it is described from the upper coal measures only. Unger placed both the Indian and Australian *Vertebraria* with *Sphenophyllum*. This is an error which everybody will perceive from the figures. Quite lately *Vertebraria* (?) *petschorensis* was described by Schmalhausen (loc. cit. p. 53, tab. VII., figs. 14 and 18) from Jurassic beds of the Petschora country (Oranetz, on the right bank of the Petschora river), but so far as I can judge from the drawings, his specimens do not show much relation with the Indian or Australian *Vertebraria*."

Dr. Feistmantel goes on to say that the one Indian species of *Vertebraria* is known from all divisions of the Lower Gondwana beds, and from almost all horizons, which would according to the same author make them the equivalents of our Hawkesbury rocks and shales.

If we take it as established that *Vertebraria* is an Equisetaceous root, I think the fossils might be expected to have as wide a range as the Equisetinæ. Such is the case in Australia. They have been hitherto regarded as restricted to the Newcastle beds, where they are generally underneath strata containing *Phyllothea*. These *Vertebraria*, I think, can be distinguished from those associated with *Equisetum*. I have found *Vertebraria* in all the lower shales of the Ipswich coal measure, which I shall refer to presently. First, however, let me mention what is known of the rhizome of a true *Equisetum*.

Taking the figures as given by Schimper from Bischoff (D. Krypt. Gewächse, tab. III.), we find that in the living *Equisetum arvense* Linn, there is a long creeping root with distant parallel grooves, diaphragmata, and sheaths, all on a larger and coarser scale than on the living stem. At intervals there are

bulbs or tubers in chains of one, two, and three. But though there is a general resemblance in the structure to the *Vertebraria*, there is an almost identity of character between the same fossils and ascertained roots of fossil *Equisetaceae*. Thus in *E. braunii*, as figured by Schimper, we find a series of short articulations with parallel grooving very similar to some forms of *Vertebraria*.

Regarding, therefore, these fossils as roots, it seems almost useless to distinguish them with generic and specific names. Such organs must resemble each other closely even where the species are different. We have no evidence that *Vertebraria indica* and *Vertebraria australis*, though so much alike, belonged even to the same genus of plants. Nay it is extremely probable that they did not, for among the common Equisetaceous plants in Indian strata *Schizoneura* is associated with *Vertebraria indica*, while *Schizoneura* is unknown in the Newcastle beds, and *Vertebraria australis* is associated with *Phyllothea australis*.

I shall distinguish the *Vertebraria* common in the blue clay at the Walloon Mines as *V. equiseti*, premising, of course, that I believe it to be the rhizome of *Equisetum rotiferum*, nobis.

*Vertebraria equiseti*. Plate, 1; fig. 3. Roots found in broad finely striated masses, three or four inches long, with occasional transverse divisions half an inch or so across. These root masses have little or no carbonaceous matter amongst them. They seem to be impressions of a mass of roots flattened out into the clay. Three different kinds of roots can be distinguished—one is a broad striated stem half an inch in diameter with transverse divisions at irregular intervals. 2. A narrow cylindrical stem with parallel striations and no diaphragmata. 3. Stems with a central longitudinal division and irregular transverse diaphragmata, which occasionally correspond at each side of the longitudinal line and occasionally do not. In the upper portions of these roots there are very distinct impressions of sheathing scales.

Occasionally oblong tubers such as those represented in *E. parlatorii*, Unger (see Schimp Pal. Veg. Atlas, plate 8, fig 14) may be met with, but they are always detached from the roots. and



lying alongside them looking very much like "knots" in the stems. There is one structure very apparent in all the stems, and that is the transverse striæ. These are close and minute so that it requires a hand lens to observe them. Sometimes they have the appearance of overlapping scales.

Found in grey clay below the coal in the Tivoli mine, amidst a number of carbonaceous fibres and rootlets, which go by the name *Filicites*.

*Vetebraria towarrensis*. Plate 1, figs. 1, 2, 4, n. s. I designate by this name certain plant impressions of roots which are very common in a formation full of vegetable remains at Rosewood about 24 miles west from Rockhampton, Queensland. The beds are in sight of the Towarra ranges and form part of the country of the Towarra tribe, and hence the name. They are broad stems with deep or regular longitudinal grooves, but with slight transverse divisions which are irregular, at long distances apart, or absent. The fine transverse striæ are not seen as on the other species. In some of the specimens the parallel lines are regular, in others they curve, twist and fold over one another. The impressions are broad like those of Tivoli, evidently derived from a mass of roots. The transverse divisions are no more than like cracks on the roots, and they are also thick and well-defined.

These remains unlike the Indian *Vertebraria* are intimately associated with numerous impressions of *Ptilophyllum oligoneurum* nobis, and various other plants to be hereafter described. There are several other fossil roots.

There are many other places in Queensland where I have noticed root impressions but have not been able to submit them to detailed examination. These localities are:—Burrum River, Upper Burnett River, coal beds beyond Blackwater, 128 miles west of Rockhampton, coal beds west of Cooktown. I do not suggest any name for such impressions, but I suppose the term *Vertebraria* should be restricted to those forms in which the transverse divisions give rise to a series of joints such as to suggest the idea of a vertebral column.

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## Order II. CALAMITEÆ. Brongniart.

This order is distinguished from the Equisetaceæ by the verticillate leaves entirely free or confluent at their base, and by the sporangiferous spikes being axillary like those of Lycopods. Some of the genera of this order have been named and classified in the early history of paleontology from fragmentary fossils, but as investigation has gone on, better and more numerous specimens were discovered, and just as in the case of the different portions of the *Lepidodendron* genus, they have proved to be different portions of the same plants. Thus Ettingshausen has proved that *Asterophyllites* are the branches and branchlets of *Calamites*, and the spikes known under the name of *Volkmannia* are the fruit bearing portions of the same genus. It is to Mr. Binney, of Manchester, that we owe the knowledge that the capsules enclosed in the spikes are not anthers, but sporangia.

CALAMITES.—Suckow (including *Calamites*, *Equisetites* (in part), *Asterophyllites*, *Volkmannia*, *Bechera*, *Bruckmannia*, *Bornia*, of Sternberg and Goepfert, and the *Calamites*, *Equisetites*, (part), *Calamodendron*, *Asterophyllites*, of Brongniart, Bunbury, Binney, Dawson, and others.

Tree-like plants, rising from a subterranean rhizome, stem simple, somewhat conical, jointed and gradually narrowed, branches in whorls, with forked branchlets. Bark smooth, or more or less distinctly sulcate, internodes of varying length, but generally shorter as they descend. Inner lining always sulcate and constricted at the joints. Internal structure similar to *Equisetum*. Cauline leaves extremely fugacious, wholly unknown but usually represented by minute, convex, ovate scars on the inner wood. Branch leaves longer and more numerous than the cauline, of equal length, free or confluent at the base, linear or narrowed or slightly dilated above, acuminate, ribbed, entire, sub-erect, or reflexed. Sporangiferous spikes, verticillate from the axils of the leaves, disposed in corymbs along the branches or at their extremities, oblong or elongately cylindrical, small for the size of the plant. Bracts, alternating with the sporangia, verticillate, lanceolate, erect above, below uniting into a disk.

Sporangia-bearing stalks, peltate, and arranged in whorls of six ; sporangia, four to each stalk, borne on the under side of the peltate leaves ; spore cases, with cellular walls ; spores spherical, with thread-like elaters.

The fruit-spike or cone bears a very strong resemblance to *Equisetum*, but in the latter all the leaves of the cone are fruit-bearing, while in *Calamites* some are fruitful, and others are like the ordinary leaves of the plant.

*Calamites* abound in the Carboniferous rocks, and no doubt the great mass of the coal was formed by them. They may be said to have died out at the close of the palæozoic period, though some are still found amongst the lower members of the mesozoic strata. We have only two quoted from Australia, and those are from the lowest group of our coal strata, Smitl's Creek, near Stroud.

*Calamites (Bornia) radiatus*.\*—Brongniart, Hist. of Veget. Foss., 1, p. 122 (quoted by Schimper as *Bornia*, vol. 1, p. 335). This species belongs to the subdivision *Bornia*, distinguished amongst *Calamites* by its interrupted, non-alternating ribs, its free leaves, which on the branches are once or twice-forked, divided above, ovoid elliptic spikes, scutellæ with a scar on the centre of the external face. It is thus characterised :—Leaves of branches very long, linear, free, often forked. Cauline leaves shorter.

The fossil is very wide-spread, being found in the lower coal and Devonian rocks of Europe and those of America. (See Dawson's Devonian Plants, Quart. Jour. Geol. Soc., vol xviii., p. 309 ; also, Schimper, atlas, pl., xxiv., where many figures are given of stem, leaves and fruit.)

In Dr. Feistmantel's work already quoted,† there are three figures given of this fossil, representing some leaves and certain portions of the stem. It should be mentioned that, except

\* See Proc. Roy. Soc. N.S.W. 1883, pl. 12, pp. 7, 8.

† Nachtrag zur Fossilien Flora Australiens, Paleontographia pars. pl. vi, vii, xxiv, xxi. It is to be borne in mind that this work is published in parts and the numerals refers to the number of plates in the part. Dr. Feistmantel inserted a second enumeration having reference to the essay on the Australian Fossil Flora as a whole. To this second enumeration I have already referred.

to an experienced eye, or without some fruit spikes, these fossils might be mistaken for *Phyllothea australis*. They belong, however, to a much lower horizon, and the leaves will be found to be dichotomous, which is never the case in *Phyllothea*. *Calamites varians* is quoted by Feistmantel (loc. cit., p. 145) on the authority of De Koninck. The passage referred to is as follows:— \* “Before commencing the study of the numerous animal forms belonging to the Carboniferous period, I will glance at some contemporary plant remains received at the same time and also often in the same rocks from the Rev. W. B. Clarke. I should state, previously, that the specimens sent to me, not above twenty in number, were in such a bad state of preservation that, notwithstanding the immense experience of M. Crepin, who was kind enough to examine them, or the abundant materials for comparison which he had at his disposal in the Brussels Museum, he was unable to determine any species with certainty. According to him, nevertheless, some specimens came very near to *Lepidodendron veltheimianum*, Sternberg, others to *Bornia radiata*, A. Brong. and others, to *Calamites varians*, Gernar: these constitute the dominant forms. All these plants are contained either in a hard and compact greyish yellow or greenish limestone, or else in friable, easily powdered grey or brownish sandstone. Many are associated with marine animal remains, such as the stems of *Crinoids*, *Productus*, *Conularia*, &c. By their characteristics they cannot be said to belong to the Carboniferous formation properly speaking, but to the period which preceded it, being preserved in the rocks on which the Carboniferous strata rest. The principal localities in which these different fragments have been collected are the Murree quarries (Loders’ Creek), Russell’s Shaft, Glen William, and Burrageood.”

*Calamites varians* Gernar (*C. approximatus*, Schlott, of Schimper). This species is distinguished by the very short intervals in the basal part of the trunk becoming suddenly elongated in the upper part. The shoots of the basilar portion were rather stout,

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\* Recherches sur les Foss. Paleoz. N. Galles d. Sud, Australie, 3 part, p. 142.

and disposed quincuncially. The scars are large and round, and the ribs near converge towards them with their upper and lower extremities. The same thing is seen in the leaf scars, but then the converging ribs are less numerous, and there are never more than three. From the Drummond Range I have a very fine series of these plants, as will be seen from the accompanying specimens and figures, which place the nature of the fossils beyond any doubt. The occurrence of this species has been known for some time, through the labours of Dr. Feistmantel, but the discovery of the roots and stems was first recorded in a paper by the author,\* who received many specimens from Mr. Phillips, at Bobuntungen. These roots and stems seem to abound in the strata, and there are some portions of the stone which is made up entirely from the stems. Nevertheless, leaves are rarely found associated with them; in fact none of the more tender plants—such as Ferns, or organs of plants—are found in these strata where *Lepidodendron* occurs. In the neighbourhood of the shales, leaf impressions and those of Ferns may be found; but these I have not as yet been able to examine.

The strata I regard as lower Carboniferous, and they are very extensively developed in this locality, where the whole eastern face of the range is composed of beds dipping by a regular and slight inclination to the westward.

#### ANNULARIA (Brongniart).

Herbaceous plants. Stem articulate, subulate, divided by a solid diaphragm at the joints; branches pinnate and bi-pinnate; leaves, many in oval whorls, lingulately, elongately, and spathulately lanceolate, somewhat thick, with a central nerve, horizontal or recurved; spikes distichous or verticillate, cylindrically elongate, rachis thick, with short sulcate internodes; bracts numerous, rising erect, flat below, then erect and lanceolate. Sporangia axillary, globose, or lenticular.

These were probably herbaceous aquatic plants, whose leafy branches floated. The internodes were hollow and separated by

\* Roy. Soc. N.S. Wales, 1882. Read at the meeting, Dec. 6. In this paper are the figures here referred to.

solid diaphragmata with a thick margin which often leave impressions in the form of a ring, and hence the name. The leaves never form a sheath as in *Equisetum*, but unite at their base with the ring. Only one species of this genus, which is a characteristic coal fossil, has been described from Australia.

*Annularia australis* (Feistmantel).—(Loc. cit. p. 154. Tab. VII.—XXV.—Stem slender, articulate; leaves verticillate up to ten in number, spreading, incurved, membranaceous, lanceolately spatulate, with a persistent median nerve, 18 millim. long.

This fossil, which is unique, was found at Greta (30 miles west of Newcastle), in beds below the lower marine paleozoic beds. The specimen was found on a slab with a leaf of *Glossopteris browniana*, which shows the actual contemporaneity of that fossil with such a truly paleozoic form as *Annularia*. The present species somewhat resembles *A. longifolia*, Brongt., but the leaves are not so long or stiff, have a thinner cuticle, farther apart from one another, and are blunt at the end.

#### SPHENOPHYLLUM, Brongniart.

This genus is distinguished by its wedge-shaped, often divided leaves, less numerous than *Annularia* and furnished with fine forked veins; grooves on the stem not alternating, and the articulations form an acute ridge which is so constant that they can be identified even without leaves. Spikes narrow, long, and cylindrical. Bracts numerous, curving down at first from the rachis and then suddenly bent upwards at an acute angle in which a single spore case is fixed. Thus while the general structure is that of *Equisetum* the fructification closely approaches the Lycopods. Fossils characteristic of the coal period.

A remnant of what appears to be a species of *Sphenophyllum* is figured by Dr. Feistmantel, in the part of his work referred to. Pl. ii, fig 1 (p. 73). There is but one whorl of five, broadly cuneiform, finely nerved, split leaves, with a narrow stem, not showing any very distinct sulcations. The ridges of the articulations are not very marked. Altogether the specimen was so insignificant that Dr. Feistmantel did not consider it sufficient to name it. From Port Stephens (Stroud?)

## DOUBTFUL SPECIES.

Before leaving the Equisetaceæ, I note the occurrence in the Rosewood (Rockhampton) beds of certain fragmentary impressions, which I regard as belonging to the stems of *Equisetum* or *Calamites*. They are finely ribbed stems with transverse partitions, often three inches in width. The only form to which I can compare them is *Equisetum mougeotti*, Brong. (See Schimp. vol. i., p. 278, and Atlas pl. 12, figs 1, 2, 3 and 4) which is a Trias fossil, from the Vosges (Gres bigarrée). The ribs of our fossil are close, fine, about 20 to an inch. I have seen no specimens perfect enough to show a good series of the partitions, so cannot say whether they were close or distant, neither are there any buds visible. To distinguish it I name it as follows :

*Equisetum? latum*, pl. 2, fig 1. Broad stems two to three inches wide with numerous small close ribs. Common on sandstone or fine conglomerate, Rosewood (Rockhampton).

## FILICES OR FERNS.

Ferns are herbaceous plants with a creeping, climbing, or erect stem, consisting of a subterranean rhizome, stem, and leafy expansions curled upon themselves. Fructification on the under surface or margin of the frond, minute, densely clustered in spore cases (sporangies) full of microscopic doubly coated spores, destitute of an embryo, but capable of developing a small leafy expansion. Prothallus bearing the essential organs of reproduction.

I shall pass over other details for which any ordinary botanical handbook may be consulted, to come at once to the subdivisions which are adopted for the fossil species. I will merely observe now that as the fructification is rarely preserved, and generally only leaves and portions of leaves, two characters become most important. One is the form of the nerves or venation of the leaves ; the other is its mode of attachment to the rachis. The following general classification of Ettingshausen is the one followed here, as it is adopted by Schimper who points out that it is merely a development of that proposed by Ad. Brongniart in

1828.\* According to this system (Ettingshausen's)†, there are five orders of extinct ferns namely :—1. SPHENOPTERIDÆ; 2. NEUROPTERIDÆ; 3. PECOPTERIDÆ; 4. TENIOPTERIDÆ; 5. DICTYOPTERIDÆ.

#### SPHENOPTERIDÆ.

Including *Sphenopteris Hymenophyllum*, *Eremopteris*, *Coniopteris*, *Steffensia*.

Fronds petiolate, simple or divided, pinnate, bi-tri-pinnatifid, Pinnules connate or lobate. Lobes dentate or subdivided. Costa fine and delicate, often bifid or free at the top, veins diverging above, or produced to the sinus of the lobes or teeth. Venules either indistinct or only proceeding from the lower part of the secondary nerves.

#### SPHENOPTERIS, Brongniart.

As the species of this genus are over a hundred it has been found convenient to divide them into families according as they approach to such living forms as *Cheilanthes*, *Davallia*, *Dicksonia*, &c. The most of the Australian specimens belong to the family *Sphenohymenophylleæ* or *Sphenopteris*, approximating to the living *Hymenophyllum* which is thus described. Rachis winged; leaves finely membranaceous, veins pinnate, single in each segment, branches dichotomous. Sori indusiate at the apex of the lobes.

*Sphenopteris lobifolia*. Morris in Strzel. p. 246, pl. 7, fig 3 and 3a. Frond bi-pinnate, pinnæ somewhat linear, elongate, alternate. Pinnules membranaceous, those of the lower pinnæ equal, ovate, oblong, contracted at the base, approximate, with three nearly equal rounded lobes on each side, and a terminal obtuse one. Veins proceeding into each to be divided near the midrib, upper one furcate. The pinnules towards the apex of the frond are rather sharply three-lobed and decurrent, the veins becoming forked in each lobe.

\* Histoire des végétaux fossiles, vol. I, p. 148: Also Tableaux des gen. de végétaux fossiles, 1849.

† Die Farnkräuter der felzwelt zur Untersuchung und Bestimmung der in der Formation du Erdrinde eingeschlossenen Ueberreste von vorweltlichen Arten dieser Ordnung. Wien, 1865. By M. Const. d'Ettingshausen. With 180 beautifully executed plates, giving the neuration of many hundred species.



*Obs.*—This appears to have been a very delicate fern: the pinnules are very slender, or membranaceous, and variable in shape according to their position on the frond. Locality: Newcastle quoted also from Mulubimba. I have found it on the Dawson River Q. L. (near Cracow Creek), and I think I recognised it from the Bowen River coal fields (Q. L.) among some specimens from Rosella, two miles above Havilah crossing “A marine bed containing *Goniatites woodsii*, De Konn., *Productus cora*, D’Orb., *Streptorhynchus crenistria*, Phillips, intercalated with the fresh-water series.”\*

*Sphenopteris alata*, Brong., Hist. veg. foss., p. 361, pl. 127. Frond tripinnate, rachis winged, pinnæ pinnate, above pinnatifid with decurrent sessile pinnules, lower pinnatifid, with three to six bluntly toothed segments, upper ones inciso-dentate, veins either simple or forked, diverging slightly into each lobe from the costa at an acute angle. Hawkesbury River, Brongniart, Mulubimba. M’Coy.

This species was referred to *Hymenophyllites grandini*, Göpp by Göppert, which belongs to the old Carboniferous of Germany. Prof. M’Coy, however, denies that either the one or the other which follows are identical with that form.

With reference to this species Dr. Feismantel makes the following remarks in his Fossil Flora of the Gondwana system. † “I have to point out some confusion which arose about this species. In his paper on “Sedimentary Formations in New South Wales, published in Mines and Mineral Statistics, 1874, page 186, the Rev. Mr. Clarke correlated this *Sphenopteris alata* with the Carboniferous form known at first by the same name ‡ and later as *Sphenopteris* (*Hymenophyllites grandini*). The matter stands however, as follows:—The Australian species was at first dis-

\* Report on Bowen River coal mine by R. L. Jack, F.G.S., Parliamentary Paper, Brisbane, 1879, p. 34.

† Vol. III., part II. Flora of the Damuda and Panchet Divisions, Page 77.

‡ The same mistake is made in the last edition of Sedimentary Formations (1878) See p. 74, and Appendix IX, p. 22.

cribed as *Pecopteris alata*, Brongt., and was subsequently placed with *Sphenopteris (alata)* by Sternberg, and is at present quoted as such. The European Carboniferous form to which Mr. Clarke referred was at first described as *Sph. alata*, Brgt., and was later quoted by Göppert as *Hymenophyllites grandini*, and now by Schimper as *Sphenopteris grandini*, Goep. Now both Morris and M'Coy who mention *Sphenopteris alata* mention it in Brongniart's sense of *Pecopteris alata*, the Australian form, and not in the sense of the original *Sph. alata* or the present *S. grandini* of the Carboniferous. The latter (Brongniart, Hist. Veg. Foss. pl. 48, fig. 4) is totally different from the Australian *S. alata*, Brongt. sp. (op. cit. p. 127, p. 361), and it was with the latter I have compared the upper portion of one Indian *Sphenopteris polymorpha*."

*Sphenopteris alata*, var. *exilis*, Morris (loc. cit. p. 246.) Frond somewhat triangular with a tri-pinnatifid base, margin of the rachis alate, pinnules either contracted at the base or confluent, decurrent, irregularly lobed, lobes entire or dentate, veins slender, pinnate. *Obs.*—This interesting species appears more nearly allied to *Sphenopteris* than *Pecopteris*, and is easily distinguished by the slender and decurrent pinnules, the membranaceous or alate membrane of the principal rachis, as observed in recent species of *Hymenophyllum*. Associated with the last species and *Glossopteris browniana* in a light-coloured shale from the Hawkesbury River. The museum of the Geological Society, London, contains specimens of the two above species.

*Sphenopteris hastata*, M'Coy, Ann. Nat. Hist. l. cit. p. 149. Bi-pinnate, pinnae long, acutely lanceolate with a broad alate margin, pinnules elliptical, obscurely undulate, dentate, having three obsolete lobes on each side, veins bi-pinnate, two branches reaching each lobe of the margin. *Obs.*—The lengthened oval form, slightly indented margin, and simple neuration of the pinnules, fully distinguish this from any published species of the genus. The average length of the pinnae is about  $1\frac{1}{2}$  inch, width 4 lines, average length of the pinnules 3 lines. Not uncommon in the shale of Mulubimba, M'Coy.

*Sphenopteris germana*, M'Coy, loc. cit. p. 150, Bi-pinnate, pinnæ oblique, alternate, elongate, ovate, with a narrow membranaceous margin, pinnules oval, deeply pinnatifid, lobes very oblique, elliptical, generally three on each side, and the apex of the pinnules 3-lobed, veins bi-pinnate, three branches reaching the margin of each lobe. *Obs.*—It is extremely difficult (says Prof. M'Coy) to distinguish this species from the *Pecopteris murrayana* of the Yorkshire Oolitic coalfields, with which it is nearly identical in form and neuration. The oval outline of the pinnules is the most obvious character, contrasting with the trigonal wide-based leaflets of the English plant. This, together with their more oblique setting on the rachis, more oblique, narrow, and deeply-cleft lobes, and the decurrent, narrow, alate margin to the straight rachis, will, I think, be sufficient to distinguish the species in the shale of Mulubimba.

*Sphenopteris plumosa*, M'Coy, loc. cit. Bi-pinnate, pinnæ curved, elongate, narrow, plumose, margin slightly alate to the rachis, pinnules close, oblique, ovate pointed, deeply cleft into about four oblique mucronate lobes on each side, exclusive of the largely trilobed apex, veins strong, much branched, so that about six branches reach the margin of each of the lobes of the lower side, and seven to each of those of the upper margin. *Obs.* The number of the lobes of the pinnules and complexity of the neuration will readily distinguish this species. The average length of the leaflets, five lines. Rare in the shale of Mulubimba.

*Sphenopteris flexuosa*, M'Coy, loc. cit. Bi-pinnate, pinnæ long, with a strong flexuous naked rachis. Pinnules large, moderately oblique, unequal, ovate, sides cut into two very large unequal rounded lobes on each side. Apex tri-lobed. Veins strong, much branched, seven branches reaching the margin of each lobe, and three going into each of the three lobes of the apex. *Obs.* This strongly-marked species is not sufficiently allied to any known form to render a comparison necessary. The average length of the pinnules is about eight lines, width four lines. In a bed of brown clay, Mulubimba.

*S. iguanensis*, M'Coy, Decades Paleont. Victoria. Dec. IV, p. 22. Pl. XXXVI, fig. 35.—This species belongs to the subgenus *Eremopteris*, of Schimper, for such species of *Sphenopteris* as have the frond dichotomously pinnate, pinnæ irregularly pinnatifid, lacinate lobes elongate, obovate or sub-cuneate, veins dichotomously radiating from the base. *S. iguanensis*. Dichotomously bi-pinnatifid, segments of usually five to seven lobes, oblique, elongate, cuneate, confluent at base, apices crenulo-lobate by small acutely angular indentations. Veins slender, numerous, forked, diverging from the base usually about three to each lobe, a few towards the middle stronger than the rest, but no distinct midrib. Rachis rather thick. Length of pinnules, one to two inches, greatest width usually about 4 lines. Obs. The pinnules or lobes are smaller, narrower, diverge at more acute angles, and are much less deeply divided than in the *Sp. artemesifolia*, Brongt., of the lower Carboniferous rocks of Northumberland, to which it is most nearly allied, and which is the type of Schimper's exclusively paleozoic *Eremopteris*. Common in hard olive upper Devonian flags of Iguana Creek, Victoria.

*S. elongata*, Carruthers, Proceed. Geol. Soc. Lond, 1872, p. 355, pl. XXVII, fig. 1 (Append. II to Daintree's paper on the Geology of Queensland.) Frond dichotomously divided, each division irregularly pinnate, pinnæ simple, bi-furcate or irregularly pinnate, segments narrow, linear, slightly tapering upwards to the somewhat blunt apex, the costa sending out simple veins which run along the middle of each segment. Obs. With *Pecopteris* (*Thinnfeldia*) *odontopteroides* this is one of the most abundant forms. Some specimens have small oval markings scattered irregularly on either side of the midrib. These probably indicate the form and position of the sori, which are the same as in some of the simple linear species of *Polypodium*. Tivoli coal mine.\* I find the same oval markings on many different Ferns, and am inclined to refer them to other causes. My own inclination is to place the fossil with *Trichomanides*.

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\* I can hardly confirm this about the fossil being common; in fact I should say that it is rather uncommon, and confined to certain horizons. It is met with at Thomas's Aberdare mine as well.

*Sphenopteris crebra*, n.s., plate 3, fig. 4.—Fronde evidently tender and membranaceous, bi-pinnate, pinnæ wide, alternate, slightly oblique, oblong quadrate, pinnules so close together as not to be easily distinguished, faintly pinnatifid, lobes a little more oblique than the pinnæ, oblong ovate, with a slightly undulating margin; costa sending off veins which fork once, and the venules reaching the margin.

Ballinore Coalfield, Talbragar River, N.S.W.

The spreading contiguous pinnæ, and the very faint lobes, will easily distinguish this species from the preceding, or from any found in the Newcastle or Ipswich beds.

*Sphenopteris (hymen.) baileyana*, pl. 4, fig. 2, n.s.—Fronde bi-pinnatifid, membranaceous, rachis winged, pinnules alternate, almost simple, broad at the base, becoming regularly narrower at each lobe, so as to form an almost conical leaflet, emerging at an open angle, and curving upwards, the lower shorter, the upper longer and spreading; lobes linear, narrow, rounded, very slightly segmented, much longer in the upper pinnules, the terminal lobe produced; costa conspicuous, reaching the apex; veins very fine, emerging at an acute angle, bi-furcating immediately, sending a venule to the end of each lobe. Rosewood, Ipswich, one specimen.

This fossil might be compared with some living species of *Hymenophyllum*, but the peculiar stout, slightly lobed pinnæ give it a character not easily referable to any recent or fossil form.

*Sphenopteris—Aneimioides*.—This subdivision of the genus *Sphenopteris* is founded on the general resemblance to *Aneimia*, a well-marked genus almost confined to America, with fertile and barren fronds, the fertile being a copiously branched panicle, and the barren having numerous radiating free forked veins. The definition of Schimper for this subdivision of the *Sphenopterideæ* is as follows:—

Pinnules somewhat broad, narrowed below, ovately lobed, lower lobes 3 to 4 in number, superior entire, coarsely toothed or sinuate, all roundly obtuse or sub-acuminate; costa of the pinnules well marked, evanescent, veins and venules numerous, diverging in a somewhat arcuate manner from a sub-erect base. Dichotomous.

In one respect the fossil now to be described does not correspond, and that is that the median nerve is scarcely to be distinguished from the others.

*Sphenopteris (Aneimioides) flabellifolia* n.s. Frond delicate, small, bi-pinnate, rachis terete, somewhat thick, pinnæ, oblong cuneate, contracted at the base to a delicate petiole, lower edge entire, upper divided into linear cuneate lobes of varying width, the edges straight or rounded, some of the pinnæ much elongated; costa inconspicuous; veins fine, close, numerous, straight, radiating.

This remarkable fossil, which has strong resemblance to *Archæopteris* occurs abundantly in a blue shale on the Burnett River, Queensland, about half-way between Bundaberg and five coal seams which abut on the river. It probably belongs to the same coal formation, but whether the shale is an upper or lower member of it I am unable to say.

*Sphenopteris* (pl. 2. fig. 2) (*Aneimioides*) *flabellifolia*, var. *erecta*.—On the same stone as the foregoing, Ferns are found of smaller size and regularly pinnate, the pinnæ lobed or segmented symmetrically at both sides. It seems a very different form, but on looking closely the venation and general shape of the lobes is seen to be the same.

*Sphenopteris (?) glossophylla*, n.s., pl. 4, fig. 4. Frond very small, with a somewhat thick rachis, repeatedly forking and bearing small, entire, alternate ovate leaves on which the venation cannot be seen. One specimen at the Talbragar mines, near Dubbo, N.S.W., where it is associated with Triassic (?) conifers.

I know of nothing either living or fossil to which this singular little fern (?) can be compared. I have given it a name for the convenience of reference.

#### SUB-GENUS TRICHOMANIDES.

Frond simple or divided, bi or tri-pinnate, primary rachis narrow, or terete. Pinnules very delicate, dichotomously divided, lobes narrowly linear or filiform, simple or forked. Sori unknown, but doubtless as in all the *Trichomanideæ* (*Hymenophyllum*, *Trichomanes*, &c.) indusiate at the extremity of the elongated lobes.

*Trichomanides laxum*, n.s., pl. 10, fig. 2. Rhizome creeping, long, slender, sending up at distinct irregular intervals delicate membranaceous, pinnate fronds. Pinnæ emerging at an acute angle, linear or cuneate, bi-furcating with one simple free vein to each lobe. Rosewood scrub, Ipswich, not common.

This fossil cannot be distinguished from *Trichomanes*; one indusium and receptacle at the end of a lobe showing the simple cup of that genus. There is some resemblance in the form to the preceding species of Carruthers, but this species is much smaller and evidently consisted of short pinnate fronds proceeding at irregular intervals from the slender creeping rhizome. This fossil has intimate relations with our existing flora.

*Trichomanides spinifolium*, n.s., pl. 3, fig 7, evidently somewhat stiff, spreading, dichotomously dividing, bi-pinnate, pinnæ opposite or nearly so, long, linear and together with the rachis membranaceously winged, pinnules nearly opposite or alternate, very short and quite acute, the apical one long, and linear, veins thick, simple free. No sori or indusium visible.

This beautiful species is distinguished by the rigid aspect, the close numerous pinnæ, the shortness and acuteness of all pinnules, except the terminal one which is disproportionately long and linear. Rosewood, near Ipswich.

#### ANEIMITES. Dawson.\*

Frond many times dichotomously divided with squarrose divisions and squarrosely pinnate. Pinnæ angularly flexuous. Pinnules somewhat remote, broadly spathulate, petiolate, trilobed or remaining nearly entire, veins dichotomous. Fertile pinnæ and pinnules subcircinately recurved, short and with a leafy expansion.

*Aneimites iguanensis*, M'Coy. Report of Progress of Geol. Survey of Victoria, No. 2, Melbourne 1875, p. 73. The only record of this species which I can find is in a letter from Prof. M'Coy to Mr. Brough Smyth, published in the above report. He states that having examined the fossils from Iguana Creek, which had

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\* Quart. Jour. Geol. Soc. Lond. vol. xvii., p. 5.

been submitted to him, he recommended that the beds in which they occur should be colored as Upper Devonian. He said further that amongst the fossils there was a new species of *Archæopteris* which he named *A. howitti*, a new species of *Aneimites* named *A. iguanensis* and a species of *Cordaites* named *C. australis*. There was no description given, but subsequently in the fourth decade of the Paleontology of Victoria, plate 36, and p. 21 to 23, descriptions were given of *Archæopteris howitti*, and *Cordaites australis*, together with the *Sphenopteris iguanensis* already described, but no further mention of the *Aneimites*.

#### Family NEUROPTERIDÆ.

Fronds simple, once or more pinnate. Pinnæ and pinnules foliaceous and generally rather large, entire, veins numerous with many forks diverging arcuately and reaching the margin either directly from the rachis or from the costa. Only a very few specimens are known with organs of fructification.

#### ARCHÆOPTERIS. Dawson, loc. cit.\*

Bi-pinnate, pinnæ alternate, pinnules obliquely obovate, imbricate, opposite, with narrow decurrent base, a pinnule often on the rachis between bases of pinnæ; veins fine, divaricating, dichotomous. Fertile pinnules in the midst of the infertile ones; sori ovate, in bunches at ends of much divided veins. Common in Upper Devonian beds of Europe, N. America, and rare in the lower Carboniferous.

*A. howitti*, M'Coy, Pal. Vict. loc. cit. Pinnæ upwards of four inches long, and about one and a-half inches wide. Pinnules subopposite, imbricate, obliquely ovato-rhomboidal, narrowed to the base which articulates to the petiole so as to appear slightly decurrent on one face, and obliquely inserted on the other. Terminal pinnules nearly the size and shape of the lateral ones, but equilateral. Average length of each pinnule, 1 inch, 1 line;

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\* The genus was erected by Schimper (see Pal. Veg. vol. 1, p. 475), who named it *Palæopteris*. This was a name already used by Geinitz, and the above as a substitute was suggested by Dr. Dawson.



width, 6 lines. Veins slightly radiating, slender (about 14 in. 3 lines across the middle), with two or three dichotomous branches from base to upper margin, edges only slightly lacerated.

*Obs.*—This species is most allied to the Canadian *A. jacksoni*, from the upper Devonian beds of Gaspé, from which it differs in its larger and broader pinnules, and to the *A. hibernica*, from the upper Devonian of Kilkenny and Berwickshire, from which its shorter, broader and more closely set imbricated pinnules and smaller pinnæ distinguish it. The fertile pinnules have not been found as yet. Abundant in the upper Devonian olive flags of Iguana Creek.

*A. wilkinsoni*, Feist. Paleoz. u. Mes. Flora d. Ost. Australiens, p. 148. Pinnate, rachis narrow, somewhat striate, sometimes forked; segments of the pinnules sub-alternate, oblong ovate, pinnatifid segments or slits sub-alternate, cuneiform, narrowed at the base, decurrent, incised, lobes denticulate, the terminal ones bi-tri-lobed with incised dentations. Veins very close flabellately dichotomous.

*Obs.*—This form approaches nearest to *A. lyra*, Stur. and *A. dissecta*, Goep., but in the latter the pinnæ are longer, the segments or slits are wider apart, are longer and more slender. Locality, Smith's Creek, near Stroud, horizon probably lower Carboniferous.

Another species of *Archæopteris* is spoken of by Feistmantel (loc. cit. p. 148) and figured (Tab. IV, XXII, fig 4), but the specimen is too imperfect to be determined. From the same locality.

#### RHACOPTERIS, Schimper.

Fronde pinnate, rachis rigid, grooved in the middle. Pinnæ elongate broadly linear. Pinnules sub-horizontal, somewhat remote, contiguous or sub-imbricate, spreading, oblong rhomboidal, more or less deeply incised and flabellate, lobes narrow, straight, or slightly removed. *Obs.*—The incisions are in the direction of the veins, and each ligule comprises one or two branches. The name refers to the incision of the pinnules. The genus is confined to the Devonian or Lower Carboniferous.

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*R. inequilatera*, Goeppert (as *Cyclopteris* Flora d. Silur-Devon. und unt. Steinkohlform), p. 72, tab. XXXVII, pp. 6, 7, and 8. Schimper (as *Paleopteris*). Paleon. veg. vol. 3, p. 485. Frond pinnate, pinnæ subimbricate, spreading very much, inequilateral, upper side broadly rounded, truncate at the base at a right angle. Petiole short, straight, decurrent. Veins united at the base, spreading widely and dichotomously divided.

*Obs.*—This species is identical with one found in Europe in the Lower coal measures (Silesia), where, however, it is rare. It is somewhat common in the beds at Smith's Creek and at Arowa. Dr. Feistmantel gives many figures, and states that he believes that Prof. M'Coy's *Otopteris ovata* (Ann. Nat. His. loc. cit.) is this species. From the figures one would say that they were identical. Prof. M'Coy points out in his description that the genus was the same as Goeppert's *Adiantites*, and Unger's *Cyclopteris*, but he referred it to *Otopteris*, because of its pinnate leaves. The species is also considered by Feistmantel to be the same as one not determined by Stur.\*

*R. intermedia*, Feistmantel (loc. cit. p. 75, Tab. 11.) Rachis thick with a prominent mesial angle, pinnules alternate, pedunculate, oblong, rhomboid, incised into cuneate segments, the centre longest, incisions scarcely marked above. Margins of the segments denticulate, veins numerous, forking, radiating in the segments. Port Stephens (Stroud)? In the form of the rachis this resembles very much *R. transitionis* and *R. machanecki*, Stur.

*R. septentrionalis*, Feistmantel, loc. cit. p. 147. Tab. iv (XXII) fig. 5. Rachis as in the last species, pinnulæ subalternate, with short petioles, suberect, oblong near the rachis deeply lobed and thence sub-flabelliform, lobes subrhomboid, deeply incised, segments rounded above. Veins indistinct.

*Obs.*—This form is also somewhat like *transitionis*, Str, but it is in every respect thinner and more slender. Smith's Creek, Stroud.

*R. römeri*, Feist. loc. cit., p. 147. At plate 11 (xx), fig. 2 and 2a., Dr. Feistmantel gives the outline of a plant from the same

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\* Culmflora d. Mähr. Schles. Dachschiefers, p. 75.

locality, which he formerly described as a *Sphenopteris*, and which he now somewhat doubtfully refers to *Rhacopteris*. The species is identical with one from the coal measures of Silesia by its subquadrate, deeply lobed pinnæ and dichotomous veins. The rachis is also grooved.

#### NEUROPTERIS, Brongniart.

FronDS pinnate or bi-tri-pinnate generally twice or thrice divided. Pinnules entire, constricted at the base and not uncommonly cordate with a short pedicel, rarely inserted by the whole width of the base, costa more or less distinct, only occasionally continuous beyond the middle of the pinnule, thence dividing into veins which emerge at a very acute angle, curved, diverging, numerous, slender, dichotomous, produced to the margin in parallel venules, and never anastomosing.

This is a large and natural genus, and is said to be peculiar to the true Carboniferous epoch. When the costa entirely disappears it may be confounded with *Odontopteris*, and when the same nerve is continuous to the apex of the pinnules it is equally difficult to separate it from *Pecopteris*, especially as this genus has the veins very numerous and emerging at an acute angle. Then recourse must be had, says Brongniart, to the shape of the pinnule, which in the greater number of species of *Neuropteris* is contracted and rounded at the base and *never decurrent* or confluent.\*

Amongst existing forms the resemblances are to *Pteris*, *Blechnum*, *Lomaria*, &c. Only once has the fructification of *Neuropteris* been observed, and that shows no analogy with any living Fern.

*Neuropteris* sp.—Fragments of a fern somewhat resembling *N. gigantea* Sternb, were found by me at Bobuntungen in Queensland. I have not the specimens now to refer to, and therefore cannot give more details. Doubtless, more will be found. A figure of the species named will be seen in Lindley and Hutton

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\* "The median pinnules must be here understood. The basal and terminal ones are often so much modified as to lose their normal form." Schimper, Note, vol. 1. p. 431.

Fossil Flora, plate 52. Sternberg Flor. d. Vorw. 4, p. 16, 5, p. 72; Brongniart Prod. p. 54, and Hist. d. Veg. Foss. 1, p. 240, plate 69.

The Rev. W. B. Clarke mentions *Neuropteris* as occurring at Newcastle, but no such fossil was found in his collections or amongst those sent to Europe. It was probably a mistaken identification.

*Neuropteris australis*, n. s., plate 8, fig. 4, 5. Frond pinnate with a thick, broad, conspicuously grooved rachis. Pinnæ ovate and lingulate, the lower ones, moderately and irregularly lobed and obtuse, unsymmetrical, the upper ones, ovate, acuminate with an acute apex, the apical pinnules, trifoliolate, with lobes broadly rounded, all affixed to the rachis by a somewhat broad petiole. Veins rather thick and prominent, radiating from the base, the venules running almost parallel in a curve to the margin. Length of lower pinnules, 15 to 20 millim.; breadth, 8 to 10 millim. Upper ones gradually diminishing in length and breadth to the summit of the frond.

This species of Fern differs from *Thinnfeldia* in the shape and arrangement of the pinnæ, which are not decurrent, and diminish in size towards the apex, where they become ovate-lanceolate and finally trifoliolate, in a way that is never seen in any of the other fossils we have in Australia. There does not seem to be any signs of the bifurcation of the frond.

The first specimen I received of this interesting fossil was obtained by the Rev. J. Milne-Curran, from the gravel of the Bell River, near Wellington, N.S.W. The fossil was in ironstone, and evidently derived from some of the limonite nodules such as are obtained from the Hawkesbury rocks. There is only one living form to which it could be referred, namely, *Aneimia* (Swartz). This genus is distinguished by forked radiating free venules, without a median vein, which make it stand alone amongst living forms. It is not represented in Australia, but is in Africa, and almost confined to the tropics.

I venture to suggest that the connection between these forms may be worth attention. There is a fossil genus connected with

them which has been named *Aneimidium*, by Schimper, and which can scarcely be separated from living forms, except in this, that the veins are closer and more numerous. There are two species known from the Wealden of North Germany. The diagnosis of the genus is thus given :—Fronds pinnate, pinnæ coriaceous, simple, oblong, ligulate, symmetrically, and unsymmetrically obovate, base inserted, gradually narrowed. Neuration distinct, thickened towards the base, often forking, and all the venules free and reaching the margin.

“The great resemblance which these species manifest to several species of *Anemia*,\* and the almost complete correspondence of the venation has induced me to give to these plant remains of the Cretaceous period the name of *Aneimidium*.”—Schimper, Pal. Veg., vol. 1, p. 485.

If we were sure of the horizon to which this species of *Neuropteris* belongs, its presence might cause interesting speculation. It has been found simply in a waterworn stone in the river bed. There are no known paleozoic plant beds near, and its aspect is certainly not that of a paleozoic fossil. The formation on which it rested was a marine Devonian limestone, with corals.

#### THINNFELDIA.—Ettingshausen.†

Fronds pinnate, segments or pinnæ oblong, ovate lanceolate, decurrent, and confluent at the base, coriaceous, costa divided into many veins, venules and veinlets, before reaching the apex ; veins emerging at a slight angle, diverging in ascending, and often forking, venules or veinlets reaching the margin. Stomata in both sides of the lobes. *Obs.*—The frond is generally dichotomous, and is with the leaves of a thick and fleshy habit. It belongs in Europe to the lower Lias and Rhætic formations.

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\* From *ἀνείμων*, without clothing (*a priv. ἔιμα*, vesture), in allusion to the naked inflorescence. Many writers on Ferns, such as Smith, Moore, Hooker, write *Anemia*, which is the orthography of Swartz, the founder of the genus.

† *Begründung einiger neuen nicht genau gekannten Arten der Lias u. d. Oolith flora.* (Abhand. d. k. k. geol. Reichsanst., I. 3, No. 3, p. 1.)

According to Dr. Feistmantel there has been much doubt about the position of these plants.\* It is not a common genus, though with us the specimens are so numerous. By Braun† it was placed amongst ferns, but in the family PACHYPTERIDÆ. By Ettingshausen it was regarded as a conifer near *Phyllocladus*. Andræ also placed it amongst conifers, but with *Taxineæ* with *Pachypteris*.‡ Schenk classed it with *Cycadopteridæ*. In the work of Schimper referred to (vol. I., p. 494) the author takes *Cycadopteris*, *Pachypteris*, and *Thinnfeldia*, and places them all amongst *Neuropteridæ*, in which Dr. Feistmantel says he is probably right adding "We have another systematic position of this genus by M. Saporta; in his Jurassic plants of France (Paleont. Francaise, N. 8, p. 340, ff.) he placed *Thinnfeldia* amongst the *Odontopteridæ*; but I believe this is not quite right, unless the diagnosis of *Odontopteris* (Brongniart) be altered, for we have in all known species of *Thinnfeldia*, Ettingsh., a distinct costa merging in venules on the apex, which does not occur in *Odontopteris*. There are seven species described from Europe, viz.—*T. decurrens*, Schenk, *speciosa*, Ett., *obtusa*, Schenk; *rhomboidalis*, Ett., *saligna*, Schenk, *laciniata*, Schenk, and *incisa*, Saporta, all from Rhætic or Lias. There are two described from India, viz.—*T. indica*, Feistm., and our common *T. odontopteroides*, Morr.

? *Thinnfeldia media*, n. s. (an var. *indica*? F. loc. cit., p. 87. Pl. xxxix, fig. 1, 1a; xlvi., fig. 1, 2, 2a; also Records Geol. Surv. Ind., ix., 2, p. 35, 1876; *Pecopteris salicifolia*, Old. and Morr. Rajmahal Flora Pl. xxvii., fig. 2). Frond pinnatifid or bi-pinnate (?), pinnæ nearly opposite lanceolate, acuminate, on the margin sinuate, the lower ones shorter, the upper more or less nearly auricled, the lower ones more or less decurrent, the costa dividing into many veins; these veins are forked. Stalk thick striated. This is the diagnosis of *T. indica*.

\* See vol. 1, Foss. Flora. Gond. Syst. Part 2, Jurassic (Liassic) Flora of Rajmahal Group, p. 85 and 33, of the work, 34 of the part.

† Braun verz. d. Petref. m. d. Kreiss z. B. 1840. k. k. Geol. Reichsanst. Abh. II. 1855, p. 43.

‡ Fl. d. Grench, 1867, p. 105.

Dr. Feistmantel remarks that the form of the pinnæ, the venation, and the thickness of the rachis all agree with *Thinnfeldia*. He says that it might almost be identical with *T. decurrens*, Schenk, a Rhætic and Liassic plant, differing only in these points :—1. The rachis is thicker ; 2. The lower part of the base of pinnæ not so distinctly decurrent ; 3. The pinnæ are thinner. He unites this species with *Pecopteris salicifolia*, Morr.

Found in the sandstones at Dubbo, where it is associated with *Thinnfeldia odontopteroides*. The sandstones are without doubt the same as the Hawkesbury sandstone, which I regard as an aerial deposit. I have also recognized occasional fragments of this Fern in ironstone. The differences in this species will appear from the following diagnosis :—(Bi-pinnate?) pinnæ quite close, nearly opposite, broadly lanceolate, broadly obtuse, the lower ones shorter, attached by the whole of the base where it is only very slightly constricted. Veins only faintly visible, but there are traces of a costa in nearly all the pinnules which is evanescent. Rachis very thick.

While the venation is so indistinct we cannot be sure that the fossil is a *Thinnfeldia*. It bears some resemblance to *T. indica*, Feistmantel and more to *T. decurrens*, Schenk, a Rhætic and Liassic plant of Europe, differing only in the form of the pinnæ, which are more obtuse. I think I have also recognized varieties of this Fern in ironstone nodules, which have evidently been derived from the Hawkesbury rocks by weathering. The decomposition of the plants has given rise to a nucleus by deoxidizing the ferric oxides in the felspars contained in the sandstone, as stated in the paper on the Hawkesbury sandstone in the Roy. Soc. N. S. Wales for 1882. A careful examination of these nodules generally manifests some fragments of plant remains.

*Thinnfeldia odontopteroides*.—Morris (1845) Physical Des. N.S.W., Strzelecki, as *Pecopteris* p. 249, pl. vi., figs. 2, 3, 4 ; 1847, *Gleichenites odontopteroides*, M'Coy, A. and M. Nat. History, vol. xx, 2nd Ser., p. 147, 1850, Idem. Unger., Genera et species plant. fossilium, p. 208 ; 1869, *Cycadopteris (?) odontopteroides*, Schimper, Trait. de Paléont. végétale, vol. i., p. 488 ; 1869, *Alethopteris (?)*

*odontopteroides*, Schimper, *ibid*, p. 569 ; 1872, *Pecopteris odontopteroides*, Carruthers, Qu. J. G. S., London, vol. xxviii., p. 335, Tab. 27, figs. 2, 3 ; 1875, *Odontopteris*, Crépin, Bull de l'Acad. Royale de Belgique 1875, vol. xxxix, 2 Serie, pp. 258-263, figs. 1-5 ; 1877, *Thinnfeldia morrissi*, Feistmantel, N. J., Mineral, &c., 1877, p. 179 ; 1878, *Pecopteris odontopteroides*, Etheridge (R.), Catalogue of Australian Fossils, p. 98 ; 1878-79, *Thinnfeldia odontopteroides*, Feistmantel, Flora des oestl. Australiens, Palæontographica, Supplement iii. Hef. iii., pp. 105, 165 ; 1878, *Cycadopteris*, M. Zeiller in Guide du Géologue à l'Exposition Universelle (Paris) de 1878, &c. ; 1880, *Thinnfeldia crassinervis*, Gein., and *Pecopteris odontopteroides*, Morr., probably identical, A. G. Nathorst in Offers. of Kongl Vel Akad. Stockholm, Förhandl., 1880, No. 5 (Review in botan. Centralblatt, No. 2, page 328, 1881). *Thinnfeldia odontopteroides*, Feistmantel, Fossil Flora of Damuda and Panchet div., p. 85, pl. xxiii., A, figs. 7, 9, from whence the foregoing synonymy is for the most part taken.

This widely spread fern, which is a very common fossil in Australia and Tasmania though rare apparently in India, was first described by Morris from very imperfect and very incomplete specimens and so to a certain extent was the figure of Carruthers (Geol. of Queensland, loc cit., p. 355). The numbers of specimens since found gave every facility to Dr. Feistmantel for the following diagnosis. Frond of varying size from small to large, simple or dichotomously divided. Simple fronds, pinnate, pinnatifid, pinnae long, pinnules rhomboid-ovate, here and there dentate, connate at the base, lower basal ones inserted on the rachis, semi-elliptic, or connected with the following pinnule. Dichotomous fronds pinnatifid or pinnate pinnatifid ; pinnae in the undivided portion and near the division close and short, those of the branches longer ; pinnules variable, sometimes obliquely ovate, oblong, sometimes quadrately ovate, entire, or obliquely truncate above, or indentate ; on the frond pinnate pinnatifid, lowest basal pinnules, even those remote and those in the upper part fixed to the rachis. Veins, rising partly from one which is almost median, coming from the basal part of the leaf at the



rachis, and forking frequently, and some also forking coming direct from the rachis.

In this diagnosis Dr. O. Feistmantel has included all the different variations to which the species is subject. He has paid much attention to it, and it is best perhaps to give an abridgement of his own remarks as they stand in the descriptions of the Damuda and Panchet divisions of the Gondwana systems (India\*), and as they are summarized in the paper read before the Royal Society of New South Wales in 1880. After stating that he believes he can identify this peculiar fossil amongst the Lower Gondwana plants he remarks that this species has undergone numerous transigrations from one genus into another, its proper place not being finally settled yet. Professor Morris did not like to decide on its systematic position, but from the dichotomy of the leaf Professor M'Coy placed it provisionally with *Gleichenites*, and so on with other authors whose opinions will be quoted presently. When Professor Geinitz sent me in 1876 his paper on the Rhætic plants of the Argentine Republic (Cassel 1876), I was at once struck with the similarity of his *Thinnfeldia crassinervis* with *Pecopteris odontopteroides*, and quite recently I find the same view expressed by Herr Nathorst, † who even thinks that both these plants are identical, after having seen the specimens from Queensland which are described by Mr. Carruthers. I have myself had an opportunity of examining several specimens from various localities in Australia, and although sometimes differing in appearance, yet from all the other characters they have, I think that they are to be considered identical. Considering the differences they present from *Odontopteris*, *Ctenopteris*, and *Pachypteris*, it appeared to me best to place this fossil with *Thinnfeldia*.

The differences to which Dr. Feistmantel refers are those between the very large fronds from Mount Victoria and the short, neat, and fern-like forms in the coalbeds of Ipswich. The species, however, abounds in the Tivoli mine, and every intermediate form can be

\* Mem. Geol. Survey India. Fossil flora of the Gondwana System, vol. 3, part 2, p. 86.

† Öfvers Kongl. Vet. Akad., Stockholm, Forhandl, 1880, No. 5 (see also Nuren in Botan, Centralblatt, No. 2, p. 328, 1881.

obtained on the same piece of black shale. It must have been a very large plant, and grew to immense size, even in the poorest sandy soil. It is found in the Hawkesbury sandstones in very poor sand, and no traces of a vegetable deposit any more than an oxidation of the iron around the plant impressions, and in some of the laminations. Fine specimens have been obtained from the sandstone quarries at Dubbo, which is nearly 200 miles from Mount Victoria.

The following observations are from the Jour. of the Roy. Soc., N.S.W., 1880, p. 113.

*Thinnfeldia odontopteroides*, Fstm. (Morr. sp.) (pls. xiv, fig. 5 ; xv, 3, 7 ; xvi, 1 ; ix a, x a, and xi a).—Prof. Morris described in Strzelecki's above-mentioned work a fossil plant from the Jerusalem basin, as *Pecopteris odontopteroides*, Morr., without being, however, able to justify this determination. Prof. M'Coy placed later the same species with *Gleichenites*. Mr. W. Carruthers quotes it from Queensland again as *Pecopteris odontopteroides* and gave two figures. M. Crépin, who described several specimens from Tasmania, classed it with *Odontopteris*, and compared it with *Odontopt. alpina*, Gein., considering the beds from which it came as Carboniferous. But its association, as mentioned before, on the same specimens with *Sphenopteris elongata*, Carr., leaves no doubt about the correlation of these Tasmanian beds. I could compare specimens from Queensland and Tasmania, and also from the Wianamatta and Hawkesbury beds in New South Wales. The comparison has shown that in the specimens from all the localities there occurs a dichotomy of the frond pretty regularly as in the genus *Thinnfeldia*, under which name I have described it in my above-mentioned memoirs. For the support of this view I quote its great resemblance to *Thinnfeldia crassinervis*, Gein., from the Rhætic beds of the Argentine Republic.

Dr. Feistmantel calls attention to the fact that this is a characteristic species of the mesozoic coal in Australia. It is certainly never found in the Newcastle beds. It is very common as already stated at the Tivoli mine, associated with *Equisetum rotiferum*, at Bundamba, in fact in all the Ipswich coal basin. It is found

in the Hawkesbury sandstone, or the similar ariel sandstone, extending far to the westward, in fact over the continent. This sandstone is of different ages. Some of it over-lies the Cretaceous rocks, though as far as I know *Thinnfeldia odontopteroides* has not been found in strata which are clearly above the Cretaceous.

*Thinnfeldia odontopterodes* var. *falcata*. plate 8, fig. 1. Frond graceful and somewhat of the same size as *T. odontopteroides* simple and dichotomously divided, pinnate pinnatifid, pinnae long and curved broadly lanceolate, *becoming long and falcate as they ascend the rachis*, entire, opposite, very close but not connate, base broad, and inserted by its whole length upon the rachis, becoming close and short, but always lanceolate at the apex, at the base or near the dichotomous division. Veins nearly the same as *T. odontopteroides*, but the costa though forking continually is more conspicuous, diverging from the rachis at a very acute angle; some nerves also forking, running direct from the rachis. Plant evidently coriaceous, rachis broad and stout with a conspicuous double groove, abundant at the Rosewood scrubs about ten miles from Ipswich, where it is associated with the *Alethopteris australis*, *Thinnfeldia odontopteroides*, *Sphenopteris elongata*, and other common forms of the Tivoli coal flora. It is by far the most abundant form, and well preserved, showing the workings and venation very distinctly.

Though Dr. Feistmantel would seem in his diagnosis of *T. odontopteroides* to have given almost every variety of form, yet the peculiarities of this species stand distinct and marked. It was evidently a Fern of stouter habit than its congener, probably not so large in growth. The rachis is always grooved and more slender, and the terminal pinnules form a long lanceolate pair in some specimens. I do not, however, exclude the possibility that this may be a variety of *T. odontopteroides*, but if it be so it is a new and distinct one which deserves to be marked.

#### ODONTOPTERIS. Brongniart.

Fronds pinnate, generally bi-pinnate at the apex, pinnae pinnate and pinnatifid, the apical ones single, sub-opposite and sub-alternate, linear lanceolate; pinnules obliquely inserted by the whole

base, decurrent, free, but towards the apex more and more confluent, and the terminal ones united, slender, ovate-acuminate, rarely somewhat rounded, the lowest ones seated partly on the primary and partly on the secondary rachis of two forms, either narrow at the base, broadly cuneate, and more or less deeply emarginate above, or obcordate. Veins all arising from the rachis, extremely fine, dichotomous, diverging as they ascend. No costa. Fructification unknown.

This is a Carboniferous genus which has no immediate relation to any Fern either extinct or existing, except perhaps *Neuropteris*; but in *Odontopteris* the pinnules are always inserted on the whole base, decurrent, and often confluent, while in *Neuropteris* they are always constricted or somewhat pedicellate. In the latter, too, there is always a median nerve, from which all the others take their origin, while in *Odontopteris* they all arise directly from the rachis. Again, the basilar pinnules of the genus just named are very different from the others, which is not the case in *Neuropteris*, whose pinnules are obtuse or rounded at the summit, while the former are often pointed and bent, or falcate. Goeppert cites some instances of the genus having been found above the true Carboniferous, but Schimper believes this to be a mistaken identification. It will be seen, however, that M'Coy's species now cited is from the so-called Wianamatta beds at Clarke's Hill, near Cobbity.

*Odontopteris microphylla*, M'Coy, (Ann. Nat. Hist., vol xx, p. 147, not figured).—Bi-pinnate, pinnae alternate, oblique narrow, about three lines wide and two inches long; pinnules alternate oblique, slightly connate at the base, obtusely elliptical, their length only equalling the width of their base, no midrib, secondary neuration indistinct.

*Obs.*—“The only *Odontopteris* approaching this elegant species by its alternate pinnae, and very short connected pinnules, is the *O. schlotheimii*, Br., from which it is distinguished by the smaller size, much narrower and more oblique pinnae, and by the pinnules being proportionately smaller and elliptical instead of being broadly rounded. The latter character also separates it from the

so-called *Pecopteris desnoyersii*, Br., of the Oolithe à Fougères, Mamers, Sarthe. Common in the fine sandstone of Clarke's Hill, N.S.W."

#### CYCLOPTERIS. Brongniart.

Frond simple, pedicellate, flabelliform or reniform, symmetrical, membranaceous, margin sub-entire, crenulate, or fringed; veins arising from the base, forking frequently, radiating, slender, all reaching the margin.

This genus connects the Sphenopterideæ and Neuropterideæ. No pinnate form is included in it. It is related to species of *Hymenophyllum* with a simple frond such as *H. reniforme*, which grows in N. Zealand.

*Cyclopteris cuneata*. Carruthers (Quart. Jour. Geol. for 1872. Append. to Daintree's Essay, p. 355, pl. 29, fig. 5.)—Form of the entire frond unknown, pinnæ entire, large cuneate, narrowed at the base, with the distal margins rounded, veins delicate, once or twice dichotomously divided, sometimes anastomosing once in their length in the middle of the pinnæ.

"Notwithstanding the slight anastomosis of the veins, these separate pinnæ, which are not very frequent, represent a very distinct species of the genus *Cyclopteris*. Locality, Tivoli Coal Mine."

Dr. O. Feistmantel thinks this is not a complete frond or leaflet, but a wedge-shaped fragment broken off by chance. This is certainly my opinion after having examined the type specimen which is preserved in the Brisbane Museum. The fragmentary character and the anastomosis of the veins inclines me to agree with Dr. Feistmantel in not regarding this as a *Cyclopteris*. Possibly it may belong to some fern of the net-veined order (Dictyopterideæ). See further remarks on some fossils of this kind from the Ipswich coal beds. Some fragments of *Sagenopteris* may resemble it.

#### PECOPTERIDEÆ.

Frond undivided, simple, or pinnate many times in a beautiful manner. Pinnules often entire, but here and there sub-divided and with a dentate margin, base wholly adnate, rarely constricted,

sometimes confluent. Costa persistent to the apex, pinnately ramose; veins dichotomous diverging to the margin at a more or less open angle. Venules simple, forking twice or thrice, rarely anastomosing. When sori are present they are marginal or disposed towards the middle of the pinnule, punctiform, oval or linear.

This order is established entirely upon the venation, and unites the characters of very different living genera and families. On this account the classification of the various forms in one intelligible system has hitherto failed

#### PECOPTERIS, Brongniart.

Veins emerging from the costa in a more or less open angle, diverging arcuately, simple or dichotomous, venules often forked.

*Pecopteris tenuifolia*, M'Coy (Ann. Nat. Hist., vol. 20, p. 152, Pl. IX., fig. 6.) Bi-pinnatifid (?) pinnules and rachis very slender, each about half a line wide; pinnules very long, oblique, linear, apparently simply united to the rachis by their entire base, one very strong costa running throughout, veins unknown. *Obs.*—“If this be truly a *Pecopteris* it is distinct from all others by its very narrow linear leaflets. The only plant I have seen at all resembling it is the *Zamites obtusifolius* from the shale of the Oolitic coal fields, Blackheath, Richmond, United States, exhibited some weeks since by Mr. Lyell to the Geological Society. The specimens alluded to of this latter plant seem imperfectly preserved, but still show on some portions of the pinnules a neuration running parallel with a strong midrib. This great costa seems to me to be incompatible with *Zamites*, so that although I point to the resemblance between the American and Australian plants, I prefer placing the latter provisionally in *Pecopteris*, as I have seen no trace in my imperfectly preserved specimens of a parallel venation, and even if it should hereafter be found to exist, I conceive it would be necessary to form a new genus intermediate in form, venation, and, I think, mode of attachment of the pinnules to the rachis between *Zamites* and *Pecopteris*, for the reception of these two plants. One specimen has occurred in the fine sandstone of Clarke's Hill, N.S. Wales.”

## ALETHOPTERIS, Sternberg (as limited by Schimper.)

Frond bi- or tri-pinnate. Pinnules coriaceous, simple, often quite entire, base wide, decurrent, free or simple, margin reflexed or revolute (covering sori?) Costa, immersed in a groove above, but prominent behind; veins, prominent or flat, simple or forking once, the venules diverging and reaching the margin.

The genus which comes nearest to this amongst existing forms, is the common *Pteris* or Brake, excluding those species which have a reticulate venation (*Lonchopteris*). Schimper is of opinion, that it is impossible to establish any clear line of demarcation between *Alethopteris* and *Pecopteris*, though they form characteristic groups sufficiently distinct.\*

*Alethopteris australis*, Morris (in Strzelecki as *Pecopteris*, p. 248, Pl. viii, fig. 1, 2, 2 a.). Frond bi-pinnate, pinnæ oblique, alternate, rather distant; pinnules thin, falcate, and rather obtuse, oblique and somewhat incurved, more or less adnate to the rachis, and sometimes decurrent, dilate at the base or auriculate Costa, slightly flexuous, evanescent towards the apex, veins oblique, bifurcate or dichotomous. *Obs.* This fern belongs to the Neuropteroid division of *Pecopteris* and bears much greater resemblance to the *P. whitbiensis* and *P. tenuis* of the Oolitic series of England, than to any other species described by Brongniart as occurring in the coal measures. The frond appears to have been bi-pinnate with oblique alternate pinnæ, the pinnules thin, somewhat falcate and obtuse, the margins of which vary slightly in form; being either sinuous or entire, according to their position on the frond. This fossil bears considerable analogy to the *Pecopteris lindleyana*, figured in Professor Royle's illustrations.

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\* Feistmantel in his papers in the Indian Geological Survey, says that this genus is especially distinguished by having the pinnæ inserted in the stem by their whole base, and by their basal portions being generally joined together. See Foss. Flora. Gondwana, vol. 2, p. 22. I am afraid however, that in some species, variability may be seen in this particular. But the generic distinction is of value, because the genus *Pecopteris* would be so large and unwieldy without it.

Professor M'Coy describes this species as a *Pecopteris* in the Decades of the Paleontology of Victoria. (pl. xiv., fig 3, p. 17). stating that it is the same species as *P. Scarboroughensis*, Bean MSS., which Mr. Leckenberg considers intermediate between *P. insignis* and *P. ligata* of the same Yorkshire Oolite beds. The only difference appears to be in the slight apical serration of the pinnules in the European species. Professor M'Coy also remarks that the veins usually fork only once, which is the case with the European and Australian species, while a secondary marginal branching is rare, though in the figure given by Morris from the Jerusalem (Tasman.) coal it appears to be common. This however is sometimes the case in the English Oolitic plants. Professor M'Coy's species came from Bellerine near Geelong, Morris's specimens came from the Jerusalem basin in Tasmania. Very common in all the Ipswich, Q. L., coal basin, Darling Downs, Clarence River, New South Wales. The Queensland specimens have at times an obtusely serrated margin, and there are also varieties very close to our common *Pteris aquilina* of world wide distribution. In form and venation the fossil and living species are certainly closely allied, but Professor Heer \* and Professor Schimper † have shown by the discovery of the fructification, that the sori were obliquely placed along the veins and not marginal as in *Pteris*. *A. whitbyensis* Goepf., is therefore referred to by Heer, as *Asplenium whitbyense*. It is so nearly allied to our fossil that the two can hardly be considered even as varieties. If we regard them as one, it is one of the most wide-spread fossils known. In addition to the large area over which it can be traced in Australia, it has been found in Yorkshire, Switzerland, S. Prussia, Persia, Siberia, the Amur countries, and Japan. It is distinctly a Lower Jurassic species.

*Alethopteris concinna*, n.s. Pl. 9, fig. 1.—Frond bi-pinnate, with rather long rounded and obtuse leaflets; costa faint, veins numerous and close, emerging at an acute angle, forking once, the venules very close and parallel, reaching the margin.

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\* Flora fossilis artica vol. iv.

† Handbuch der Paleontologie, Zittel and Schimper (1879), vol. 2, p. 97.



Locality? I suspect this is from Ballinore Mine, Talbragar River, from the nature of the matrix, but it may have come from Ipswich, Q. L. The rounded and obtuse leaves, and the closeness of the veins and venules, distinguish this species

*Alethopteris currani* n.s., Plate 6, fig. 4.—This fossil, if I may judge from the small fragment, appears to have belonged to the division *Pecopteris acrostichides* of Schimper, in which the frond which is pinnate and bi-pinnate, has the pinnules adherent by the whole base and confluent. The veins are slender, costa disappearing near the apex, the veins forking. Of the sori, nothing is known, and the relations may have been as in other members of the genus, with *Asplenium*. In this case, the secondary pinnules only are seen, in the apex of what has been probably a portion of the frond. The pinnules are falcate, oblique, oblong lanceolate, slightly serrated at the upper edge, rounded at the apex into a blunt point, nearly opposite, adherent by the whole base, confluent. Costa of the pinnules emerging from the rachis at a very acute angle; veins few, conspicuous, forking once, the venules reaching the margin at the re-entering angle of the serrations, apical pinnules acute. Length of fragment, 25; greatest width, 15; length of longest pinnule, 10; width of base, 6; all millimetres.

Ballinore coal field. The only species to which I can compare this, is to the preceding *A. whitbiensis*. The differences however, are very great. The pinnules and median vein are very much more oblique, the rachis stouter, and the pinnules are also lobed, broader, the whole frond large, but more tender and membranaceous.

#### MERIANOPTERIS. Heer.\*

Sterile fronds tri-pinnate, elegant, secondary pinnæ elongate, segments of pinnæ inconspicuous, costa arcuate, veins dichotomous, the lowest two from contiguous pinnules bending towards each other and anastomosing.

This diagnosis is applied by Dr. Heer, to distinguish two species of Ferns from the Upper Lias in Switzerland. The principal

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\* O. Heer, Flora Fossilis Helvetiæ, 1877.

characteristic is the arching and anastomosis of the basal secondary nerves of contiguous pinnules. They are small Ferns, but Dr. Feistmantel found one of much larger size in the Ramiganj coal plant beds in India, which he described in his essay on the Flora, Damuda and Panchet Divisions.\* I have found what I believe to be the same fossil in the Ballinore coal beds in N. S. Wales. It is thus described.

*Merianopteris major*. Feist. loc. cit. Frond large, tri-pinnate, secondary pinnae somewhat broadly elongate, only a little narrowed towards the apex, pinnati-sect or pinnatifid, pinnules or lobes rounded at the apex and very thin-leaved, costa distinct, and somewhat curved at the apex of the veins, the two lowest divide on emerging and join with the same of the adjoining leaflets in a pointed arch, while the others are placed more towards the upper portion of the pinnule, pass out at a very acute angle from the costa, are also dichotomous, and somewhat flexuous.

The state of preservation in the Indian and Australian forms shows a large but very thin-leaved and tender Fern. From the figures in Feistmantel, one would conclude that the pinnules are united, and the arching vein spreads from one leaflet to the other in the manner indicated. This occurs more rarely in the Australian fossils. The pinnules are sometimes quite distinct, as I have figured in the plate, which is a little larger than nature, the leaflet three times natural size. There are specimens in which the anostomosing nerves quite correspond with Feistmantel's definition, and I have no doubt that in all other respects they are the same. The Indian beds are regarded as Lias. The Fern is not uncommon but probably not so common as *Alethopteris currani*, in these strata.

#### TENIOPTERIDÆ.

Fronds stipitate, simple, oblong, lanceolate and broadly elongate, entire or pinnate, pinnae linear, lingulate, more or less acuminate, shortly pedicellate or sessile. Rachis and costa conspicuous, veins

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\* Op. cit. Vol. III., part 2 & 3, p. 83. Plate 19 A, figs. 9 & 11. (There is a mistake in the reference page opposite the plate, 9 to ii., being printed instead of 9 to 11.)

emerging at an acute angle but immediately becoming horizontal or oblique; simple and dichotomous. Sori transversely oblong, submarginal, or rounded and scattered over all the lower part of the surface or in series along the venules.

This order is founded entirely on the neuration and would include amongst living Ferns the *Marattiaceæ*, the *Aspidiaceæ*, and probably the *Acrostichiaceæ* (Schimper). The fructification is certainly that of *Marattia* in some cases, and that of *Acrostichum* in others, except that in the latter the sori are distributed over the terminal under surface of the frond, as we see in our common Stag's-horn Fern (*Platynerium*) and the equally common Queensland swamp Fern *Acrostichum aureum*.

It has already been stated what great importance was attached to one species of *Tæniopteris* from the fact that it was chosen as the typical fossil of certain coal deposits in Australia. The late Mr. Daintree stated that *Tæniopteris* and *Glossopteris* were characteristic fossils of different formations in Australia, and were never found associated in the same beds. *Tæniopteris*, he thought was indicative of Australian carbonaceous beds of mesozoic age and *Glossopteris* was characteristic of our paleozoic coal deposits. The Rev. Mr. Clarke also laid stress upon the *Tæniopteris* fossils, so that the name came prominently forward in the discussion between himself and Prof. M'Coy.\* On this account it may be necessary to state briefly what are the latest views on the subject of these fossils.

The genus, *Tæniopteris*, was established by Brongniart in 1828 for Ferns with simple entire leaves, a stiff thick costa and perpendicular veins either simple or forked at the base. In 1838 Count Sternberg divided the genus into two groups—1. With simple fronds and 2., with pinnate fronds, and he enlarged the definition, making it include all Ferns with simple large stipitate fronds, entire or dentate, or profoundly pinnatifid or pinnate. Many different genera were then united which have been subsequently separated. The history of the changes which ensued

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\* See Trans. Roy. Soc. Victoria, 1860, page 89; also, Art. III, page 96, Art. XIII, page 209 and Art. XIV, page 215.

need not be specified as they have no immediate bearing on the Australian fossil flora. In all of them the characters of *Tæniopteris* were regarded as of generic value only, and the Ferns were included with the *Danæacææ* which belongs to the *Marattiaceæ*. In 1869 Schimper erected the characters of *Tæniopteris* into one of his five orders of Ferns which are—1. *Sphenopterideæ*; 2. *Neuropterideæ*; 3, *Pecopterideæ*; 4, *Tæniopterideæ*; 5, *Dictyopterideæ*. The definition of Schimper for the *Tæniopterideæ* is that which is given above. It is divided into seven genera—1. *Tæniopteris*, simple scolopendrifrom fronds with horizontal or oblique veins and unknown fructification. 2. *Angiopteridium*, Pinnate fronds with the fructification of the living *Angiopteris*. In all formations from the Trias to the present day. 3. *Marattiopsis*, long linear dentate pinnae with narrow filiform costa and oblique veins. A tertiary genus like our own *Marattia fraxinea*. 4. *Oleandridium*, simple lanceolate elongate or lingulate coriaceous fronds with the fructification of *Aspidium*. Rhætic to tertiary. 5. *Macrotæniopteris*, a large *Tæniopteris* with sometimes a dentate margin and fructification of *Aspidium*. Rhætic, Oolitic and Tertiary. 6. *Danæopsis*, a Triassic form like the living *Danæa*. 7. *Danæides*, Pinnate fronds with the veins emerging from a narrow costa at a right angle with ex-annulate sporangia, which are situate at the under side near the margin, &c.

From these definitions it will be seen that all the Ferns of the family where the fructification is not known are referred to *Tæniopteris* or *Macrotæniopteris*, and these include simple fronds with either horizontal or oblique veins.

#### TÆNIOPTERIS, Brongniart.

Frond simple and in habit like *Scolopendron*. Costa conspicuous above, sub-terete underneath, veins generally conspicuous, slender, numerous and close, dichotomous a little above the base; venules simple or dichotomous, parallel, with an occasional intermixture of simple nerves.

In this genus the veins emerge from a very prominent costa at almost a right angle. They are very close, curved or straight,

simple, or forking once or twice, and there are never any venules. Some authors thought that the genus may possibly be a Cycad allied to *Stangeria*, but there are very many objections to this view.

*Tæniopteris daintreei*, M'Coy (Paleon., Vict. Pl. xv, figs. 1 and 2, p. 15); frond very long, linear, parallel-sided; substance thick, edges straight, costa very strong, veins extending at right angles from the midrib to the lateral margins, a few straight and simple, the greater number once forked at a variable distance between the midrib and lateral margin, total width of frond four lines, about ten or eleven lateral veins in the space of two lines at the margin, both of ordinary specimens, four lines wide, and one specimen nearly two inches long, but only one and a half lines wide throughout.

This species has been found in two places in Victoria, viz., Murndal on the Wannon river in Western Victoria, and at the Barrabool mills near Geelong. In the latter place it was associated with *Alethopteris australis*, Morris, and according to Professor M'Coy with *Phyllothea*. But I venture to suggest that as the identification of *Phyllothea* depended upon the stems alone, without the characteristic long linear sheath leaves, it may be doubted whether it was the same species as those of the Newcastle beds. We have seen that the stems of this genus *Schizoneura*, *Equisetum*, and other Equisetaceæ cannot be distinguished from each other without leaves. It may then be affirmed that *Tæniopteris* is a plant of the mesozoic flora, and is never found in the Newcastle beds, or associated with any Newcastle or paleozoic plants.

*T. carruthersii*, nobis (*T. daintreei* Carruthers. Proc. Geol. Soc., London, April 1872, p. 355). Frond simple (?), broad linear, costa somewhat thick, veins leaving it at an *acute angle*, then passing out at right angles to the margin, once or twice dichotomously divided. Tivoli coal mine Ipswich, Queensland.

The venation and general form of this plant differ very much from Professor M'Coy's *Tæniopteris daintreei*, with which Mr. Carruthers identified it. It is a larger plant and the veins, which are much finer and more numerous, frequently emerge from the midrib obliquely, which they never do in M'Coy's species. Both

are found in the Tivoli mine, and as Dr. Feistmantel has already suggested the distinctness of the species, I venture to give the one first figured and described by Carruthers, the name of that illustrious paleontological botanist. I have compared specimens from the Wannon, Victoria, side by side with the Ipswich plant, and can affirm that they are quite different.

#### MACROTÆNIOPTERIS. Schimper.

Large and handsome fronds more or less broadly and elongately lingulate, obtuse or acuminate, entire or rarely irregularly pinnately incised.

The distinction between this genus and *Tæniopteris* is only in the large and handsome form of the fronds. They are very like our Australian Bird's-nest ferns (*Asplenium nidus*.) They are common in the Oolitic coal of Richmond, Virginia, in the Lias of Europe, and in the Lias and Oolitic coal measures of India. They also reach the Tertiary formations.

*Macrotæniopteris wianamatta* Feistm. (Paleoz. u. Mesoz. Flora des Ost Australiens p. 107. Pl. 13, f. 2.) Frond elongately obovate, simple, base attenuate, apex ? Rachis thick, grooved or striated. Veins emerging at an angle of from 20 to 25 deg., close, near the rachis from 6 to 8-tenths of a millim. apart, slender, dichotomous towards the margin. See plate 10A. This fossil is quoted from the Wianamatta, above the Hawkesbury sandstone. I have some similar specimens near Ipswich, but the dichotomy of the veins is near the rachis and it may be a distinct species.

#### ANGIOPTERIDIUM.\* Schimper 1869.

Frond pinnate, pinnae articulate and finally deciduous. Sori when visible convex—linear, marginal, bivalvate like *Angiopteris*.

The leaves of these Ferns were formerly classed as *Tæniopteris*, and then some of them were removed to the Cycads as *Stangerites*. The present genus was established by Schimper as noted above, who showed that the specimens on which he founded his division

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\* Pal. Veget. Vol. 1., p. 602. Also, Feistmantel. Rajmahal Florà.

were really Ferns but differing from *Tæniopteris* in having deciduous pinnæ. I need scarcely say that the living Ferns which these species most resemble never have deciduous leaves.

*Angiopteridium ensis*. Oldham. Fossil FL., Rajmahal Hills. (Foss. Fl. Gondwana, vol. 1, p. 35, pl. 6, figs 8, 9, 10.)—Fronde pinnate, pinnæ elongate, linear ovate, acuminate at the apex; costa thick, rapidly diminishing; veins prominent, often forked once or twice, emerging obliquely from the costa.

This variety is easily distinguished from the other forms by the obliquity of the secondary nerves, by the rapid thinning out of the midrib, and by the generally subovate or lanceolate form of the pinnule and the forking of the veins near the edge of the leaflet. A false serration is another distinguishing feature.

I know of nothing to prevent my referring the fossils which are found at Rosewood, near Ipswich, Q.L., to this form, as it corresponds exactly with the figures and with the description. I must confess that I should at first been inclined to regard the specimen as a Fern very near in habit to *Blechnum*.\*

The affinities of this species are Jurassic and Rhætic.

#### Sub-order. DICTYOPTERIDEÆ.

Nerves *reticulate*, fronds many times pinnate or pinnatifid.†

A. With a midrib.

a. Costa conspicuous, frond simple. *Glossopteris*.

b. Costa inconspicuous, except in the middle, frond quadrilobate. *Sagenopteris*.

B. Without a costa. *Gangamopteris*.

#### GLOSSOPTERIS. Brongniart.

Fronde simple, elongately elliptical, acuminate, entire, coriaceous, petiolate, rachis broad, gradually tapering up to the apex. Veins emerging from the rachis at an acute angle, from which to the middle of the leaf they form a hexagonally rhomboid net; thence to the edge somewhat more free, dichotomous, not so often anastomosing, and forming very large rhomboidal areolæ. Sori rounded

\* See also p. 172, and pl. 1, fig. 6a, 7a, op. cit. (Liassic Flora Rajmahal), where Feistmantel reviews the genus and species.

† In Schimper and Zittel's Paleonologie this is only a sub-order of Tæniopterideæ.

M. Brongniart states that the partial reticulation of the secondary nerves, near the rachis, is the characteristic peculiarity of this genus, but M. Schimper points out after Morris, that this is not strictly correct. The anastomosis is continuous to the margin, but is less frequent. I have remarked that in *Sagenopteris* the case is different. The anastomosis is frequent only near the costa, and subsequently the veins become nearly parallel, only sending an occasional small branch to unite with one another. Detached leaves of *Sagenopteris* are in many respects, like some species of *Glossopteris*, and this may afford a means of readily distinguishing them.

The genus *Glossopteris*, as already mentioned, derives a special interest in Australia, because it is so well represented, and because it has been the subject of so much controversy. In India also it has been a source of paleontological dispute, and this has led to a thorough examination of its position at the hands of Dr. Feistmantel.\* I avail myself of many of his remarks in the following summary. The genus has a very wide range in geological time, from the Carboniferous to the Jurassic, with one species in a tertiary formation. It is equally wide spread horizontally. Besides being extensively found in Australia and Tasmania, it occurs in Africa in the Karoo formation (Beaufort and Stormberg beds), in strata of supposed Triassic age. In India, it begins in the Talchir series (Trias), becomes more numerous in the Karharbari, reaches its highest development in Damuda series, goes on into the Panchet, and passes into the upper portion of the Gondwana system (upper Lias and lower Jura), and occasional solitary instances are found with a still higher position. In Russia, a species is quoted from the "Klinische" sandstone, which is of Cretaceous age.† In Asia Minor, there are coal beds near Eregli, the ancient Heraclea Ponti, Bithynia, from which two

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\* Foss. Flora, Gondwana Syst. vol. iii., Flora Damuda and Panchet Divisions, p. 94.

† Nouv. Mem. Soc. Imper. d. Naturalistes, Moscow, vol. xiii., p. 221, pl. 19, fig. 1.



species of *Glossopteris* have been described by Schlehan,\* but as no figures or descriptions were given Dr. F. doubts the identification especially as in Tchiacheff's "Asie Mineure" (1867) they are not mentioned by Ad. Brongniart, who described the fossil plants in that work. But Schlehan was probably right, as R. Etheridge recognized a species of *Glossopteris* amongst the fossils brought by Admiral Spratt from the same coal formation.† It is remarkable that this species (*Glossopteris sphenophyllum*) was found amongst such a truly Carboniferous flora as *Lepidodendron*, *Calamites*, *Sphenophyllum*, *Neuropteris*, *Sigillaria*, and *Stigmaria*, thus giving an earlier origin to net-veined simple Ferns than was ever previously claimed.

In a monograph of the Tertiary Flora of Novale, Messrs. Visani and Massalongo have described a *Glossopteris* (*G. apocynophyllum*), in which the figure and diagnosis well coincide with the definition of Brongniart.‡ This is the latest stratum to which the genus has been traced. Dr. Feistmantel throws a doubt on the identification, but for no sufficient reason.

The fructification of some species is known—all Indian fossils. It consists of round sori in longitudinal rows between the margin and midrib, which would indicate a relation to the living *Polypodium*. Mr. Carruthers, however, says that with regard to the Australian species he thought he observed certain indications of a fructification in the form of sori running along the vein nearer the margin than midrib. Dr. Feistmantel thinks that this would indicate a relation to *Antrophyum*, but that, I may observe, has no midrib, and the veins, though reticulate, are uniform. However, as Dr. F. justly remarks, the observation of Mr. Carruthers is of the utmost importance, as it indicates that *Glossopteris browniana*, of India, and the fossil which bears the same name in Australia, are not only *different species, but belong to entirely*

\* Versuch einer geognost. Beschreibung der Gegend zwischen Amasry und Tyrila-Asy, 1852.

† See Spratt and Etheridge on the coal-bearing deposits of Erekli, Q. Jour. Geol. Soc., Lond., vol. 23 (1877), p. 524.

‡ Mem. d'Acad. di Torino. 3 Ser., vol. 17.

*different genera.* In the case of *G. angustifolia*,\* there is a longitudinal intramarginal vein indicating a fructification like *Pteris*, our commonest living Fern. The fossil is not known in Australia.

Twelve species and a variety are recorded from Australia, and these distinctions depend entirely on the shape of the leaf, and the mode of the reticulation. Such distinction would not be specific in living ferns, but in paleontological botany we cannot always have well-marked and numerous specific features; yet in proportion as they are slight, we must exercise the greatest caution in recognizing such forms as characteristic of different horizons or localities.

*Glossopteris browniana.* Brongniart Prodrômus (p. 54; Veg. Foss., p. 223, t. 62. Morris in Strzelecki, p. 247, Pl. vi., fig. 1, 1a. M'Coy; Ann. Nat. Hist., Vol. 20, p. 150. Feist. Ost. Aust. Pal. und Mesoz. Flora p. 91, Pl. viii, figs. 3, 4., x. 1, 2, 5, 7., xi. fig. 1.) Frond simple, spatulate, or oblong lanceolate, entire, attenuate at the base; costa thick, canaliculate, gradually contracting towards the apex, veins oblique, anastomosing, hexagonal near the rachis and elongate near the edge. Of this species Morris makes the following observations. He says that it is abundant in the coal beds of Australia, and if they should turn out to be coal measures (paleozoic) it would be exceptional, as in the same period in England and America, there is no evidence of Ferns with simple fronds and reticulate venation. He remarks that this species forms the type of Brongniart's genus *Glossopteris*, but two other species were referred to it from the Oolite series of Sweden and England. The one from England, *G. phillipsii*, while agreeing with *G. browniana* in the venation, appears not to have been a simple frond, but digitate, four or five pinnulæ arising in a fan like form from a common rachis. Goepfert in consequence made it form one of the sections of his genus *Acrostichites*, but it was obviously a *Sagenopteris*.

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\* The second of the two forms originally described by Brongniart. Hist. 1, p. 227, pl. 63, fig. 1.

The young or smaller pinnulæ of *G. browniana* are generally lanceolate, the larger ones more spathulate and obtuse; the midrib is large at the base and gradually contracts to the apex, the veins are distinct, parallel near the base, but soon after become oblique and regularly anastomose.

Prof. M'Coy says with reference to the same species (loc. cit. p. 150) "I think I recognise both the Indian and Australian forms of this species (var. A and B of Brongniart) in nearly equal abundance among the specimens examined, and some of the fronds are of a size far exceeding any hitherto published, some of them being six inches wide, which in the proportion of the small perfect examples would indicate a frond of more than two feet in length. I believe I have ascertained the rhizome of this species, which is furnished with ovate clasping (or at least very convex) subcarinate scales, having a divaricating, reticulated neuration, resembling that of the perfect frond, but much less strongly marked. These scales are of large size, some of them being nearly an inch in length, and terminating at the apex in a long, flat, linear appendage about one line in width, which occasionally gives off small lateral, flat, membranaceous branches, nearly at right angles, the whole perfectly resembling, except in size, the rhizomal scales of *Acrosticium*, *Laromanes* and *Hymenodium*, as figured in Fée's "Memoire sur la Fam. des Fougères," and when combined with great similarity in form, habit, and neuration, would warrant us in presuming a strong affinity between these genera."

*Glossopteris linearis*, M'Coy, loc. cit., p. 151, pl. 9, figs. 5, 5a. Leaves very long, narrow, with nearly parallel sides, costa very large, veins fine, forming an angle of about  $50^{\circ}$  with the costa, anastomosing occasionally from thence to the margin. *Obs.*—"It is only with the *G. angustifolia*, Br. from the Indian coal fields of Ramiganj, near Rajmahal, that this long parallel-sided frond would be confounded, and it is distinguished easily from that species by the fineness of the neuration, which is as remarkably delicate as that of the other is coarse. The neuration of *G. angustifolia*, is also distinguished by its great obliquity, forming an angle of about 30 degrees with the costa, while the veining of the present species

is not more oblique than that of *G. browniana* or *G. milsoniana*. In this species also, from the anastomosing being continued up to the margin, it results that the veins are little closer at the margin than at the middle of the leaf, while in *G. augustifolia*, the anastomosing is continued to the central portion, and the dichotomosing goes on to the margin, where in consequence the neuration is finer and closer than towards the costa. None of the specimens are perfect at the extremities, the largest being three inches long and seven lines wide at the basal fracture, and diminishing about two lines in that length, towards the distal end, being about eight lines wide in the middle. Disconnected fragments show that the base diminishes insensibly to a lengthened petiole, as in *G. browniana*, and that the apex is elliptical and pointed. Very abundant in the grey shale at Wollongong. Not uncommon in the hard siliceous schists of Arowa, N. S. Wales." Abundant also in Newcastle.

*Glossopteris ampla* Dana (l.c. p. 717, pl. 13, fig. 1,) also Feist. (l.c. p. 91, Pl. 11, fig. 2, pl. 12, 17.)—Frond very large, widely ovate, entire, undulating, obtusely acuminate, costa thick, extending to the apex; veins, extremely fine and close, leaving long narrow reticulations, which are longest towards the margin. Locality—Newcastle, Illawarra.

*Glossopteris reticulata*, Dana (l.c. p. 717, Pl. 13, fig. 2,)—Frond large, oblong-elliptical, the width not exceeding a third part of the length, gradually attenuate towards the apex; veins, broadly reticulate to the margin. Locality—Newcastle. This is a rare form.

*Glossopteris elongata*. Dana (l. c. p. 717.) Frond narrowly elongate, lanceolate, attenuate at the base; costa somewhat thick, distinct; veins neatly reticulate. Locality, Newcastle.

*Glossopteris cordata*. Dana. (l.c., p. 718., pl. 13, fig. 5.) Frond distinctly cordate towards the base, lobes rounded; costa, thick; veins reversed at the base, diverging from the costa, neatly reticulate, with narrow oblong interspaces. Locality, Illawarra.

All the above four species of Dana are considered by Feistmantel to be only varieties.

*Glossopteris teniopterioides*. Feist. (l. c., p. 92, pl. 9, fig. 1, 1a.) Frond simple, elegant in form, oblong, ovato-spathulate, attenuate at the base, costa, valid, striate or grooved. Veins emerging at nearly a right angle, giving at first sight the appearance of a *Teniopteris*. Under the lens the venation is seen to form an oblong, narrow, obliquely acute parallel network which is sometimes indistinctly polygonal. The costa is stiff and straight. Only one specimen was known to Dr. Feistmantel, which came from Blackman's Swamp coal beds.

*Glossopteris wilkinsoni*, Feist. (l. c., 92, pl. 13, fig. 1, 1a.) Frond extremely narrow, sub-parallel, strap shaped. Costa distinct, produced at the apex; veins sub-horizontal, dichotomous, anastomosing usually once near the apex, forming an oblong network, with a few smaller meshes towards the margin of the rachis. Locality, Blackman's Swamp.

*Glossopteris parallela*. Feist. (l. c., p. 93, pl. 9, fig. 2, 3, 4.) Frond very long, simple, elongately ovate, apex unknown, costa distinct, grooved in the middle. Veins emerging at an angle of 30 deg. in the lower portion and at an angle of 20 deg. in the upper portion of the frond, dichotomous, parallel, but anastomosing, forming a distinct oblong polygonal net, which is narrower towards the margin.

This is a very peculiar and characteristic form, says the author, not only from the form of the leaf, but also from the venation and form of the net-work which appears as if it were parallel. Göppert referred a form of this kind to *G. browniana* var. *biloba*, which Ettingshausen considered as a *Polypodium*, and named *P. goepperti*.

*Glossopteris elegans*. Feist. (l. c., p. 155, pl. xxvi, pl. viii 2nd part—fig. 2, 2a).—Frond of medium size, oblong spathulate, with a costa which becomes merged in the tissue above; below it is formed of pairs of areolar spaces, which are oblong; above these are similar spaces, but shorter and somewhat polygonal. Veins arising at an acute angle from the median areolar spaces, dichotomous, anastomosing, and forming an oblong network.

There is no Indian or Australian form which resembles this in the peculiar character of the midrib. From Greta, N.S. Wales, under the marine paleozoic beds.

*Glossopteris primava*. Feist. (l. c., p. 79, pl. 5, fig. 3, 3a).—Fronde spathulate, costa thick, grooved veins, emerging at an angle of from 20 to 30 deg., parallel, dichotomous, anastomosing, forming a polygonal network, which is wider and shorter near the rachis, narrower and longer near the margin.

Locality—Greta, N.S.W., from the lower coal. It is also known from Damuda in India.

*Glossopteris clarkei*. Feist. (l. c., 79, pl. 5, fig. 4, 4a).—Leaves oblong ovate, obtusely acuminate, costa distinct, grooved in the middle. Veins parallel, dichotomous, free for the greater part of the leaf, like a *Taniopteris* anastomosing only at the margin, twice or thrice forming a rhombo-polygonal network. Locality—Under the marine beds, Rix Creek, N.S. Wales.

*Glossopteris browniana*, var. *præcursor*.—Leaves small, long, spathulate, costa distinct, fading away towards the apex; veins emerging at an acute angle, curved, forked, anastomosing, forming a sub-equal elongate, polygonal network. (Feistm., l. c., p. 79, pl. 5, fig. 4-7.) Under the first marine beds of Stoney Creek, N.S. Wales.

#### GANGAMOPTERIS, M'Coy.

Fronde simple or impari-pinnate, middle pinnæ spathulate, symmetrical, semi-elliptically pointed above, gradually tapering towards the base; lateral pinnæ variable, very acute, tapering from base or obliquely ovate, to trigonal or flabelliform, broad above, gradually narrowed towards the oblique adherent base, which is never auriculate, but moderately wide and embracing, no costa, veins coarsely reticulate, many arising from the base, branching as they diverge towards the margin, and frequently anastomosing to form an irregular polygonal network.

This genus was formed by Professor M'Coy in the Decades of Paleont. of Vict. (p. 11, pl. 12 and 13), the name being derived from γαγγαμον, a small round net, and πτερις a fern. A species

which was referred doubtfully to *Cyclopteris* by the Professor in 1847 (See Ann. Nat. Hist, l. c.) from the Newcastle beds is claimed for this genus, described with some from Bacchus Marsh in Victoria as follows :

*Gangamopteris angustifolia*, M'Coy, (Pal. Vict. loc. cit., also Ann. Nat. Hist., loc. cit., pl. 19, fig. 3 and 3A). Very long, narrow, unequal sided, very gradually tapering towards the apex from the widest portion near the base, base slightly contracted, embracing and obliquely truncated, length often nine or ten inches, width rarely exceeding one inch.

From the upper coal measures, New South Wales, and the Bacchus Marsh sandstones, Victoria, where it is common. In the Indian Talchir group and Kaharbari beds.

*Gangamopteris spathulata*, M'Coy (l. c., p. 12, pl. 13, fig. 1, 1A). Spathulate, symmetrical, equal sided, semi-elliptically pointed above, tapering towards the base to a slender petiole, length  $4\frac{1}{2}$  inches, width about  $1\frac{1}{2}$  to 2 inches. This is the rarest of the three forms in the Bacchus Marsh sandstones.

*Gangamopteris obliqua*, M'Coy (l. c., p. 13, pl. 12, fig. 2, 3, 4). Wide, inequilateral, oblique, sub-trigonal, widest near the broadly rounded distal end, gradually tapering towards the base, which is not petiolate, but obliquely truncated, with a moderately wide, sessile base of attachment. Length commonly about four or five inches, width near apex about three and a half inches, width near base, commonly about nine lines.

"This is the most variable and common of the three forms, abundant in the sandstone quarries of Bacchus Marsh." Both the above have representatives in the Indian Talchir divisions (Feistmantel), and they are found at Guntawang, Mudgee, New South Wales.

*Gangamopteris clarkeana*, Feist. (l. c., p. 93, pl. 15, fig. 9). Frond spathulately rounded, of medium size, coriaceous, entire, symmetrical, rounded above but greatly attenuated towards the base, whence the somewhat thick and distant veins radiate, forking and forming an oblong network.

At first sight this resembles M'Coy's *G. spatulata*, but on examination the nerves are seen to be thicker and wider apart. Locality, Bowenfels, New South Wales.

#### SAGENOPTERIS, Presl.

Fronde quadri-lobate arising from a terete stipe, lobes free to the base, articulate, deciduous, extremely variable even in the same frond, being hastate, cultriform, rhomboidal, oblong-lanceolate, and unsymmetrical, coriaceous, thickened at the articulation. Costa immersed in the tissue at the base, but distinct towards the middle: veins arising at an acute angle but diverging in ascending, anastomosing, forming a hexagonal rhomboidal network. Epidermis unequally rectangular above, polygonally areolate below, and pierced with stomata.

Schimper regards this genus as an approach towards the Marsiliaceæ, even though the stomata exclude it from that order. The fern has no living analogue and stands quite alone in the extinct cryptogamic flora. It is known only from the Lower Lias to the Middle Oolite in Europe, and all Australian specimens are from the Upper or Mesozoic coal basins of Ipswich Q. L., and Jerusalem, Tasmania.

*Sagenopteris rhoifolia*. Presl. in Sternberg. (Flora. d. Vorw., 11., p. 165, tab. xxxv., fig. 1. Schimper, vol. 1, p. 640, Tab. xlv., fig. 2-8; Feist. op. cit. pl. xii., a., figs. 1-4-7. Frond very variable both as to the shape and size. Pinnæ narrow at the base, articulate, spathulate, obovate, or oblong acuminate, rarely oblong lanceolate or sub-rotundate, inequilateral, very rarely sub-symmetrical, the middle leaves larger than the lateral ones, and quite entire. Ordinary length about 32 mill., with a diameter of 16 mill. The internal margins of the lateral fronds somewhat expanded, furnished here and there with a broad indistinct dental lobe.

This fern is identical with Goeppert's *Acrostichites*, Brongniart's *Glossopteris elongata*, *nilssoniana*, and *Phyllopteris nilssoniana* as also Münster's *Glossopteris latifolia*, ita. Schimper. It occurs in the argillaceous schists of Bayreuth, Kulmbach, and Bamberg,



which are Rhætic. Also in the lower Lias with *Ammonites angulatus* near Coburg, &c. It is a fern of almost infinite variability, as no two specimens are found to correspond in the shape or dimensions of the leaves. Schenck, in his classical work on the fossil plants of the beds intervening between the Keuper and the Lias, gives numerous details on this interesting plant and proves by a multitude of examples from all the known localities where it occurs, that there is but one species. The most extreme forms graduate insensibly from one to another. So far, it had only been found in one place in Australia, but I found some fine specimens on the Darling Downs, near Toowoomba, associated with a peculiar coal flora. They are figured on pl. 9, fig. 4.

*Sagenopteris tasmanica*. Feistmantel (l. c., p. 111, pl. 15, fig. 10). — Frond compound digitate (?), with linear lobes attenuate at the apex; costa distinct and rounded, veins emerging at an acute angle, forked, and once (so it seems in the fragments) anastomosing.

This somewhat doubtful species has a resemblance to *S. phillipsi*, Lindley and Hutton, of the English Oolite, Jerusalem basin, Tasmania.

#### GLEICHENIACEÆ.

Sori subrotund, disposed in the under side of the leaflets, often radiate, in series or immersed in a hemispherical pit, 3 or 6 capsular on the dorsal surface or apex of the veins, or placed in a minute raised punctiform receptacle. Capsules sessile, with an oblique excentric ring, splitting longitudinally. Spores, spherically tetrahedral. Fronds dichotomous, rarely simple, pinnate, smooth, pilose, or with a colored powder.

#### GLEICHENIA, Swartz.

Veins pinnate, simple or rarely dichotomous, ending in an obtuse apex. Capsules (where there are four) decussately disposed, sessile, coherent, immersed. Frond dichotomous, branches bi-pinnate, pinnules small, coriaceous.

Living species inhabiting Australia and the Cape. They are found fossil in the Oolite and Cretaceous beds in India and Europe. *G. bindrabunensis* of India, is extremely common in the Oolitic

formation of Bindrabun (Rajmahal). It is very like our common *G. dicarpa*, but appears to have been regularly tri-pinnate, instead of dichotomous.

*Gleichenia dubia*, Feist. (l.c. p. 106, pl. 15, fig. 8.)—Fronde dichotomous, pinnate, rachis moderate in size, terete, pinnæ remote, alternate, obcvate-elongate, inciso-lobate, nerves indistinct. Dr. Feistmantel only states Wianamatta beds as the locality, which makes the horizon doubtful for the reasons I have given.

*Gleichenia lineata* n.s. Plate 3, fig. 6, pl. 8, fig. 2.—Fronde small, coriaceous, with a strong thick rachis, dichotomously divided, pinnate, bi-pinnate. Pinnules entire, linear, attached by almost the whole of the base, but slightly contracted at the lower portion, somewhat distant, not decurrent. Upper edge, convex, lower, slightly concave, but in a few pinnules divided into deep rounded lobes,\* apex acute, emerging from the rachis at an angle of about 35 degrees; veins not prominent, costa not forking and quite persistent to the apex; veins not very visible in any of the specimens, but apparently grouped and numerous, emerging at an acute angle and bifurcating. There appear to be two venules emerging at the very base of the pinnule. Rachis conspicuously marked with a single deep dark median groove.

Rosewood scrub, near Ipswich, Queensland, where it is abundant, but preserved in a red ferruginous oxide in purple slate, whence the venation is difficult to trace. In consequence of the indistinctness of the nerves I regard this only provisionally as a *Gleichenia* very closely allied to the common *G. flabellata*, R. Br., which is found on the east coast of Australia, from Cape York, on the extreme north, to Tasmania, in moist shady places. I am unable to point out any well-defined mark by which this fossil could be distinguished from the living species named, but as yet the venation is obscure.

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\* But this may be a monstrosity, as it is seen on a few pinnæ of only one specimen.

## Ord. OPHIOGLOSSACEÆ.

Herbaceous Ferns. Fronds springing from a subterraneous rhizome, erect, biform, binate. Sporangia sessile, unilocular or sub-bilocular, exannulate, coriaceous, united to each other and bivalvate.

In this order, but amongst the plants about whose true position there is much uncertainty, Schimper places the following genus.

## JEANPAULIA. Unger.

Fronds coriaceous, arising from a cylindrical stem, flabelliform, segments, which are linear, forking repeatedly, entire, more or less elongate. Veins numerous rather prominent, equal, parallel, dichotomous with the divisions of the frond. Superior epidermis formed of elongate rectangular or oblique cells. Lower side of hexagonal cells with an undulating margin, and numerous stomata. Fruit ovate-pisiform.

These plants have been placed by Braun, Unger and Brongniart amongst the Rhizocarps near Marsiliaceæ. By Schenk they were classed as Ferns by the side of *Baiera* and *Hausmannia*. Lindley and Hutton doubtfully placed them among Algæ, adding :—" We place it amongst *Solenites* rather more for the sake of giving the plant a station and a name, than because we have any reason for considering it of the same nature, further than its similarity of appearance."\* Schimper adds that having collected abundance of specimens from a schistose sandstone, with plenty of what he considered to be the fruits, he was able to identify them with certain fossils of a similar nature from the Oolitic beds of Whitby.

There are two species described, one from the Rhætic beds of Europe near Bayreuth, Bamberg, Erlangen and Schnaitach and Forchheim, in Franconia. The other (which has much narrower segments) from the Oolite of Scarborough. Schimper thinks that *Sphenopteris longifolia*, Phillips† is the same species as that found in Franconia, *Jeanpaulia münsteriana*.

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\* Fossil Flora, Vol. 3, plate and page 209.

† Geology of Yorkshire, plate 7, fig. 17.

*Jeanpaulia bidens* n. s. Plate 4, fig. 3. Frond broadly flabellate, segments somewhat short, often becoming broader towards the apex and ending in a short wide bifurcation, or in a curved falcate, acute or acuminate point. Veins not conspicuous, numerous (6 to 10) parallel, not branching. The longest of the segments in the specimen figured is 55 millim., and the width is from 3 to 6 millim.

The resemblance of the form of this fossil to some species of *Helminthostachys* is great, but the parallel venation reminds one more of *Schizaea*. Probably we have nothing amongst living Ferns which can be compared to this singular plant. The species described differs from *J. münsteriana* in the brevity, widening and bifurcation of the segments. The specimen figured was found in the Burnett River coal seams, Queensland.

#### FRAGMENTS OF FERNS.

Paleontological botanists divide the fragments of Ferns into four sections, viz. :—1. *Spiropterides*, or young fronds either rolled up or not as yet completely developed. 2. *Rachiopterides*.—Fragments of petioles or of rachis. 3. *Phthoropterides*.—Petioles of ferns generally contained amongst, or in an envelope of adventitious roots. 4. Stems of Ferns. In the last section we have :—

#### CAULOPTERIS, Lindley and Hutton.

Trunk erect, cylindrical. Scars of the petioles flat, elliptical or ovate. Cicatrices of the vascular bundles, round, concentrically disposed, or borne in longitudinal impressions. These stems or trunks, says Schimper, have their analogues amongst the tree ferns of the present period, such as *Cyathea* and *Alsophila*.

*Caulopteris adamsi*. Feistmantel, loc. cit. p. 94, pl. 12, figs. 1 and 2. Trunk of a tree of medium size, marked on the surface with the scars of branches or leaves. Scars disposed spirally and quincuncially, transversely oblong-oval, somewhat prominent, the sides marked with a decurrent line, the internal surface covered with minute vascular cicatrices.

This species was dedicated to Mr. P. F. Adams, Surveyor-General of N. S. Wales. The specimens were imperfect, and on the whole the peculiarities of the species were such that Dr. Feistmantel was far from satisfied that it should be referred to the genus *Caulopteris*, yet as the details were too indistinct and scanty for the erection of any new genus, he knew no existing form with which it could be classed, except the one to which he referred it. It was found in Newcastle, but there are no particulars as to the mine or the horizon.

#### ORDER. LYCOPODIACEÆ.

Stem or rhizome bearing true leaves, either linear, or small and one-nerved, or reduced to minute scales. Spore-cases solitary or few together, sessile in the axils of the leaves or of the bracts of a terminal spike, either all similar or of two kinds, larger ones *macrosporangia*, containing a few larger spores or *macrospores*, and smaller *microsporangia*, containing numerous smaller, often microscopic *microspores*, the differences now generally admitted to be sexual.

The order, as far as existing species are concerned, is spread over nearly the whole globe, and three of the Australian genera have nearly as wide a range; two others are both in the New and the Old World, chiefly tropical or southern; the remaining two extend to N. Zealand, one of them also being in the Pacific Islands. I need not refer to the wonderfully important part taken by this order in former periods of the earth's history, especially in the earliest Carboniferous flora. Not only did this Order predominate but also its members assumed the proportions of large trees and formed immense forests, which are now entombed, and preserved for man in the form of coal. Australia has been no exception to this, though the fossil species that we have are found more in connection with the Devonian rocks than with coal.

#### LEPIDODENDRON. Sternberg.

Large trees with dichotomous branches, surface closely covered with alternately arranged, rhombic scars, having a vascular cicatrix near the middle or upper angle. Leaves linear or peltate, fruit a strobilus or cone at the extremity of certain branches.

Sub-genus — BERGERIA, Presl. Scars nearly flat, obovate, rhombic or quadrate with a very small oval vascular cicatrix near the upper angle.

This genus belongs to the Paleozoic rocks, and various portions of the same plant have been formed into *Stigmaria* (roots), *Lepidostrobus* (cones or fruit spikes), *Sigillaria* (fluted trunks of some species). *Cyperites* (foliage), *Knorria* (casts of stems), *Sternbergia* (pith) and other genera.

*Lepidodendron (Bergeria) australe*, M'Coy, Pal. of Vict, p. 37, pl. IX). Stem about two inches in diameter, having rhombic scars, with straight thick boundaries, about four inches long and three and a half inches wide, with a very small oval, rounded, vascular cicatrix, rarely near the middle, or more usually excentric towards the upper angle, and often connected with the appearance of a vertical shallow rounded sulcus; branches one inch in diameter, having similar scars three lines long, and two and a half lines wide, upper and lower angles of the scars usually slightly more acute than the lateral ones, very rarely the lateral ones more acute.

“The species here figured is scarcely distinguishable from the *L. tetragonum*, Sternberg, of the European Carboniferous deposits by any definable character, so that my inclination was to indicate it as variety *australe* of that species, and I do not see any reason for supposing it referable to the little Devonian *L. nothum*, Unger, nor the probably identical *L. gaspianum*, Dawson, nor the *L. chemungense* of Hall, from the Devonian sandstones of New York. Hall's figure of the latter plant is not much less than the narrow part of the right hand branch of our figure, but it shows the scars nearly five times more numerous, and scarcely one-fifth of the size and all the figures of the Devonian species mentioned indicate the much smaller, more numerous, and much more acute, longitudinally elongate leaf scars as constant characters, together with a central vascular cicatrix.” Common in the red and yellow micaceous carboniferous sandstone of the Avon River, Gippsland. This sandstone rests unconformably on the upturned edges of true Devonian rocks with characteristic fossils. Professor M'Coy

thinks that his species is identical with the Queensland *Lepidodendron*, recognized by Carruthers as *L. nothum*, Unger, but Dr. Feistmantel and others think that they are different.

*Lepidodendron nothum*, Unger (see Carr. in Jour. Geol. Soc., 1872, p. 350, pl. 26, fig. 1 to 14, also Feistmantel, pl. 15, fig. 9). Scars of the leaf contiguous, rhombic, with a single and generally central vascular scar; leaves small, peltate and imbricate, on long slender petioles, fruit produced on the apices of the thick branches, a single sporangium, almost sessile, borne on the middle of the petiole of the leaf, roots stigmarioid.

In the paper of Mr. Carruthers referred to, full details as to the structure of this plant are given from abundant specimens brought by Mr. Daintree from Queensland. There it is so common that a full series of specimens are easily found, giving a knowledge of the roots, leaves, and fruit scales of this species. Thus many doubtful points in the structure were cleared up. Mr. Carruthers believes it to be identical with Dr. Dawson's *Leptophleum rhombicum*, and thus the species has a range all over the world. In Queensland, Mr. Daintree obtained it from Mt. Wyatt, Canoona, and the Broken River, all in Northern Queensland. Prof. M'Coy quotes it from Gympie, probably misunderstanding the report of Daintree. I have not been able to find it in the rocks of Gympie, where, however, there are many plant remains, which seem to be like *Cordaites australis*, M'Coy. It was found on the Drummond Range, at the end of the central railway. (Bobuntungen, Medway River, &c.) It is in a light brown or yellow micaceous sandstone, forming the escarpments of all the eastern face of the range, and dipping away to the westward. The strata show much false bedding, and oblique laminae like the aerial rocks of the Hawkesbury. Also in many places in N.S. Wales in (presumably) Devonian rocks, as at Cowra, Canowindra, on the Lachlan River; Goonoo Goonoo Creek, on the Liverpool Plains.

4. *Lepidodendron veltheimianum*. Sternberg. Flor. d. vol 1, part 12, pl. 52, fig. 2. See also Schimper, "Paléontologie Végétale, vol. ii, p. 29, atlas, pl. 59, figs. 6, 7, 8. Schimper gives a large list of references and synonyms, which I need not quote here. See

also Feistmantel, "Paleozoische and Mesozoische Flora des östlichen Australiens"—Cassel, 1878 and 1879, p. 151, pl. 5, figs. 2 and 3 (though doubtfully referred to this species); pl. 7, fig. 2; pl. 23, figs. 2 and 3.

Apparently a moderate-sized tree, with dichotomous branches, covered with a network of very narrow leaf scars; leaves narrowly lanceolate, spreading, slightly incurved; scars of the branches erect, rhomboid, close, with an obovate cushion acuminate at the base, keeled, furnished with a transverse rhomboid cicatrix; scars of the trunk oblong rhomboid, apex and base long and acuminate, subinflexed, and after the disappearance of the little cushion, fusiform.

This plant is characteristic in Europe of the lower coal formations, corresponding to the Carboniferous Limestone. It has been found in many places in Silesia, in the *Posidonomya* schists at Magdeburg, in the Hartz Mountains, at Nassau, in the valleys of Thann and Niederburdach; in France, in the Upper Vosges, and in the coals of the black forest. This fossil is also, according to M. Geinitz, the same as *Ulodendron ornatissimum*.

In the 3rd edition of the late Rev. W. B. Clarke's "Sedimentary Formations of New South Wales" (1875), at p. 17, mention is made of a species named *Lepidodendron rimosum*, of which in 1878 Feistmantel, gave a fig. (*loc. cit.*), remarking that it seemed more to resemble *L. veltheimianum*. Before this, 1876, as I have stated previously, Professor de Koninck had submitted about twenty plant specimens sent to him by the Rev. W. B. Clarke to the eminent Belgian paleontologist, M. Crepin of the Brussels Museum. Though the specimens were in a very bad state of preservation, he was able to recognize *L. veltheimianum*, besides *Calamites radiatus* and *C. varians*, all of which we shall see are found in the Drummond Range. Dr. Feistmantel was not aware of Mons. Crepin's determinations at the time he pronounced upon his specimens, so that the independent testimony of two such eminent and experienced authorities gives additional weight to the identification. Mr. Clarke's fossils are quoted by De Koninck as from the quarries of Murree, Russell's Shaft, Glen William,



Burrageood, and the Ichthyodorulite Range. Dr. Feistmantel's examples came from the strata of Smith's Creek, near Stroud and the Rouchel River.

Amongst the numerous examples found in the Drummond Range, there are many compressed branches which have formerly been cylindrical, and instead of having the lozenge-shaped depressed leaf-scars with a raised margin, are marked with impressions of distant narrow-pointed leaf-like scales. They exactly correspond with the figure given by Feistmantel in the above work, at plate 23, figs 2 and 3, and which are lettered *Knorriastadium* (?) and *Lepidodendron veltheimianum* (?), the doubtful note in both cases being that of Dr. F. They came from Smith's Creek, New South Wales. I think there can be but little doubt, from the mode in which they are associated, that they belong to the same plant. There are also smaller stems, of which I figure one example which seems to me like the internal casts of the smaller branchlets. The surface is covered with raised cushions, which are closely quincuncial. The cushions rise gradually towards the apex, and have an imbricated appearance. In the larger examples the cushions are longer and very much narrowed. I think we have in these, internal casts of the branches. If we suppose the external scars to be raised in such a way as to give rise to a corresponding depression in the internal cylinder, then the casts would present the appearance noticed above. Moreover, they are ill-defined, and without any leaf impressions, just as internal depressions would be. The stone is quite fine enough to retain the most delicate marks where they exist. The shape of these casts also confirms this explanation, for they are always more or less cylindrical, or the casts of cylinders which have been compressed. Whenever the exterior of the branches is exhibited, it is on the surface of concave casts.

#### CYCLOSTIGMA. Haughton.

The plants thus distinguished were first brought to the notice of science by Dr. Haughton, in a paper published in the *Annals of Nat. History* for 1860 (3rd ser., vol. v., p. 444), entitled

“On *Cyclostigma*: a new genus of fossil plants from the old red sandstone of Kiltorkan.”\*

*Cyclostigma australe*. Feistmantel, *loc. cit.* p. 76. A tree trunk with slender terete branches, cushions or raised scars subglobose, pitted, approximate, spirally disposed, impressions oblong oval, rather deep, situate in the upper portion of the oblong ovate tubercle. The species was found in two places in New South Wales, according to Dr. Feistmantel, named Goonoo Goonoo Creek, near Tamworth, and at Smith's Creek. Dr. Feistmantel was of opinion that the species was so near *C. kiltorkense* that he could see little difference, but lest he should make a false identification in a plant where the details are so few and simple, he preferred to give it another name. He gives figures of a few specimens at pl. i, fig. 6, a doubtful identification, pl. iv., fig. 3, pl. v, fig. 1, pl. xxii, fig. 1. Amongst the Drummond Range specimens I have only one which can be referred with any probability to this species, and in this case the impressions are so faint and worn that I figured it as a *Stigmaria* (*Cyclostigma*?). I quote from the Rev. Dr. Haughton's paper somewhat fully, because his description corresponds so well with the strata of the Drummond Range that lithologically they may certainly be said to belong to one formation. The rose pink sandstone in which some of the fossils are embedded, and the golden yellow colour of others, is especially remarkable.

“The fossil plants of the yellow sandstone of the county Kilkenny occur, as they do in other parts of Ireland, in the sandstone lying immediately under the great mass of the Carboniferous limestone, which constitutes the most important member of our Irish fossiliferous rocks. They are found at Jerpoint, about a mile and a half south of the Abbey, on the roadside near the cornmill, on the road to Ballyhale, about 90 feet below the

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\* Other species have since been described by Heer, Fossil Flora de Burren-Insel, p. 43, pl. xi; by Lesquereux, Geol. Survey of Arkansas, p. 318, pl. iii, fig. 3; and Dawson, Fossil Plants, Geol. Survey of Canada, p. 43, pl. xiii, figs. 92 to 96.

lowest bed of limestone, in rocks composed of red, white, and blue limestone, with trilobites formed of pink quartz, rounded pebbles grooving the hone stone; and above the plant beds a remarkable white grit conglomerate is found. The plant-beds, on the same geological horizon, are also found in the railway cuttings at Ballyhale. They are found, however, in the greatest abundance, and in the best state of preservation, on the top of Kiltorkan Hill, near the railway station of Ballyhale. I believe the plant-beds on the summit of this to form an 'outlier,' and to occupy the same geological position with respect to the limestone as the beds at Jerpoint and those of the railway cutting. The fossil plants here found have never been described except casually. They consist of remains of a large Fern, called *Cyclopteris hibernica*, by Professor Forbes, associated with a large bivalve, named by him *Anodon jukesii*; of undescribed dermal plates of a cartilaginous fish, probably a species of *Cocosteus*; and of numerous unknown plants closely allied to *Lepidodendron*, and so named by Professor Forbes and M. Brongniart, the latter of whom has named a remarkable species, preserved in the Museum of the Royal Dublin Society, *Lepidodendron griffithsii*. Others of these fossil plants have been named *Knorria*; and a large undescribed group remains, to which I propose to give the name of *Cyclostigma*."

Mr. Carruthers, in his appendix on the fossil plants (see Daintree on the Geology of Queensland, *loc. cit.*), says:—"Among the Devonian fossils presented by the Rev. W. B. Clarke to the Society's museum there is a fragment of a lepidodendroid plant which I cannot separate from that found at Kiltorkan, to which Dr. Haughton gave the name of *Sigillaria dichotoma*, and afterwards of *Cyclostigma kiltorkense*, and which, after receiving many other aliases, should be named, I believe, *Syringodendron dichotomum*, as being a species of that genus as amended by Brongniart in his 'Histoire,' and again in his 'Tableau.'"

In the Nat. His. Review, vol. 6 (1859), there are four plates (pl. 38, 39, 40, 41), giving different details of the *Cyclostigma*, showing the whorled and spiral structure of the leaves, &c.

## LYCOPODIUM.

Stems leafy, hard, branching, creeping, prostrate or erect. Leaves small, entire, or minutely serrate, inserted all round the stem, usually in four rows. Spore-cases all of one kind, flattened, one-celled, two-valved, sessile in the axils of the upper leaves, or of bracts usually smaller or broader than the stem leaves, and forming terminal or lateral spikes. Spores all minute and powdery.

The genus is widely spread over every part of the globe. Of the eleven Australian species three are generally distributed in the New and in the Old World, the seven others are in New Zealand, five of them extending to the Pacific Islands, and two to South America.

There are seven fossil species, and if we include the *Lycopodites*, which are, however, plants of uncertain position, three more must be added to the list. Of the seven fossil species, six belong to the coal formation, and the seventh, about which there is some doubt, comes from the middle Jurassic. Amongst living Lycopodiaceæ a distinction is made between those which have the spore cases and spores all of one kind (*Lycopodium*) and those in which they are of two kinds (*Selaginella*). The plants of the latter genus are moreover smaller and weaker than *Lycopodium*, and have distichous lanceolate leaves.

With reference to the fossil species of *Lycopodium*, Schimper says (op. cit. vol. 2, p. 7) that under the name of *Lycopodites*, and *Selaginites* the most heterogeneous plants have been described, such as the branches of *Knorria*, *Lepidodendra*, conifers and the rhizomes of young fronds of Ferns. For this there is an excuse as some of the rhizomes of Ferns which grow above ground are divided by dichotomy, and covered with leaf-like hairs or scales, and they resemble certain species of *Lycopodium*, especially when they are preserved as impressions on clay. Moreover, many conifers have a pinnate ramification very similar in appearance to those of *Selaginella* and *Lycopodium*. But Schimper adds that certain marks will always enable us to detect the differences. Whenever

the branching of conifers presents a pinnate structure the principal axis is always straight simple, never dichotomous, and the branchlets decrease gradually and regularly from the base to the summit. In the first condition they are always simple, but when they branch in their turn it is by axillary distichous branchlets which develop themselves in turn in these branches of the second order as they have done in the first instance. On the other hand whenever species of *Lycopodium* or *Selagenella* appears to be pinnate from the alternate inequality of the branches at the point of bifurcation, this stem is in reality a Sympodium which is easily distinguished in the young state, or at its superior extremity by a regular zig-zag outline whose re-entering and salient angles correspond to the points of dichotomy. The absence of lateral buds in Lycopods naturally excludes lateral or axillary branches. The germ-like projections which are noticed in some species of *Lycopodium* and *Selago*, and which at first sight seem to resemble lateral or axillary buds, are in fact enlargements which sometimes take the place of spore-cases, of which they are probably the morphological equivalents. The leaves of the two branches which result from dichotomy are, in the case of Lycopods, homodromous, or running in the same spiral direction; whereas, in the case of conifers they are antidromous, or run in the opposite direction to the principal branch. Bearing these distinctions in mind I think that some of our so-called conifers, which have been passed over as imperfectly preserved specimens of *Brachyphyllum* are in reality *Lycopodites*. I am not at present in a position to describe any of the specimens to which I refer. Some in my possession from the Ipswich coalfields are too fragmentary for determination. I merely record the fact of there being some doubtful evidence of *Lycopodites* for future investigation.

#### ORDER. CYCADEÆ.

Flowers unisexual, without any perianth. Male flowers forming catkins or cones, consisting of numerous spirally arranged imbricated scales (or stamens), more or less cuneate, bearing on the concealed portion of their under surface, numerous sessile or

rarely stipitate anther-cells, each opening in two valves, the upper imbricate and exposed part of the scales hardened and often much thickened, the apex truncate or more less produced into an incurved or recurved point or lanceolate appendix. Female cones consisting of numerous scales, imbricate at least when young, either with one pendulous ovule (or carpel) on each side of the thickened and hardened apex, or with three or more erect ovules (or carpels) in marginal notches below the flattened acuminate, and usually dentate or pinnatifid apex. Fruiting-cone enlarged, and either remaining imbricate with two pendulous seeds to each scale, or the scales with marginal seeds spreading as the central shoot is developed within the cone. Seeds naked (or nuts) with a thick or hard outer coating or integument, and a fleshy albumen, in a central cavity of which the straight embryo is suspended by a long folded cord. Cotyledons two, undivided. Palm-like plants, with a thick globose, and underground or erect and cylindrical woody stem, simple or rarely slightly branched, marked with the scars or bases of the old leaves. Leaves forming a crown at the apex of the stem, once or twice pinnate. Cones sessile or very shortly pedunculate, within the crown of leaves.

The Order extends over tropical America, sub-tropical and southern Africa, and tropical Asia. Of the three Australian genera, one is also in Asia and Africa, the other two are endemic. The theoretical significance of the outer coating of the ovules and seeds, whether carpellary or seminal, is, as in the Coniferæ, still the subject of contention.

#### ZAMITES. Brongniart.

(As amended by Schimper including *Zamia* and *Zamites* of Brongniart in part and *Crossozamia* of Powell)\*

Leaves very variable in size and shape, either ovate-oblong acuminate, or oblong or linear and oblong acuminate; all regularly pinnate. Pinnæ more or less horizontal and inserted perpendicularly into the rachis, lanceolate, linear lanceolate,

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\* Matériaux pour servir a la Flore fossile des Terres-Jurassiques de la France. Par. M. Powell, 1849.

oblong, acuminate or obtuse, base contracting suddenly and fixed to the anterior side of the rachis by a more or less distinct callosity; solidly coriaceous. Nerves distinct, straight, parallel, ending abruptly at the apical margin of the leaflet.

In this genus are grouped Cycads with straight parallel nerved leaflets abruptly constricted at the base, fixed at the centre of that base on a callosity. They are mesozoic plants which make their appearance in the Oolitic period, and continue to the present day. It is not certain that the fossils are in every case true Cycads, as the fructification has seldom or never been seen. The female cone of *Zamites epibius*, Saporta, and some few others have been found.

In this genus Dr. Feistmantel includes *Podozamites*, regarding the latter as a sub-genus. It was recited by Braun and is adopted by Schimper, M'Coy and others, and on that account I think it better to continue to give it generic distinction. Up to this no true *Zamites* have been found in Australian plant beds.

#### PODOZAMITES. Fr. Braun.

Leaves of medium size. Leaflets distant, spreading, oblong, ovate, and linear-oblong, apex obtusely acuminate or rounded, gradually narrowed towards the base, subpedicellate, pedicel articulate, deciduous. Nerves dichotomous at the very base, then simple, erect, parallel, then converging towards the apex.

This genus differs from *Zamites* proper in the oval, oblong, or elongate leaflets, more or less obtuse above and gradually narrowing below, inserted on a pedicel at an acute angle, with nerves dichotomous at their origin, but rarely dividing afterwards, inwardly curved and converging towards the top. Three species are already described.

*Podozamites barkleyi*, M'Coy (Pal. Vict., p. 33, pl. 8, figs. 1, 2, and 5.) Fronds from one and a half to two and a half inches wide, rachis thick, about one and a half lines wide, pinnules close set, narrow linear, elliptically pointed at the distal end, about one inch five lines long and one line wide in var. *gracilis*, and one inch

three lines long, and one and a half lines wide in var. *latior*, abruptly contracted to the base, the narrowed lowest portion of which is obliquely inserted in two very slightly alternate or nearly opposite rows, basal portion with about ten or twelve narrow, equal, rounded, longitudinal ridges, which usually become obsolete towards the distal half, on which often only three large ridges or undulations can be seen; the surface has about 50 to 70 longitudinal striæ in the width of a pinnule. The bases of the pinnules are nearly opposite, and from their narrowness, seem rather widely separated, though only far enough apart to allow the edges of the broader portion to nearly touch the adjoining edges of the next ones.

“There is someslight variation in the amount of alternation or opposition of the pinnules in different specimens. . . . Also, as in the recent examples, the upper surface is more nearly smooth and the lower surface of the pinnules more distinctly ridged. At first sight in size and shape this nearly resembles the common *Zamia hastula* of the Yorkshire Oolite coal beds, but is easily distinguished by its smoother surface, and the contracted base of the pinnae or leaflets.” Found in a shaft sunk for coal between Geelong and Queenscliff, associated with *Alethopteris australis*. The species is dedicated to Sir Henry Barkly.

Prof. M'Coy points out the strong resemblance of the plants to conifers, to which order Dr. O. Feistmantel considers they should be referred. We must await the discovery of cones or fruits to decide the question.

*Podozamites ellipticus*. M'Coy (l. c., p. 35. pl. 8, fig. 4.) Fronds about  $2\frac{1}{4}$  inches wide; rachis very thick, about 2 lines wide; pinnules elliptical, scarcely touching, varying in size from  $1\frac{1}{4}$  inches long and  $3\frac{1}{2}$  inches wide, to 1 inch, 1 line long and 2 lines wide; substance thick, usually showing only three obtuse ridges, but sometimes 11 smaller, the whole covered with a very fine longitudinal striation; base of pinnules contracted and inserted obliquely on the rachis in a slightly alternate order or nearly opposite.



“This is easily distinguished from *Z. barkleyi*, by the much thicker rachis, the broader oval form of the pinnules and their thicker substance. I have just received some specimens nearly like this plant in foliage, but having indications of the leaflets or leaves being in four instead of two rows, and having a branching stem, recalling *Lycopodites williamsoni* of the Scarborough Oolites, but with the leaves flat and elliptical, instead of thick carinate and falcate. I should propose the name *Bunyalites* for the fossil forms which approach *Araucarites* in many respects, and have branching stems, but with the leaves contracted at the base as in the *Podozamites*, and *Araucaria bidwilli* or Bunya-bunya. Along with these plants are also fruit cones resembling the Oolitic *Zamistrobus*, as far as their character can be seen.”

*Podozamites longifolius*. M<sup>c</sup>Coy (l. c., p. 35. pl. 8, fig. 3.) Fronds about ten lines wide, rachis about half a line thick; pinnæ slightly contracted and obliquely inserted at base, closely arranged in two rows, standing nearly at right angles to the rachis, except at the curved base; pinnæ linear narrow, elliptically pointed at apex about 5 lines long and half a line wide; midrib distinct with fine, parallel longitudinal striæ.

“At first sight this resembles *Z. taxinea* of the Yorkshire Oolites, but is smaller and even more like a yew from the distinctness of the midrib. It differs more essentially in the contracted base and oblique insertion of the leaflets. The strong midrib approximates the species to *Cycadites*, but it varies in some pinnæ and the contracted oblique base of the pinnæ prevents a reference to the genus. The plant is not so common as the other gymnosperms in the coal shale at Bellarine, where I have seen about half-a-dozen specimens.”

*Podozamites lanceolatus*, Lindley and Hutton (as *Zamia*), Foss. Flor., 111, 194, 1837. *Zamites lanceolatus*, Eichwald, Leth., Ross., II, p. 40, pl. 3, fig. 1, 1865-68; *Podozamites distans*, Schimper, Pal, veg., vol. 2, p. 159, Atlas, pl. 71, fig. 1. *P. lanceolatus* and varieties, Heer Flora Ostsibiriens, &c., p. 108, pl. 26, fig. 10, 1876; Feistmantel records Geol. Survey India 1 & 4, p. 131,

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1876 ; Geyler, Jura Pflanzen aus Japan, 1877 ; Feistmantel Flora of the Jabulpûr group, Upper Gondwanas, Pal. India, vol. 2, p. 11 (91), pl. 3, fig. 7 to 14, pl. 4, fig. 1 to 10.

Leaves remote, deciduous, entire, narrowed at base, lanceolate acuminate at the apex, nerves many, forked just above the base then simple and converging to the apex. Dr. Feistmantel adds that this is "a very characteristic form widely spread in the Jurassic formation. It is known from Spitzbergen, England, S. Russia, East Siberia, Amûr, and Japan. In our own Jabulpûr group, it is pretty frequent." To these localities I am enabled to add Australia. I have found it very abundantly at Ipswich. In the work already quoted by Dr. Heer on the Jurassic Flora of Eastern Siberia, he distinguishes a number of varieties, some of which were formerly regarded as distinct species. Thus *P. distans* of Presl, a Rhætic fossil is connected with *P. lanceolatus*, as well as *P. eichwaldi* of Schimper. Dr. Feistmantel finds three varieties in India, namely, *P. lanceolatus genuinus*, in which the leaves are lanceolate with a pretty acuminate apex. South Rewah, Jabulpûr, and Sher River. *P. lan. var. spathulatus*, Feistm., pl. 4, fig. 11-12. Leaves shorter, oval lanceolate, base attenuate. "There are some leaves which I think however belong to the same species, distinguishing it as a variety only." South Rewah.

Both these varieties occur abundantly in the Ipswich basin, one specimen showing how the leaves were affixed to the parent stem, and though the fragment is imperfect it shows precisely the growth figured by Schimper. (Atlas, pl. 71, fig. 1.) There are other fragments of stems which also show the mode of attachment attributed to this species. I am aware of course of the risk of error in making the identification between the fossils of Ipswich and those of Europe, but the resemblance is so close that I do not think that there is any ground for hesitation.

In the Queensland specimens the veins are simple, straight, parallel, from 8 to 12 in a leaf. Length of leaves from 45 to 100 millim., breadth from 2 to 12 according as the leaf is ovate or lanceolate.

This plant may have been the same as *Zeugophyllites australis*, Morr. It must be remembered that the latter genus was established by Brongniart for a plant with leaflets such as these, but in pairs. In the plants found at Jerusalem, Tasmania, and classified by Morris as *Zeugophyllites* there was nothing to show that the leaflets were in pairs. The form of the leaf alone guided Prof Morris in his determination; and that form was so similar to the leaves described above that they may have been the same. For the present I must leave the matter as it stands. There is only one species of this plant, but I note, also, leaves of the same shape associated with them, but in which the coriaceous epidermis is almost smooth in consequence of the fine, close nerves. In these leaves there are sometimes faint traces of a midrib also; leaves larger and coarser than the foregoing, with which they are always associated. The nerves are only four or five, and the leaf has a rough appearance. Also a fossil which may be the same as *P. hacketi*, Feistm. (l.c., p. 92, pl. 7, fig. 4, 5, 4a, 4b, 5a,) in which the leaf is broader, springing from a thick rachis, veins numerous with an indistinct median nerve like a midrib. Dr. Feistmantel found it in connection with the rachis and compared it with Heer's *P. plicatus* from the Amur countries. The number and variety of the leaves at Ipswich makes that deposit peculiarly advantageous for their study. It is one of the many instances of the fact that we meet with a fossil in Australia, which is world-wide in its distribution.

#### PTILOPHYLLUM. Morris.

(As amended by Schimper.) *Paleozamia (Ptilophyllum)*, Oldham and Morris. Leaves rather long, petiolate, petiole exactly terete, graceful, feather-like (whence the name), linear-lanceolate, gradually acuminate towards the summit, sometimes narrowed below. Leaflets of equal size, affixed to the rachis by the anterior side and somewhat imbricate there, flat, coriaceous, linear, apex obliquely acuminate above and slightly curved, the superior angle of the base rounded, sub-auriculate, free, the lower and fixed portion acute and slightly decurrent. Fructification strobiliform; seeds small, ovate, oblong. Stipe cylindrical, narrow.

This is the type of the Indian fossil plant, which has not been found in Europe, nor hitherto in Australia. It is distinguished by its long, straight, pinnate, feather like leaves, regularly acuminate above and below. The pinnules are very close and somewhat imbricate at the base, but the decurrent portion does not unite with the base of the leaflet beneath, but passes behind it. The nerves are somewhat numerous, well-defined, simple or bi-furcate and more or less divergent. The principal distinction is the manner in which the pinnules are affixed to the rachis. They were small and elegant plants which must have been abundant in the places where they grew, as numbers are always found entombed together. They seem to have no analogy with any living form. Two species are known, and both from India.

These plants were originally classed with *Palæozamia*. Endlicher, which included certain fossils referred by Brongniart to *Zamia*, and by Lindley and Hutton, to Ferns. Oldham in 1862, proposed to arrange the genus in three sections, viz.:—1. *Ptilophyllum*, with linear pinnae, approximate, *scarcely auriculate*, nerves parallel or slightly divergent. 2. *Otozamites*.—Pinnae lanceolate, *auriculate or semi-cordate at the base*, veins fine, numerous, divergent. 3. *Sphenozamites*.—Pinnae ovate, wedge-shaped or cuneiform, *not auriculate* at the base, veins numerous, diverging. The section *Ptilophyllum*, included five species from India, which are described in the 1st vol. of the Fossil Flora of the Gondwana system (pp. 27 to 31)\* as *Palæozamia*.

When the revision of the Flora came out in 1880, Dr. Feistmantel in the same vol. at p. 116 (p. 64 of the Fasciculus) gave his reasons for including Oldham's section, *Ptilophyllum*, in a distinct genus of that name, which had been proposed by Morris in 1840.\* He says (loc. cit.) "*Ptilophyllum*, is a peculiar Indian genus, which in the same form has not occurred elsewhere. The only analogy is the Liassic *Otozamites gracilis*, Kurr sp. The chief characteristics are in the insertion and the basal angle of the

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\* Memoirs of the Geol. Surv. of India. Palæontologica Indica, Ser. II. Calcutta. Govt. Printing Office, London, Trübner and Co., 1880. But Oldham's part appeared much earlier, in 1862.

leaflets. The leaflets are as M. Schimper has already pointed out, inserted only at the lower angle of their bases, where they are little decurrent, and are overlapped by the free and slightly auriculated angle of the next lower leaflet." This feature is only seen on the upper surface, while on the lower we see only the stalk.

In Dr. Oldham's first determination he included five species in his section. Three of these have since been included with *Otozamites* by Dr. O. Feistmantel. The other two are now described as *Ptilophyllum acutifolium*, Morr. and *P. cutchense*, Morr. The first is distinguished by its large size and acute leaflets; the second by the smaller size of the leaf and by the shorter and more obtuse leaflets. They occur in a compact limestone with Ferns, also in opaque white chalcedony, in which the fragments of fronds and leaf stalks form a breccia.

The species which I now describe partakes of an intermediate character. It has the acute leaflets of *P. acutifolium* and the small size of *P. cutchense*, and furthermore is distinguished from both by its few, simple parallel veins.

*Ptilophyllum oligoneurum*. n. s. Plate 7, figs. 2, 3, 4. Frond pinnate, long linear, gradually tapering to the apex. Pinnæ rather long, narrow, slightly oblique, alternate, separate, but very close, rounded and curved, somewhat falcate, ending in quite an acute apex at the upper edge; base rounder or auriculate above, obliquely inserted, leaving when detached a series of oblique alternate, elongate depressions on the rachis. Veins distinct from their origin and parallel to the apex, from 4 to 6 in number, all well marked and conspicuous. Length of longest pinnæ 12 to 15, breadth  $1\frac{1}{2}$  to 2, mill.

Very common in the plant formation of Rosewood, near Rockampton, where it is associated with a *Sequoia* (?) to be hereafter described, a large *Equisetum*, some Ferns and *Vertebraria*. The stone crops out on the surface and is a kind of chert or travertin.

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\* Geol. Transactions, London, 2nd Ser. vol. for 1840, pl. 21, &c., and Annals of Nat. Hist. Ser. 1, vol. 7, p. 116.

The plant impressions often occur as in the Indian *Ptilophyllum* in a compact limestone, or an opaque chalcedony, in which the fragments of the fronds are imprinted and then have been broken. These have been subsequently stratified into lines of breccia between masses of more compact rock.

STANGERITES. Bornemann 1856.\*

This genus was established by Bornemann for certain species of Cycads which had previously been regarded as Ferns of the genus *Teniopteris*, but which from their resemblance to the living Cycad *Stangeria* (from Port Natal), were called *Stangerites*. I mention this, because one species found by me at Rosewood, near Ipswich, was certainly Oldham v. Morris's *Stangerites ensis*, now however, regarded as a Fern of the genus *Angiopteridium*, already described in the foregoing pages.

OTOZAMITES. Fr. Braun.

(*Odontopteris*, Sternb. Göeppert, Unger, in part. *Otopteris*, Lindley and Hutton, Schenk.)

Leaves moderately large, rarely very large, regularly pinnate, elongately linear, narrowed at each end, leaflets densely close or more or less remote, alternate or linear lanceolate, obovate rhomboid or sub-circular, base suddenly narrowed, obliquely inserted on the upper side of the sub-terete rachis, unequally auriculate, upper auricle smaller than the lower one, and adpressed to the rachis. Nerves radiating from the insertion of the leaflet; basilar arcuate, the others sub-arcuate, once or more dichotomous. Epidermis with elongate deeply sinuous cellules. This genus which is distinguished by its peculiar leaflets and thin mode of attachment to the rachis, has been by some, regarded as a Fern allied to *Lindsaea*, but the cycadaceous character is well established. *Otozamites* make their first appearance between the Trias and Lias. They abound most in the middle Oolite, and after that, diminish until in the upper Oolite, they are replaced by *Zamites* and *Sphenozamites*, No existing form closely resembles them.

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\* Ueber organische Reste der letzteren Kohlengruppe, Thüringen.

*Otozamites mandeslohi* Kurr, Beitrage Foss. Flora d. Juraform. Württemb., p. 10, tab. 1, fig. 3. (as *Zamites*). Leaves long linear, gradually narrowed towards the apex, 25 millim. wide. Leaflets densely crowded, oblique, alternating, inserted on the rachis with contiguous bases, ovate oblong, obtuse, base sub-cordate, 14 millim. long, 8 broad, nerves close, diverging.

On this species, Dr. Feistmantel says (op. cit. pl. xii., a fig. 6). "This is the first *Otozamites* identified from Australia. From upper mesozoic beds, Queensland, Talgai diggings. It appears to be very close to *O. mandeslohi*, a Liassic species, to which I refer it for the present." Also Toowoomba, common.

#### ZEUGOPHYLLITES. Brongniart.

Fronds (?) petiolate, pinnate, pinnae opposite (?) oblong, nerves valid few, equal, becoming confluent at the base and apex.

This is the diagnosis which Brongniart originally gave of the genus from specimens which came from Ramiganj in India. Subsequently in 1844, in his "Tableau des genres de Végétaux fossiles, he says:—"Under this name (*Zeugophyllites*) I have described a pinnatifid form of *Monocotyledonous* leaf, resembling such Palm leaves as *Calamus*, *Desmoncus*, &c, whose leaflets have many principal nerves and are not bent into a keel on the median line. In the only species (then) known the leaves are opposed as in some species of *Calamus*."\*

At first Dr. Feistmantel was inclined to think that this was a species of *Schizoneura*. This it will be remembered is an Indian equisetaceous plant, the sheaths of which are united and stem clasping. Subsequently they divide along sutural lines which look like nerves. But there is clearly no such division here, and neither Schimper, Morris, nor M'Coy, took that view. Still I cannot adopt the opinion that these leaves have anything to do with palms like *Calamus*. A comparison of the leaves will at once show the difference. Besides these plants have evidently grown in marshy places in company with the true *Equisetum*. Now though *Calamus* is found in moist jungle, it hardly seems to be of such a

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\*Ita Feistmantel op. cit. p. 95.

habit that it would probably give rise to coal. Then again, all the stems of such palms are extremely thick and woody, and we meet with no such remains. The same objections apply to *Zamia* and *Cycas*. They certainly do not grow in moist places in Australia, but on the contrary are found in the very driest and sandy soil. Undoubted Cycads are found in connection with coal in Europe and India, as the cones testify, but they are different from our existing forms.

To this genus was referred some specimens brought to Europe by Count Strzelecki. In the account given of the Fossil Flora of Australia, Prof. Morris says\* *Zeugophyllites*, Brongniart, family uncertain. *Z. elongatus* (Pl. vi., fig. 5, 5a). Stem ? leaves petiolate, oblong elongate, entire truncate, and slightly thickened at the base; veins distinct, equal, parallel. The specimen figured, has been provisionally referred to *Zeugophyllites* Brongniart, as it agrees tolerably well with the characters assigned to the leaves of that genus. These leaves were probably sessile or even amplexicaul, as might be inferred from their slightly thickened base, and pinnately arranged at short distances along a common stem, after the manner of the foliation of *Schizoneura*, Schimper, *Convallarites*, Brongniart, to which genus our species offers some resemblance; the leaves however in *Schizoneura*, have fewer veins, and appear to have been somewhat carinated. Locality—Lower Jerusalem Basin, Van Diemen's Land.

Feistmantel quotes the genus from Newcastle beds as well. I have never seen it there, or at least the Newcastle specimens are not the same as those of Tasmania, which are very like those of the Ipswich (Q.L.) Mines, and probably as already stated, belonging to *Podozamites lanceolatus*, Lindley and Hutton.

#### FOSSIL PLANTS OF UNCERTAIN AFFINITIES.

##### NÆGGERATHIOPSIS. Feistmantel.

Leaves unknown, leaflets (pinnules) wedge-shaped from the base or elongate-spathulate, sub-rhomboid or obovate, margins

\* See Physical Description of N. S. W. and Van Diemen's Land, by P. E. de Strzelecki, London, 1845, p. 250.



straight or incurved ; nerves close and numerous, somewhat thick at the base, and from thence forking twice or oftener, becoming slender and diverging into the leaf.

This is a genus erected by Dr. Feistmantel in 1878,\* for certain leaves from the Talchir-Karharbari beds, which had been previously classed as *Nöggerathia*. To this latter genus had been referred similar fossil plants from the Newcastle beds by Dana, and also other leaves from the Jura rocks of the Altai mountains. A comparison since made, has shown that the whole of these leaves belong to closely allied plants, though Prof. Schmalhausen working independently, has called his genus *Rhiptozamites*. In Australia, they occur in paleozoic strata. In India, they are Liassic, and in the Altai, Oolitic. They differ in many ways from true *Nöggerathia*, a genus which includes a very miscellaneous assortment of plants. Some are probably Conifers and some Cycads, while Dr. Heer suggests that *Noeggerathiopsis* is a connecting link between the two. Dr. Feistmantel states (l.c. p. 156) that his father had made the discovery of a true Fern fructification of sporangia and spores in *Nöggerathia foliosa*, Sternberg, of the Bohemian coal measures, but this cannot be held to apply further than to that one species. The species are not to be confounded with either *Schizoneura* or *Zeugophyllites*, as the venation of the leaves clearly shows.

*Noeggerathiopsis spathulata*, Dana (l.c., p. 715, pl. 12, f. 9.) Leaves short, spathulate ; apex triangular and subacute, narrowed at the base, and thence gradually dilating, nerves very delicate and only partially distinct—four or five veins in the breadth of a line.

In the figure given of this fossil by Dana there is a cluster of leaves radiating from a common base, each nearly  $2\frac{1}{2}$  inches long. "In this cluster," says Dana, "which is evidently a natural group, the leaves are of different sizes. The younger are quite narrow, oblanceolate ; length five times the greatest breadth, and have a tapering apex. The older are nearly an inch broader towards the apex, the base of the largest is but a little over  $1\frac{1}{2}$  lines, and from this base they widen till within half an inch of

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\* Records Geol. Surv. India, vol. xi., p. 23.

the apex. The centre from which the leaves radiate has a shining coaly aspect, as if a soft bud or vegetable base of some thickness had been pressed down and carbonized. The same specimen contains a portion of another similar group.

*Noeggerathiopsis media* (Dana), loc. cit., pl. 12, fig. 10. Elongate lanceolate, tapering towards the base and broadest within an inch of the apex. Extremity subtriangular, and apex rounded. Veins a little divergent about fifteen to half an inch. One leaf five inches long, about an inch wide within an inch of apex, and a fourth of an inch at base; another shorter. Newcastle.

*Noeggerathiopsis elongata*.—This is a doubtful species which Dana identified with Morris' *Zeugophyllites elongatus*, but says that it was found at Newcastle, which is clearly an error. He says that it may be identical with Goeppert's *N. distans*,\* but that plant grew in clusters, and, moreover, had veins bifurcating in the middle, which does not occur in Morris' fossil.

*Noeggerathiopsis prisca*, Feistmantel (Pal. Flor. Oest. Aust., p. 158, pl. 16, fig. 3). Leaves unknown, leaflets (pinnules) medium-sized, sub-rhomboid, obovate, slightly inequilateral. Nerves close and fine, emerging radiately from a narrow base and forking twice or thrice.

Greta Creek, N.S.W., under the marine paleozoic fossiliferous strata.

#### CORDAITES. Unger.

Stem a simple woody cylinder without medullary rays, but composed of radiating scalariform vessels, encircling a large pith with transverse lamellar partitions. Bark marked with leaf-scars. Leaves simple, sessile, very long, flat, parallel-sided, with broad clasping base, easily disarticulated from the stem, no midrib, but fine parallel neuration.

These plants are variously placed by different authors. The leaves have certainly the aspect of endogenous plants, but the stem and woody tissue are cryptogamic. Schimper regards them as coniferous. They are characteristic of the Devonian and Carboniferous periods.

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\* Tchihatcheff's *L'Altai Oriental*, p. 385, pl. 28, fig. 8.

*Cordaites australis* M'Coy (Pal. Vict., Decade 4, p. 22. Plate, 36, figs. 6 and 7.) Leaves several inches long, thick, flattened, parallel sided, with unequal, longitudinal, simple parallel striæ; clasping base slightly widened and bent a little downwards. Leaves at one inch from the base, about four to five lines wide; base about two to three lines wider.

"The leaves of this species although narrow, are much thicker in the substance than in any of the other known species, and the parallel veins are more unequal and less distinct, the larger having fewer and sub-equal small ridges with much more numerous sub-equal fine striæ, thus approaching more to the foliage of *Dammara* and favoring M. Grand-Eury and Prof. Schimper's idea of coniferous affinities. Common in the Upper Devonian flags of Iguana Creek."

I believe I have identified the same species in the shales and slates of Gympie, Queensland (Lady Mary shaft), and also in the sandstone ranges at the Drummond Range (Bobuntungun in the sandstone, about one mile west of the railway station.)\* In both it is not very abundant.

#### CLASS CONIFERÆ.

Trees or shrubs, mostly with resinous secretions, the leaves are stiff, sometimes linear or needle like, sometimes short and scale like, or more rarely broad, lobed, or divided. The flowers are unisexual, either in cylindrical or short catkins, with closely packed scales, or the females are solitary. There is no perianth. The stamens in the males are either inserted on the axis of the catkin under the scales, or the anther-cells are sessile, on the inside of the scales themselves, which then form part of the stamens. The ovules and seeds are naked, that is without ovary style or pericarp, although sometimes more or less enclosed in two bracts, or in a fleshy or hardened disk. The seeds are albuminous with one, or sometimes several embryos in the centre, each embryo having sometimes more than

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\* It is very common in the fragments of stone of which the embankment is made at the Medway bridge, with *Lepidodendron*.

two cotyledons. There are probably nearly two hundred species known, dispersed over a great part of the globe, several of them forming large forests in temperate climates, or more rarely within the tropics; while some of them extend almost to the utmost limits of woody vegetation in high latitudes, or at great elevations. They are distributed into about twenty-five genera, forming three tribes or sub-orders:—1. *Abietinæ*, with the fruits collected in cones and inverted ovules; of this the principal genera are *Pinus* (including *Abies*), *Araucaria*, *Cunninghamia*, *Sequoia*, &c. 2. *Cupressinæ*, with the fruits collected in cones and erect ovules; including *Juniperus*, *Callitris*, *Thuja*, *Cupressus*, *Taxodium*, *Cryptomeria*, &c. 3. *Taxinæ*, sometimes considered as a distinct family, with the fruits solitary or loosely spiked, including *Podocarpus*, *Dacrydium*, *Phyllocladus*, *Salisburia*, *Taxus*, &c.

The woody tissue of the trees of this family is seen to be marked with peculiar circular dots or punctuations, when examined under the microscope. The ovules at the base of each cone-scale are generally held to be naked, each ovule having a large opening at its apex, to which the pollen from the anthers is applied directly. But some say that the ovules are not naked, but are contained in a proper ovary, which is closely applied to the seed; that the outer membranous scales are modified leaves; and that the hard scales are altered bracts bearing the pistillate flowers.

Some botanists look upon Conifers as the highest type of true dicotyledons.

We have abundant evidence of the existence of Conifers in Australia, in almost all our plant beds except the very earliest coal formations. This is necessary to bear in mind, because Morris in Strzelecki's work already referred to, lays stress upon the absence of such woods from the N.S. Wales specimens. Wood, leaves and scales of Conifers, are mentioned by Dana. Many specimens of coniferous wood, are reported to occur in the lower coal measures, Greta Creek. Wood and leaves are found in the Jerusalem Coal Basin in Tasmania, and both are common as we have seen in the Ipswich coal beds and in the Tivoli Mines in Queensland.

Fragments of a kind of jet, in which however, the coniferous structure is very visible, are common also in the Desert Sandstone in Queensland. Finally, there are some fossil *Walchia*, which evidently bore a large share in forming the coal at Ballinore.

During the Triassic and Jurassic periods the exclusive reign of cryptogams had given place to an almost exclusive reign of Conifers. They formed the principal part of the vegetation in those times and gave it its particular aspect. *Lepidodendron* still lived but held a subordinate place, and at the same time Tree-ferns and Cycads in new forms of vegetation took their places amongst the Conifers. At the epoch of their first appearance these as far as fossil evidence will enable us to judge were represented by one type, and that was the araucarian type, at least that is the structure of the most ancient form of coniferous wood known. Several forms closely allied give us the gradual history of the differentiation of this proto-araucaria. Towards the middle of the Jurassic period, the Cypresses appear while successive forms of *Araucaria* have disappeared during the Permian, Liassic and Jurassic periods. From this epoch *Araucaria*, formerly so numerous commenced to decline in Europe and was represented only by the genus *Eutacta*, which appeared towards the close of the Jurassic age, and only grows now in some isolated localities of the southern hemisphere. With the close of the tertiary period the age *Araucaria* became extinct in Europe, and was replaced by the Abietinæ (Silver and Spruce Firs, Larches and Cedars), which has assumed the lead of the Cypresses. Nevertheless the Abietinæ though in the first rank of Conifers in the present day, is not nearly so numerous as it was during tertiary times.

The genus *Araucaria* (including under this name the genera *Colymbea* and *Eutacta*), has entirely quitted the northern hemisphere, where its first traces were seen in the Oolitic times. It is now confined to the south. One species inhabits the mountain ranges of Brazil; a second extends southward of Chili to Patagonia. There are only five other species known, and these are confined to Australia and a few Pacific Islands close to Australia. All the Araucarieæ are distinguished by having the

scales of their cones one-seeded. In *Araucaria* proper, leaves are scale-formed, persistent, and widest at the base. The flowers are male and female on separate plants; the cones are mostly large globular, terminal, with scales partially or entirely deciduous, and the seeds more or less attached to them. *Colymbea*, a true *Araucaria*, with broad lanceolate leaves, and seed leaves germinating under ground. *Eutacta* (false *Araucaria*), with awl-shaped leaves and seed leaves germinating above ground. *Dammara*, with broad, flat, stalked leaves, opposite, alternate and leathery, cones axillary, scales persistent, seeds attached. See Schimper, *Paleontologie Vegetale*, vol. 2, p. 227, whose views I have summarized in the above remarks.

#### SUB-ORDER TAXODIACEÆ.

Leaves and scales of the strobilus or cone disposed spirally, rarely decussate. Leaves of very varied forms according to the genera either squamose, acicular or linear, falcate or narrow, spreading on every side or distinctly flattened. Bracts of the scales adnate more or less produced. Scales often ligneous, somewhat thick, not numerous. Ovules 2 to 9, inverse or erect.

In this sub-order is included one living Australian Conifer, *Arthrotaxis* which is indigenous to Tasmania, but according to this arrangement our common pine *Frenela* or *Callitris*, would be found amongst the CUPRESSACEÆ. Among the TAXODIACEÆ is included *Brachyphyllum* which is however doubtfully so placed as its true position and relations are matters of dispute.

#### BRACHYPHYLLUM. Brongniart.

Shrubs or trees. Branches irregularly pinnately ramulose. Leaves extremely short, arranged spirally, densely close, bases dilate, contiguous, probably fleshy when alive, pyramidal, curved above, or from the mutual pressure of the bases pentagonal and hexagonal, produced into short or very short papillæ, long persistent, and with age as the branches thickens, dilating and becoming scutelliform, subsequently when falling away leaving raised contiguous rhomboid scars marked in the middle with vascular cicatrices.

No genus of living Conifers corresponds with these fossil plants. The leaves are short and fleshy, straight or curved, contiguous at the base, but with age they resemble pentagonal or hexagonal cushions which clothe the branch like a cuirass. In this state they have been mistaken for the cones of Cycads or Conifers. The leaf scars resemble those of *Lepidodendron*. The fruits are unknown, and therefore the systematic position is uncertain. They are generally Oolitic fossils.

*Brachyphyllum* (?) *australe*. Feistmantel (l.c., p. 98, plate 7, figs. 3 to 6, and plate 17.) Branchlets elongate, slender, flexuous, much branched, leaves spirally disposed, squamiform, rhomboid-oblong, somewhat thick, apex acuminate, sub-keeled and a little flattened, amentum covered with sub-rhomboid, acute, acuminate scales, the apex somewhat flattened and spirally disposed.

The form and position of the leaves corresponds well with the typical species of *Brachyphyllum*. Several specimens of this fossil were found in the Eskbank and Lithgow collieries.

*Brachyphyllum australe*, var. or n.s., *crassum*, nobis, Plate 5. Brong. Prod., p. 19, *Mamillaria desnoyersii*, Ann. Sc. Nat. pl. 19, fig 9. Unger. Gen. et Spec., p. 308 (included amongst cycadaceæ). Branches and branchlets rigid, coarse and thick, leaves more or less irregular in shape, and mammillately shield-like, bases contiguous, 5 to 6 angled. Schimper separates this fossil from *B. mamillare*, Lind. and Hutton, which is much more slender and with more numerous branches. It is found abundantly in the Oolite of Oxford, Wiltshire, Yorkshire, and in several places in France. The above is Schimper's definition.

In the Geological Magazine for 1869 (vol. 6) there are figs. at Pl. ii., figs 12, 13, of branches of a coniferous plant, which Schimper identifies with this species. That which I distinguish as a variety of the same, may be thus described. Plant robust, thick, stem and branches, repeatedly dichotomous. Leaves thick and fleshy, densely crowded, homodromous, short, broad, obtuse, conspicuously keeled, erect, closely imbricate, but slightly spreading. Branches and branchlets very little narrower than the parent stem, and of equal width to the summit. All portions of the plant curved.

Three leaves visible in each spiral. About three rows in a centimeter. Length of leaves, from 2 to 3 mill. ; breadth, from 5 to 6. Diam. of cauline stem at widest part, 10 mill. ; of branchlets, 8 mill. ; length of shortest, 18 mill.

Amongst the fragments imbedded around, there are some with rhomboidal depressions like lepidodendroid scars. These are stems from which the leaves have been shed. They are about 30 mill. long and 2 wide.

Ipswich coal, the only specimen I have seen.

#### TAXITES. Brongniart.

Leaves linear, narrow, or sub-falcate, obtuse, coriaceous, fleshy, with a median rib ending in a minute mucrone, flat, furnished with a half-twisted pedicel which is briefly decurrent.

This is a mesozoic genus of few known forms, about some of which Schimper says that he would not venture to offer an opinion. No doubt it includes different genera as those groups known only by the form of the leaf must necessarily do. They are known from Italy and Greenland, besides two species from the Upper Gondwana system (Jabulpur, Sripermatúr, and other places) on the Madras coast. The general habit and form of the leaves shows that we are dealing with plants closely allied to our living species of *Taxus* or Yew.

*Taxites medius*, n.s., Pl 9, fig. 3. Branchlets thin, leaflets spirally and bilaterally disposed, emerging at an acute angle, sub-alternate, sometimes slightly curved outwards, narrow linear, obtuse, rather long, and the decurrent pedicel thick, long, and broad (nearly as broad as the leaf at times). Midrib thick and conspicuous, surface shining and transversely wrinkled. Ipswich, Q. L., precise locality unknown.

This specimen is on a stone which has impressions of *Equisetum* stems and *Thinnfeldia odontopteroides*. The fossil is conspicuously shining, no doubt from its coriaceous surface, the wrinkling of the leaves is due to their fleshy nature. The number of detached leaflets scattered on the stone manifest their deciduous attachment. I name the specimen from its intermediate character between the



two Indian forms, *T. tenerrimus*, Feistm., which has very small horizontal leaflets, and *T. planus* which has also horizontal leaflets but much longer and broader.

#### SEQUIOITES. Carr.

Named from the close connection with *Sequoia*, Endlicher, a genus of splendid trees of gigantic height, separated from *Taxodium* on account of the non-deciduous leaves, and the seeds being from 3 to 5 in each scale. Leaves subulate, flat or scale-like in two rows. Flowers monœcious, male and female separate, but on the same plant, solitary and terminal in the living (*S. sempervirens* Endl., the Californian Redwood), but axillary in the fossil species. Anthers numerous, bilocular, connective peltoid. Female amentum terminal, densely covered with imbricate scales. Cones small, sub-globular, or obtusely oval and woody, the scales inserted almost horizontally, wedge-shaped and truncate. Seeds (in the fossil species) 5 to 7, affixed to the base of each scale, and winged nearly all round.

This genus is by most botanists made to include *Wellingtonia*, from which it can only be distinguished by the seeds being always as stated, and not four in number. The leaves are flat and yew-like, while in *Wellingtonia*, they have always a triangular section, and are closely imbricated. *Sequoia sempervirens* and *gigantea*, Lindley, are the only living species. The first is spread over all the mountains of the west side of North America and in the south of California. The other species is limited to a few places in California. Amongst the fossil species, *S. langsdorffii* cannot be distinguished from the living *S. sempervirens*. It occurs in the Miocene strata of Switzerland, Vienna, Berne, Italy, and Eastern Europe. It also occurs amid plant remains of similar age in Vancouver's Island, and on the edge of the Polar regions. *S. sternbergii* (tertiary) approaches *S. gigantea*, while *S. couttesia* is a medium between the two. The earliest recorded appearance of the genus is in the Cretaceous period.

To this species I am inclined to refer a species which appears to be very common in the plant beds of Rosewood near Rockhampton

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where it is associated with *Ptilophyllum oligoneurum*. It is of course only an approximate identification, as no cones, either male or female have been hitherto discovered. I think they should be abundant from the number of the leaves, but as yet the beds have been only explored by myself, and I merely collected stones from the surface. I give the plant therefore a name provisionally, not meaning to pronounce positively upon its characters, but only its resemblances. If the surmise—for I can call it little better than a surmise—be verified, it will be the first time that *Sequoiites* has been identified south of the equator. This however will not be so surprising since the genus *Phyllocladus* of Tasmania extends into Borneo and *Arthrotaxis* of the southern hemisphere can hardly be separated from the Chinese *Cunninghamia*. We have no Australian Conifer with leaves similar to *Sequoia* except *Podocarpus*, but though in some species of that genus the foliage is long, flat, and with a prominent midrib, there is a distinct petiole which in this fossil is wanting.

*Sequoiites* (?) *australis*, n. s. Leaves very close, two rowed (?) spread out, flat, alternate, straight, rarely falcate, smooth above, midrib prominent below, rounded at the apex, towards which there is only a very slight tapering, not contracted at the base but becoming a sheath, down the centre of which the midrib can be distinctly traced, from 20 to 25 millimetres long, and  $1\frac{1}{2}$  wide, but much shorter and smaller near the extremities of the shoots, where they are somewhat imbricated all round the branch, and loosely spiral. The sheathing base of the leaves gives rise to a jointed appearance to the stem. Length of longest fragment 91 millim., on which there were about 50 leaves; width about 25 millim., at base tapering to 8 mill. Pl. 7, fig. 5.

ORD. ABIETACEÆ. Fam. WALCHIÆ.

Schimper says that it was the system for a long time to place in genus *Araucarites* every impression of the branches of Conifers whose leaves showed some resemblance to the leaves of *Araucaria* of the group *Eutacta*. A better acquaintance with these plants, which arose from the discovery of inflorescence and fruits enabled paleontologists to show that most of the species had nothing in

common with *Araucaria* except the leaves and the structure of the wood. In other respects they were found to belong to many widely separated families. The genus *Araucarites* is now restricted by Schimper to two species. In referring as I do to the following species to the genus *Walchia*, I do so mainly because of the general similarity of the leaves, and the structure of the male amentum to which I shall presently refer. Otherwise the resemblance is to *Araucaria* as far as the leaves go.

WALCHIA. Sternberg.

Arborescent plants of the habit *Araucaria* of the sections *Euctata*\* or *Dacrydium*, branches pinnate, ramulose, branchlets alternating and spreading. Leaves of two kinds, the shorter ovate or linear imbricate, the longer linear lanceolate and gathered into a tuft, incurved at the apex, or falcate and erect from the base, subdecurrently spreading, keeled on the back and finely striate. Cones terminal, oblong, cylindrical or elongate, scales ovate-acuminate or lanceolate, seed solitary in each scale, ovate, minutely apiculate. Male amentum (?) composite, anthers axillary, oval.

Schimper says of the genus that it partakes of the character of *Araucaria* and was for a long time regarded as a Lycopod in spite of its different mode of ramification. (*Lycopodites*, Brongniart and Unger.) With *Ullmannia* it is characteristic of Permian period. They are the most ancient Conifers of which the leaves and fruits are found, though coniferous wood occurs in the oldest paleozoic carboniferous formations. The two genera named disappear in Europe at the close of the Permian. *Voltzia*, *Albertia* and *Glyptolepis* take their place in the Trias.

*Walchia milneana*, n.s. Plate 2, fig. 3. Branches obtuse, leaves very closely imbricate, spirally disposed so as to leave three to four visible in each spiral; falcate, acuminate, breadth at base, half the length, mucronate, in young branches, obtuse in the older ones, curving together in linear scale-like leaves at the top.

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\* In this section *Euctata* the cones are small, terminal and globular; unequal shaped and small. In *Dacrydium* the fruit is fleshy and erect, and the leaves acicular or scales and opposite. The *Araucarias* moreover differ from the pines and firs in having the sexes on separate trees.

By the side of one of the specimens, there is the end of a branchlet, which for a part of its course has crowded narrow leaves, much longer than the others. There is also a fragment whose leaves are broad and acuminate. Number of leaves visible in a branchlet, 25 mill., long, 16. Average length 5 mill., width 2 to 2½ mill. The narrow long leaves referred to, are 10 mill. long by 1 mill. wide.

From Ballinore coal field, Talbragar near Dubbo, where it appears to be abundant.

With the branches and stems are associated certain remains, which I regard as the male amenta, of which a figure is given at Pl. 6, figs. 7, 8. They are distichous spikes, with closely set scale-like bracts in pairs, lying closely together and projecting in a long thin scale, like the glume of wheat, within this there is a scale with four distinct projections like a comb, within these may have been situate the anthers. In Goeppert's Foss. Flor., d. Perm. Form., pl. 49, fig. 13, there is a figure of what has been regarded as the male amentum of *Walchia piniiformis*, Sternberg, in which these peculiar teeth on the scale are given on the summit of the figure.

#### CUNNINGHAMITES. Presl.

These Conifers are distinguished by their general resemblance to the genus *Cunninghamia*, R. Brown, a genus only known by one living species, which is the common native fir of China. It is thus described : Leaves lanceolate, quite entire, flat, sessile, spreading, rigid, pungent, bent downwards, one inch and a half long, and disposed all round the branches and stems except on the old lateral ones where they are arranged in two rows. Branches generally in whorls, lower ones horizontal, but those near the top ascending. Branchlets opposite in two rows and spreading. Male catkins, terminal in clusters, cylindrical and near an inch long. Cones globular, three or four together, but sometimes solitary, sessile, drooping, smooth, and about the size of a walnut. Scales ovate, tapering to a sharp point, leathery, sharply denticulated on the margins, thin and free at the points.

Three fossil species are known in Europe, all from Cretaceous rocks, and one from the Lower Jura or Upper Lias coal beds of India. It was named *C. inaequifolius*, Oldham and Morris, but Feistmantel thinking the name inappropriate changed it to *C. dubiosus*. The specimen is very imperfect. See Foss., Flor., Gondwana, vol. 1, p. 140, pl. 33, fig. 3, 4. Also Lindl. and Hutt., Foss., Fl., vol. II., pl. 127, where there is a figure of the living species with an axillary cone. Also Goeppert, Monogr., d. foss., Coniferen, pl. 47, fig. 5.

In the specimens found at Rosewood, Ipswich, there are two or three with male amenta in terminal clusters which are figured here rendering the identification of the genus much more certain. The leaves, however, are seldom entire, which gives the appearance of an obtuse or unequal foliage which is seen in the Indian fossil.

*Cunninghamites australis*, n. s. Plate 3, fig. 1, 2, 3, plate 4, fig. 1. Leaves long, linear, pointed, decurrent, entire. Male amenta in rather thick corrugated clusters at the ends of the branches. Generally two of the amenta are alone distinct in the fossil, but others can always be traced in the centre: they are *curved*.

Abundant in a pale, yellowish shale, at Rosewood, where no doubt a careful search would enable us to restore the plant completely.

#### PINE FRUITS.

*Araucarites (?) polycarpa*, n. s. I give this name to a fruit cone, of which a figure is given at Pl. 10, fig. 1. It was found in a conglomerate partly derived from the coal beds of the Burnett River, Q. L., but it may be of subsequent date or even Tertiary. It is an ironstone (limonite) concretion. The inside of the fruit has been dissolved, leaving a cast of the external portion beautifully preserved, except where it is covered by a black vitreous iron ore which fills the centre. The whole formed a brown water-worn stone, which being broken across in making the railway ballast discovered the fossil inside.

## EXPLANATION OF PLATES.

NOTE.—The heliotypes though at first sight indistinct, will bear examination with a hand lens, when all the detail will be distinctly seen. Type specimens of all new species, except *Sph. bayleyana*, are in the Macleayan Museum.

## PLATE I.

- Fig. 1. *Vertebraria towarrensis*.  
 2. Ditto ditto.  
 3. *Vertebraria equiseti*.  
 4. *Vertebraria towarrensis*.

## PLATE II.

- Fig. 1. *Equisetum latum*.  
 2. *Sphenopteris flabellata*, var. *erecta*.  
 3. *Walchia milneana*.

## PLATE III.

- Fig. 1. *Cunninghamites australis*.  
 2. Ditto terminal branch with cluster of male amenta.  
 3. Portion of branch of same.  
 4. *Sphenopteris crebra*.  
 5. Male amentum of *Walchia milneana*.  
 6. *Gleichenia lineata*.  
 7. *Trichomanides spinifolius*.

## PLATE IV.

- Fig. 1. *Cunninghamites australis*.  
 2. *Sphenopteris bayleyana*,  
 3. *Jeanpaulia bidens*.  
 4. *Sphenopteris glossophylla*.

## PLATE V.

*Brachyphyllum crassum*.

## PLATE VI.

- Fig. 1. *Thinnfeldia media*,  $\frac{1}{2}$ -nat. size.  
 2. *Merianopteris major*,  $\frac{1}{2}$ -nat. size.  
 3. Ditto pinnule enlarged.  
 4. *Alethopteris currani*.  
 5. *Equisetum rotiferum*.  
 6. Ditto diaphragm.  
 7. *Walchia milneana*.  
 8. Ditto male amentum.  
 9. *Phyllothea concinna*, sheath leaves.

## PLATE VII.

- Fig. 1. *Cunninghamites australis*, male amenta.  
 2. *Ptilophyllum oligoneurum*.  
 3. Ditto ditto.  
 4. Ditto single leaflet enlarged.  
 5. *Sequoiites australis*.

## PLATE VIII.

- Fig. 1. *Thinnfeldia falcata*.  
 2. *Gleichenia lineata*.  
 3. *Podozamites distans*.  
 4. *Neuropteris (Aneimidium) australis*

## PLATE IX.

- Fig. 1. *Alethopteris concinna*.  
 2. *Phyllothea carnososa*.  
 3. *Taxites medius*.  
 4. *Sagenopteris rhoifolia*.

## PLATE X.

- Fig. 1. *Araucarites polycarpa*.  
 2. *Trichomanides laxum*.

## PLATE XA.

*Macrotaeniopteris wianamatta*.



## CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY THE REV. B. SCORTECHINI, F.L.S.

During a short stay at Stanthorpe, a township situated in Queensland, near the borders of New South Wales, I happened to make several botanical excursions in its neighbourhood, and being fortunate in discovering a few plants new to the Queensland Flora, I hasten to communicate to this Society the result of my observations. The inland as well as the littoral south Queensland districts need to be more thoroughly searched before a complete Flora of the colony can be worked out, not to mention that many valuable additions may be expected both from the northern and western regions. In drawing up a list of these plants, I have availed myself of the systematic census of all Australian plants now with great care and much assiduous labour, elaborated by Baron von Müeller, to the great advantage of Australian Botany. Thus, it was an easy matter to discard from the present list any species, which other workers in the field might have found about the same locality. Only such plants therefore, are here admitted as the latest data of our knowledge in geological botany have not hitherto attributed to Queensland.

The vicinity of Stanthorpe where these plants were obtained, stands on elevated ground. The elevation from the sea level attains something like 3,000 feet. Snow and frost are not strangers there in the winter season, while the summer months are more enjoyable there, than in any other spot in Queensland. Colonists who to avoid the summer heat, resort to the sea coast, would do well to spend these days on the high elevations of Stanthorpe. It is the lofty region of the Blue Mountains that Sydney affords to its inhabitants when in quest of pure air, and bracing climate. The modest scenery around Stanthorpe cannot be indeed compared with the grand awe-inspiring scenes which are seen amid the Blue Mountains. Still here and there nature displays such sights as are not easily forgotten, and the lover of plants finds here much to gratify his heart.



The geological formation of the country is granite. It is a continuation of the main axis of the eastern table land, rich in mineral deposits. It differs from the Blue Mountains, which are sandstone, although the detritus of both look much the same. It is very striking to meet several sub-alpine plants common to both. From which we may safely infer that the character of vegetations depends more on climatic agencies, than on the nature of the soil.

It may be well to note here, that nearly every one of the plants of which I subjoin a list, was discovered by Mr. C. Stuart, in the adjoining district of New England, within the borders of New South Wales.

#### RHAMNACEÆ.

*Pomaderris prunifolia.* A. Cunn.

Close by a rivulet that wends its way through rocky ridges a short distance north of Stanthorpe, a tall straggling shrub growing abundantly in company with *Acacia decurrens*, *Melaleuca* and *Leptospermum*.

#### LEGUMINOSÆ.

*Mirbelia speciosa.* Sib. in Dl. Prod. II., 115.

Judging from the general aspect, the verticillate leaves and pods, the identification of the specimens gathered among barren rocks with this species seems nearly certain. Flowers were wanting. While it is very abundant on the Blue Mountains, it appears very scarce around Stanthorpe, at least in those places which have been visited. C. Stuart has traced it to New England. The further it removes from its central home, the Blue Mountains, the less copious it becomes, till at a lower altitude, or more northerly directions it ceases to grow.

#### MYRTACEÆ.

*Baeckea densifolia.* Sm. in Tran. Linn. Soc. iii., 266.

On wet clayish flats, growing side by side with the small-leaved variety of its congener *B. crenulata*, with which it shares the general habit. Yet close inspection discloses a very marked difference in the leaves, in the number, shape, and dehiscence of the anthers, in the form of filaments, and above all, in the number of the ovary cells. It is nearer to *B. virgata*, with which it is

classed under the same section, yet inflorescence and form of leaves separate them both one from the other. It is distinct too, at any rate as a variety from *B. Nova-anglica*, or *Babingtonia Nova-anglica* of Müeller gathered in New Zealand. The smallness of the flowers, the obtuse and not turbinate shape of the calyx at the base point to the typical form.

*Callistemon pithyoides*, Mig. in Ned. Kruidk. Arch. iv., 142.

What I forwarded to Baron von Müller as a doubtful *Melaleuca*, he recognises as this species, of which other specimens had been sent to him with perfect flowers from other quarters. While the flowers of this plant remained unknown, in generic position it was hovering between a *Callistemon* and a *Melaleuca*. Miguel with some hesitation, throws it among the *Callistemons*, while in Baron von Müller's Herbarium, it was named *Melaleuca*. The inspection of flowers now dispels all doubts as to its being a *Callistemon*, and it must henceforth be placed in that genus. On swampy ground, a low bush bearing the aspect of a stunted *Melaleuca nodosa* may be seen growing near Stanthorpe, close by the creek, or a few miles away at a short distance from the foot of a hillock, enjoying the more pretentious name of Blue Mountains. It is our *Callistemon*. At the time of my ramble the rather copious individuals of this species scattered all over the swamps had done flowering. Only here and there some stray young shoot was lagging behind to yield scanty blossoms.

*Melaleuca armillaris* Sm. in Trans. Linn. Soc. iii., 277.

A handsome free flowering shrub, growing in abundance along the banks of Quart Pot Creek. The general aspect is that of *M. linearifolia* of the semi-tropical coast districts, with which at the first sight I had confused it. The arrangement of the leaves, the much longer staminal bundles, with long slender filaments, pinnately set, and the very loose flowering spikes separate it from *M. linearifolia*, although both are united under the same section of *spiciflorae*.

*Eucalyptus capitellata* Sin. Bot. Nov. Holl. 42. var.

A tree of not very imposing dimensions growing chiefly on flats close to Stanthorpe. Whether I am right in referring it to this

species further observation will decide. The exact sameness of the fruiting calyx, and shape of leaves would make it pass for *E. capitellata* without any doubt. Yet there is a divergence in the shape of the lid which comes near that of *E. macrorrhynca*, with which *E. capitellata* is closely allied. The operculum of the Stanthorpe specimens is neither so conical as that of *E. macrorrhynca*, or so hemispherical as that of *E. capitellata*. The excellent figures of both species drawn for Baron v. Mueller's imperishable work on Eucalyptus when compared with our specimens render this fact evident. As all other characters agree with *E. capitellata*, the departure, not great indeed, in the shape of the operculum will warrant the distinction as a variety from the normal *E. capitellata*.

#### UMBELLIFERÆ.

*Actinotus Gibbonsii* F. v. M. Frag. VI, 23.

The only other station recorded for this plant is M'Leod's Creek in New England, where E. Stuart first discovered it. It may be passed over unnoticed by any collector owing to its humble decumbent habit, and strongly contrasts with its more showy congener *G. helianthi* Labill. This may be seen growing close by, on long stalks, the snow white softly velvety flower heads, while the sessile umbels among rocks make the small species easily escape observation.

#### COMPOSITÆ.

*Aster ramulssus* Labill., Nov. Holl. Pl. sp. 51.

At the time this plant was collected the florets and achenes were gone, only the scarious involucre remaining, this, the habit of the plant, and leaves, have been the only clue leading to its discrimination. Abundant on those granite hillocks which form quite a feature of the Stanthorpe scenery.

*Brachycome discolor*, C. Stuart in Benth. Fl. Austr.

*Brachycome Stuartii* Benth. Fl. Aust. III, S.B.

*Brachycome ciliaris*, Less syn., comp. 172.

Three *Brachycomes*, which along with *B. multifida* grow together on damp flats, not far from Stanthorpe. The redness of the under side of the leaves of *B. discolor*, as noticed by E. Stuart, is very

apparent in fresh specimens. *B. multifida* was first collected by me within Queensland borders on the Maranoa about twelve months ago. Within a short time there have been four species of *Brachycome* added to the scanty number of species already known to belong to Queensland. Further additions may be expected of the thirty-eight species recorded for Australia. New South Wales musters the largest number, thirty-one being endemic there, whereas Queensland, even including those newly discovered possesses no more than eight species: considering therefore that the head quarters of the genus lies in temperate climate we may expect more species in the cool regions within Queensland boundaries.

*Leptorrhyncus squamatus* Less. Syn., comp., 273.

The same plant has been seen by me in the neighbourhood of Roma. Around Stanthorpe it is rather scarce. It has been noticed in two or three places close to the creek that runs by Stanthorpe.

#### GOODENACEAE.

*Dampiera Brownii*, F v. M. Frag. VI, 29.

Only few specimens of this species were obtained near a gully about a mile from Stanthorpe. Under this specific designation several varieties are now grouped, which were once considered by R. Brown as distinct species. What I gathered on the Blue Mountains as *D. Brownii* on many minor points shows a divergence from the Stanthorpe specimens.

#### LOGANIACEAE.

*Logania floribunda.*, R. Br. Prod. 456.

Along a streamlet which wends its way to Quart-pot creek among rocks a few individuals of this species may be seen growing with *Pomaderris prunifolia*, *Acacia decurrens*, *Leptospermum*, &c. At the time when my collection was made the flowers were gone, giving place to the capsule which has been a secure guide to its identification. The same plant I have gathered on the Blue Mountains.

## JASMINEÆ.

*Notelea linearis*, Benth. Fl. Austr. iv. 300.

Very plentiful down the creek a short distance from town, growing among boulders. The dark red, and occasionally white drupes, which were rather abundant on the branches, have been the only data remaining for the determination of the species.

## PROTEACEÆ.

*Hakea microcarpa*, R. Br. in Trans. Linn. Soc., X, 182.

The flowers were not obtainable to see the sectional characters of this species, still the leaves, the horned fruit, and form of seed wing afford enough evidence for its recognition. Rather plentiful along the sandy banks of the creek.

*Hakea dactyloides* Cav., Ann., Hist., Nat., I, 213.

Unfortunately the flowers of this species too were wanting at the time the specimens were collected. By a process of analytical reasoning alone I was able to arrive at framing a nearly certain estimate as to the identity of the specimens with *H. dactyloides*. Of section *Grevilloides* to *H. trineura* alone it could approach, but the short clusters of flowers as the position of the fruits suggest remove it not alone from *H. trineura*, but from the whole section. In section *Euhakea* there is no species either eastern or western with flat, triply nerved leaves, such as our *Hakea* possesses. The three first series of section *Conogynoides*, including all western species, afford no type to which our plant can be referred. The last three series of the same section, that is *Uninerves*, *Enerves*, and *Teretifoliæ*, as their very name implies, exclude this three nerve leaved *Hakea*, as also the last section of *Manglesioides*, including all western, and either terete or nerveless leaved *Hakeas*. There thus remains only the series *Nervosae* of *Conogynoides* sheltering species with leaves lanceolate or linear, three or more nerved, where our specimens may find a place. Pursuing the same process of comparison further within the precincts of this series, we come face to face with *H. dactyloides* offering much resemblance, if not entire identity with our plant. Minor points of difference are the rather curved beak of the fruit instead of being straight as described, the narrowness or total absence of the wing decurrent on the upper

margin of the seed ; the length and narrowness of leaves slightly departing from the normal form. There are specimens of *H. dactyloides* collected by C. Stuart in New England, having rigid narrow leaves nearly approaching those of *H. ulicina*, to which specimens ours appear to be very similar.

*Grevillea ilicifolia*, R. Br., Prot., Nov. 21, var., *Scortechini*,  
F. v. M., Mss.

On the sandy banks of a deep gully. Its trailing habit uncommon for the species, which is described as a large spreading shrub, the second racemes of flowers, the silvery underside of the leaves would at once suggest *G. laurifolia* of frequent occurrence on the Blue Mountains, or *G. repens* of more southern latitudes, or something between the two. It is a very marked variety of *G. ilicifolia*. Any botanist adopting less rigid views than Baron von Mueller on the nature of species would perhaps have raised it to specific rank. My impression was that its prostrate habit, the distance from where *G. ilicifolia* has its home with no intermediate stations, the rather more hemispherical than oblique follicle covered with a white tomentum which on the back turns deep purple in irregular lines, the larger flowers, the larger glans would have afforded sufficient characters to separate it specifically from *G. ilicifolia*. In a group of Grevilleas among which this is numbered, none of them presenting highly differential marks it seemed natural to give to it the same position as the others enjoy. After a careful comparison the learned Baron comes to the conclusion that this is simply a variety of *G. ilicifolia* resting on the larger size of the flowers, and greater prominence of the hypogynous gland. I learn from the same authority that occasionally *G. ilicifolia* is prostrate quite as much as *G. repens*, and that *G. ilicifolia* has been traced by him so far back as 1854, into N. S. Wales, though no record of it appears ever to have been published.

#### EUPHORBIACEÆ.

*Bertya rosmarinifolia*. Planch in Hook, Lond. Jour., iv., 473.

In the cracks of rocks cropping up close to Quartpot Creek, only a couple of capsules left on the plant have helped to its

identification. The flowering must have been over months ago, when the fruiting at the time of collecting was at an end.

## SANTALACEÆ.

*Choretrum lateriflorum*. R. Br., Prod. 354.

## CONIFERÆ.

*Callitris Muelleri*. Benth and Hook, Gen., pl. iii., 420.

There is no doubt as to this species. The fruit-cones, and the dorsal points of their valves point to no other *species*. A small pine-tree growing on very rocky ground.

## LILIACEÆ.

*Arthropodium laxum*. Sieb. in Boem, syst., vii., 441.

Rather abundant on grassy moist soil not far off Stanthorpe.

## ADDENDA.

*Bossicea scortechini*. F. v. M., in S. Science Record, January, 1883.

On rocky hills close to Stanthorpe, the description of this species by Baron von Mueller is now going through the press.

## DESCRIPTION OF TWO NEW FUNGI.

BY THE REV. C. KALCHBRENNER.

*Polyporus Pentzkei*, Kalchbrenner (Sect. Pleuropus).

Pileus tenuis coriaceus elongato-obovatus basi cuneatus fere concavus glaber zonatus ex-ochraceo-fuscidulus, linea recta in stipitem cylindricum aequilongum pallidum apice hand dilatatum descendens, pari stipiti concolores albido-ochracei minimi.

Daintree River, Pentzke.

*Paxillus hirtulus*. F. v. Mueller.

Pileus e convexo depressus margine involutus luride fuscescens, stipes deorsum incrassatus et pallidior ad basim abruptam radicans hirtulus, lamellæ adnatæ æqualiter decurrentes confertæ angustæ luridæ.

Daintree River, Pentzke.

Pluribus notis *P. sordario* convenit sed multo minor, pileus vix 3-4 lineas latus stipes circiter pollicaris et sesquilineam crassus.

## NOTES ON THE FRUCTIFICATION OF THE BUNYA.

BY THE HONORABLE JAMES NORTON.

In August, 1881, it was noticed for the first time in this colony at Ecclesbourne, Double Bay, and subsequently at Fernhill, Mulgoa, and also in the Queensland Gardens, that the Bunya (*Araucaria Bidwellii*) which had freely produced infertile cones for many years had then commenced to produce male catkins in abundance.

The tree which produced catkins in my own garden has since ripened several cones which are now falling filled with fertile nuts.

It is singular that the cones were all formed at a greater height in the tree than the catkins which were to fertilise them, and that the fruit should take so long a period of time (at least eighteen months) to come to perfection.

I have collected more than a bushel of the nuts, and one of them having been planted by a boy by way of experiment immediately germinated, but as the boy unwittingly placed the large end in the soil the root is at present growing upwards in the air.

The question whether the tree is monœcious or diœcious is now therefore beyond a doubt. In another part of the garden, at about eighty yards distance, I have nine other specimens of this tree, but these have never produced catkins, and out of fifty-one cones formed by them this year I have only obtained about twenty-six fertile nuts, while the tree first mentioned has produced nearly 1000.

I may here mention that two out of the three fertile nuts ripened by these trees, in 1881, before the appearance of the catkins in this colony, are growing and in a healthy condition, but as yet no difference can be perceived between them and the ordinary unhybridized plants though there can be little doubt that they are the result of fertilisation by some other *Araucaria*.

It may be interesting to botanists to state here that *Pinus insignis* is now producing cones freely. Although for several



years I have watched for the male inflorescence, if it may be so called, I have never succeeded in discovering it, but the only cone which I have yet examined contains fertile seeds.

This, however, may be due to some other pine of the same class, for the pollen is sufficiently light to be capable of being wafted by wind to considerable distances.

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DESCRIPTION OF SOME NEW AUSTRALIAN FISHES.

BY E. P. RAMSAY, F.L.S., &C.

*SAURIDA FEROX*, sp. nov.

D. 1/10. V. 9. A. 11. P. 14 to 15.

A horny tubercle on either side at the base of the tail. Length of head four times in the total without the caudal. The interorbital space equals the distance from the centre of the eye to the tip of the snout, and is nearly four times in the length of the head. Adipose eyelid well developed, extending to the nostril. Short diameter of the eye one and two-thirds in the snout, and one and a-half of the interorbital space, eight times in the length of the head, silvery with a narrow yellow margin anteriorly. The height of the body six times in the total length without the caudal. The dorsal fin commences opposite the thirteenth scale of the lateral line: the pectoral reaches as far as the vent and to the eleventh scale of the lateral line. The adipose fin is equal to half the length of snout from centre of orbit. A pale rose band below the lateral line followed by three or four of a yellowish tint: belly silvery, above the lateral line brown. Lateral line raised, keeled.

Hab. Port Jackson.

*BATRACHUS punctatulus*, sp. nov.

D. 12—16. A. 15. V. 1, 5. P. 21.

No branchiostegals. General color light sienna brown, spotted with blackish brown, larger spots on the back, the whole of the head above and below spotted. Pectoral fin broad and short, as wide as long; dorsal continuous, the rays about twice as long as the spines, tips of the fourth and fifth ray reaching to the membrane

M

of the caudal ray Caudal rounded of 22 rays. Height of the body at the vent six times, and at the ventrals  $4\frac{1}{2}$  times, in the total length. A strong row of curved canine teeth. The maxillary reaches to the vertical from nearly the middle of the eye; interorbital space  $\frac{1}{4}$  diameter of the eye; length of the snout about 13 times that of the eye; diameter of the eye  $3\frac{1}{2}$  in the length of the head; width of the head from the hinder margin of the orbit equal to the distance from thence to the snout, the length of the head to point of operculum  $3\frac{1}{3}$  of the total. Small scales on the body, none on the head, none on fins. End of maxillary free, overlapping the anterior portion of the preoperculum. No teeth on palate or vomer, pharyngeal teeth in a cluster, strongly curved inwards, a strong cluster at the base of tongue, narrow band of teeth on the maxillaries with an outer series with strong curved teeth set rather wide apart; in the lower jaw an inner and an outer series of strong incurved teeth, a series of smaller teeth between them: Lateral line bent under the 8th spine, the remainder of it straight.

*Hab.* Torres Straits, Queensland.

Said to live in holes in the sand.

Presented to the Museum by Mr. Cousens.

GENYORGE MACLEAYANA, *sp. nov.*

D. 11/14, A. 3/9, P. 17, L. lat. 60-70. L. transv. 10-11/20.

The first spine of the dorsal very short, the 5th, 6th and 7th, nearly equal and longest, the 8th ray longest, the others decreasing in length to the 14th; the 3rd spine in the anal longest and strongest, about a third longer than the 2nd, the first only  $\frac{1}{3}$  the length of the 2nd, and about  $\frac{1}{4}$  the length of the 3rd, the 4th and 5th ray longest, the 6th, 7th, 8th, and 9th gradually decreasing. Pectoral falcate, tapering to a point, the 5th ray longest. Lower jaw in advance of the upper. Deep notch on the preoperculum, the lower border of which is serrated; from 3 to 6 rows of scales on the cheeks; 12 to 13 on the gill-cover. Bony protuberance on the interoperculum comparatively small. The length of the maxillary equals the length of the snout from the anterior margin of the eye. The diameter of the eye is  $2\frac{1}{2}$  in

the snout. Length of the head three times in the body without the caudal. The height of the body from the first dorsal spine to the vent is  $2\frac{4}{5}$ ths in the length without the caudal. Color of a uniform, rich orange red, the centre of the scales being opalescent. On the caudal portion below the lateral line there are 9 to 10 scales and 7 above, between the last ray of the anal and the lateral line there are ten rows of scales; from the first spine of the anal there are 17 scales, and from the anus 18 below the lateral line and 10 above. Teeth moderate.

Total length 2 ft. 6 in. Pectoral fin  $7\frac{1}{2}$  in.; extent of dorsal  $13\frac{1}{2}$  in., of the anal 4 in. The height of the body 9 in.

This very fine specimen was captured at North Head by line.

D. 5/21. A. 17 to 18. PERCIS COXII, sp. nov.

The height of the body at the vent is five times in the length without the caudal; diameter of the eye one and a half in the snout, and four times in the length of the head; length of the head four times in the total; short diameter of the eye equal to the space between the eyes; operculum with a sharp flat spine; distance between the snout and the preoperculum equals the length of the pectoral fin; the ventrals reach to the anus; caudal very slightly forked; a black spot on the first dorsal; second dorsal opalescent, or slightly spotted at the base; color rich vermilion, with blue lines on the snout and between the eyes. There are remains of six or seven blackish transverse bands on the body. A series of strong incurved canine teeth in both jaws.

Hab. Port Jackson.

Presented to the Museum by James C. Cox, Esq., M.D., F.L.S.

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#### NOTES AND EXHIBITS.

The President read some "Notes on the Tuena Gold-Reefs," by M. F. Rate, Mining Engineer. The author gives a description of the workings, and of the mode of occurrence of the gold and the rocks associated with it. He points out the importance of the relations between eruptive and dyke rocks and mineral deposits, and calls attention to the rather unusual fact of the presence of calcite in quartz at the Lucky Hit reef.

The Rev. J. E. Tenison-Woods exhibited some of the Coal Fossils described in his paper, namely, *Sphenopteris crebra*, *Phyllothea concinna*, and *Taxites media*. Also a specimen of *Sagenopteris rhoifolia*, the second found in Australia, from the Oolitic plant beds, Darling Downs, Queensland.

Mr. Perceval Pedley exhibited specimens of Copper from Mount Hope and Great Central Copper Mines, including interesting specimens of malachite, blue carbonates, sulphides, and red oxide of copper, taken from various depths from the surface to 120 feet.

Mr. Alexander Morton, of the Australian Museum, exhibited a collection of New Guinea Implements, consisting of masks, clubs, stone adzes, belts, nets, drills, shields, ornamented pipes, &c. Many of the stone implements are unique and very interesting; one in particular was formed of a fossiliferous rock. These were portion of a large and valuable collection kindly lent by Mr. Wilson of Mason Bros.

Mr. K. H. Bennett exhibited specimens of the Spinifex or Porcupine grass (*Triodia pungens*), from the interior of New South Wales; also the Mallee hen (*Leipoa ocellata*) with the young and eggs; also sand from the nest from which the eggs were taken.



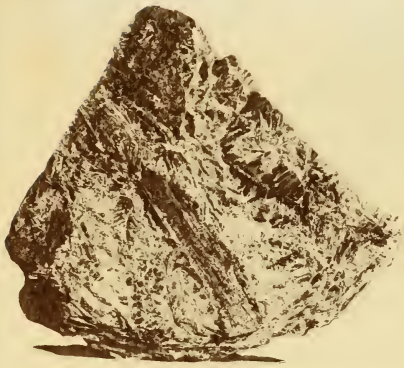


FIG. 1.

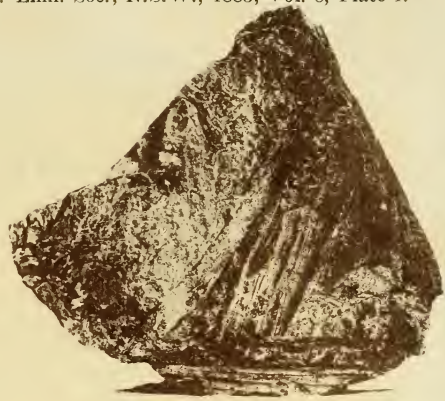


FIG. 2.

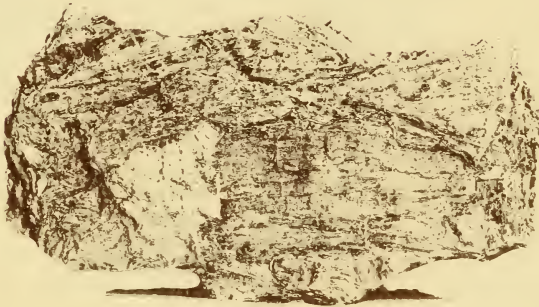


FIG. 3.



FIG. 4.

Proceedings of the Linnæan Society of NSW. Vol VIII 1883  
Figs. 1, 2, 4. *Vertebraria towarrensis*.—Tenison-Woods.  
Fig. 3. *Vertebraria equiseti*.—Tenison-Woods.



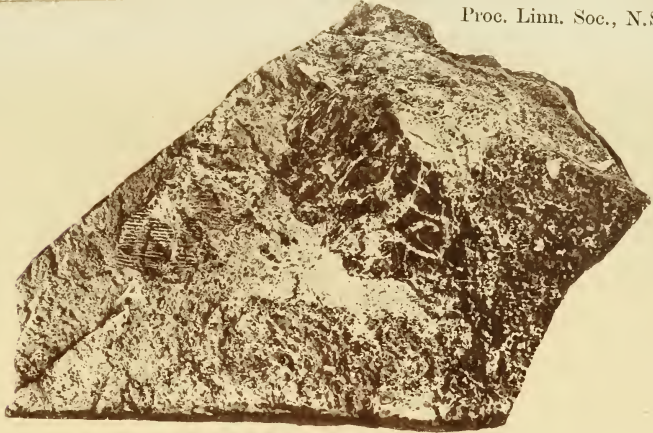


FIG. 1.



FIG. 2.

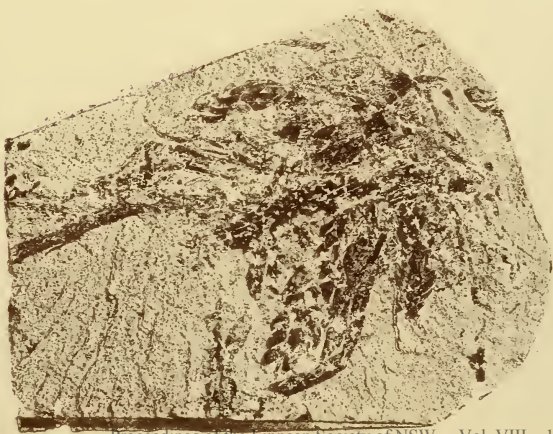


FIG. 3.

Fig. 1. *Equisetum latum*.—Tenison-Woods.  
Fig. 2. *Sphenopteris flabellifolia*, var. *erecta*.—Tenison-Woods.  
Fig. 3. *Waldia outucana*.—Tenison-Woods.







FIG. 1.



FIG. 2.



FIG. 3.

Figs. 1 and 3. *Cunninghamites australis*.—Tenison-Woods.  
Fig. 2. Male amenta of same.  
Fig. 4. *Sphenopteris crebra*.—Tenison-Woods.  
Fig. 5. Male amentum of *Walchia milneana*.  
Fig. 6. *Gleichenia? lineata*.—Tenison-Woods.  
Fig. 7. *Trichomanides spinifolium*.—Tenison-Woods.



FIG. 4.



FIG. 5.

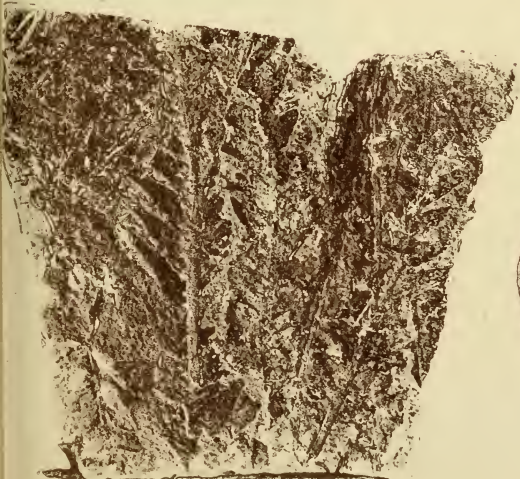


FIG. 6.



FIG. 7.



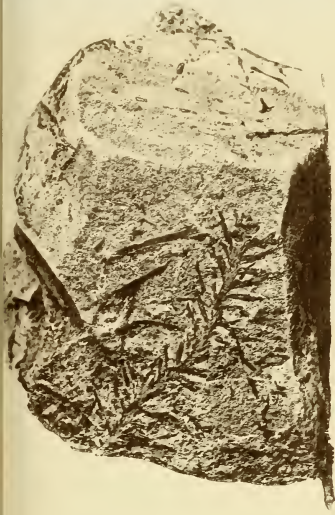


FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

- Fig. 1. *Cunninghamites australis*?—Tenison-Woods.  
Fig. 2. *Sphenopteris baileyana*.—Tenison-Woods.  
Fig. 3. *Jeanpaulia bidens*.—Tenison-Woods.  
Fig. 4. *Sphenopteris glossophylla*.—Tenison-Woods.





*Brocchophyllum australe*. —Tension-Woods.





FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.



FIG. 5.



FIG. 6.

- Fig. 1. *Thamnofilia metta*,  $\frac{1}{2}$  nat. size.  
 Fig. 2. *Merionopteris major*,  $\frac{1}{2}$  nat. size.  
 Fig. 3. Ditto pinnule enlarged.  
 Fig. 4. *Althopteris curvata*.  
 Fig. 5. *Equisetum rotiferum*.  
 Fig. 6. Ditto diaphragm.  
 Fig. 7. *Halebia milliciana*.  
 Fig. 8. Ditto male amentum.  
 Fig. 9. *Phyllothea concinna*.



FIG. 7.

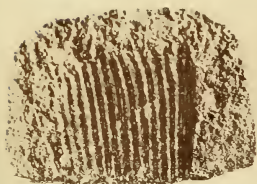








FIG. 1.

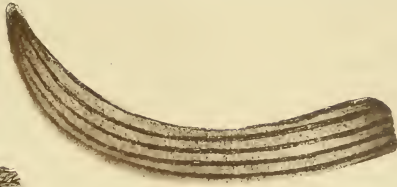


FIG. 5.

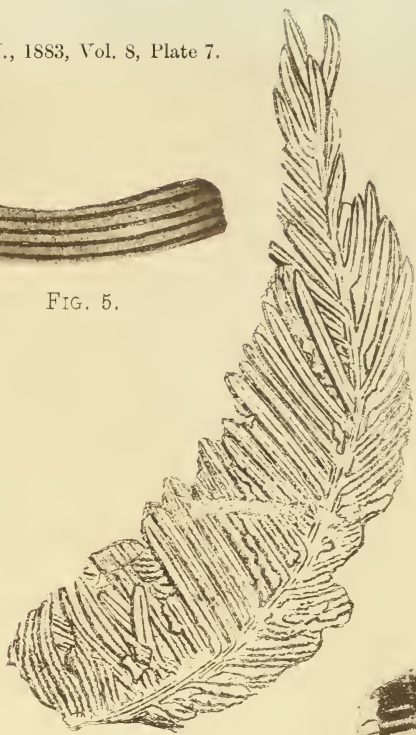
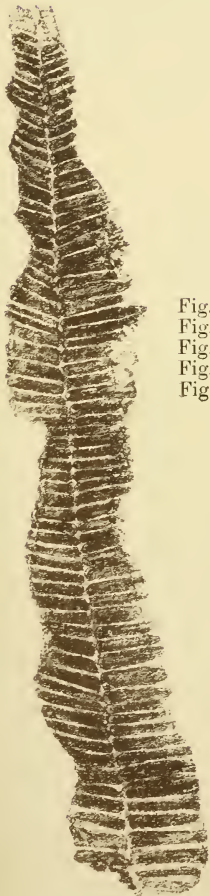


FIG. 4.



- Fig. 1. *Cunninghamites australis*, male amenta.
- Fig. 2. *Ptilophyllum oligoneurum*.
- Fig. 3. Ditto ditto.
- Fig. 4. Ditto single leaflet enlarged.
- Fig. 5. *Sequoiites australis*.

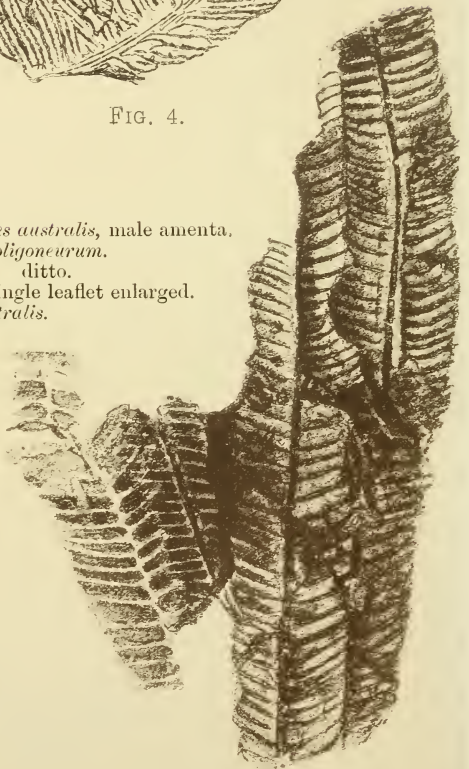


FIG. 3.





FIG. 1.



FIG. 2.

- Fig. 1. *Thinnfeldia falcata*.
- Fig. 2. *Gleichenia lineata*.
- Fig. 3. *Podozamites distans*.
- Fig. 4. *Neuropteris (Aneimidium?) australe*.
- Fig. 5. Ditto part of pinnule enlarged.



FIG. 5.





FIG. 1.



FIG. 2.

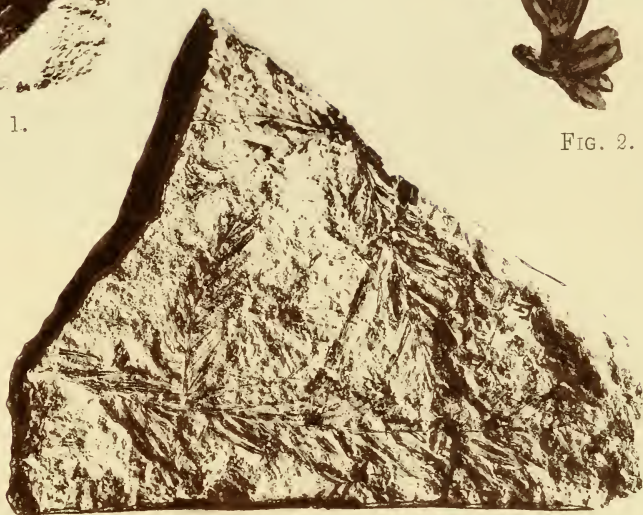


FIG. 3.

- Fig. 1. *Alethopteris concinna*.  
Fig. 2. *Phyllothea carnosa*.  
Fig. 3. *Taxites medius*.  
Fig. 4. *Sagenopteris rhoifolia*.

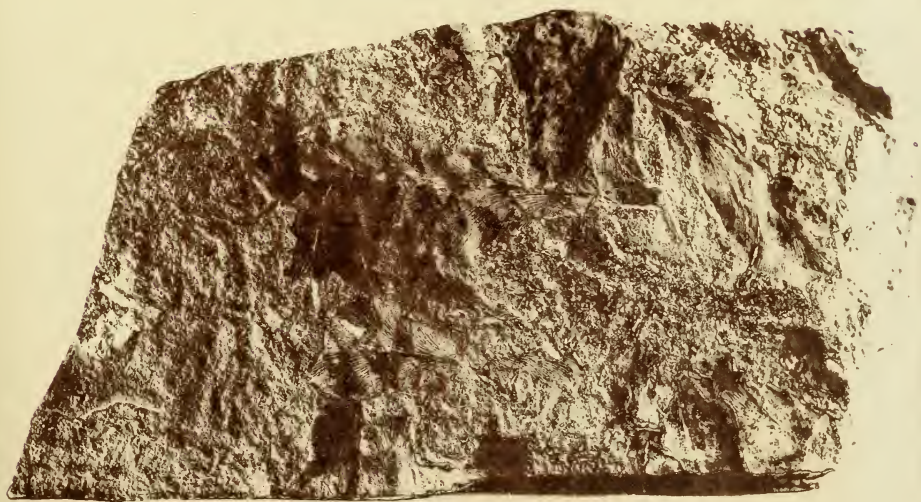


FIG. 4.





FIG. 1.

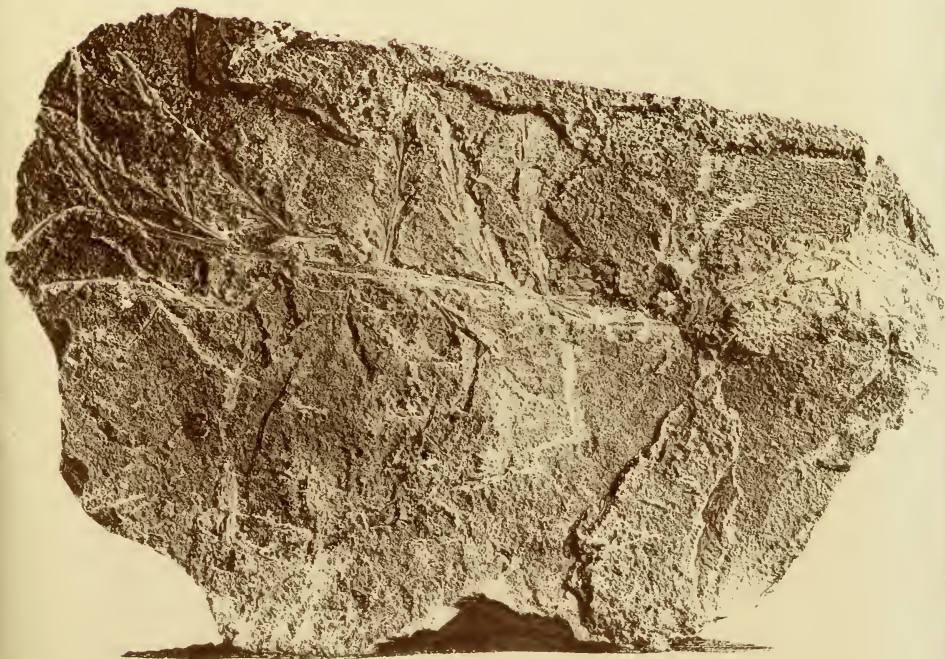
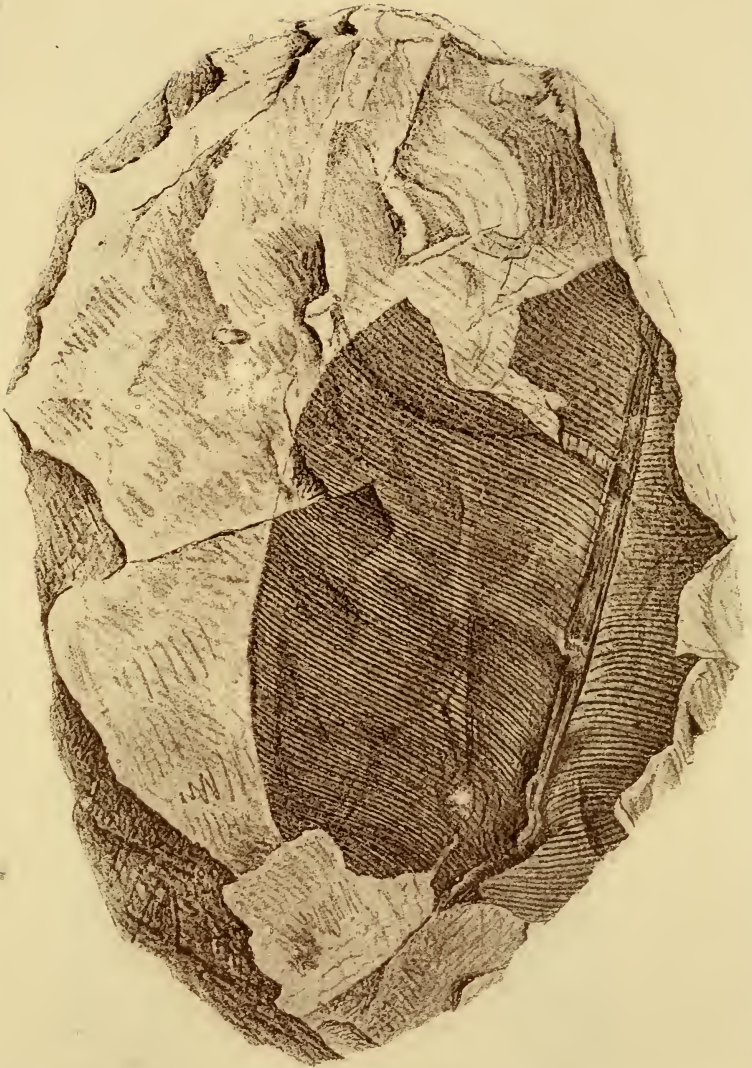


FIG. 2.



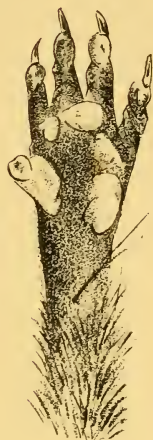




*Macrotaniopteris Wianamatta.*



1



2



3



4



5







WEDNESDAY, MARCH 28TH, 1883.

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The Vice-President, the Rev. J. E. Tenison-Woods, F.L.S., &c.,  
in the chair.

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MEMBERS ELECTED.

J. H. Madden, Esq., Curator of the Technological Industrial  
and Sanitary Museum, Sydney; Hon. Charles Stuart Mein,  
Brisbane, Queensland; H. G. MacKinny, Esq., M.E., Campbell-  
town; Thomas Keele, Esq., C.E., Douglas.

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DONATIONS.

"Southern Science Record," vol. II., Nos. 11 and 12, November  
and December, 1882. From the publishers.

"Journal of the Royal Microscopical Society," December 1882.  
From the Society.

"Annales de la Société Malacologique de Belgique," Tomes  
XIV. et XVI. 8vo., 1879 and 1881.

"Proces-verbal de la Société Malacologique de Belgique,"  
Fevrier à Juillet 1882.

A set of papers, 43 in number, chiefly on Mollusca and  
Echinodermata, by Edgar A. Smith, F.Z.S., &c. From the  
author.

N

A pamphlet containing several papers by Baron Mueller and Prof. Tate on the Flora of North and South Australia; also a pamphlet containing "Notes on the Tertiary Strata beneath Adelaide," "Diagnoses of new species of Miocene Fossils from South Australia," and "Land and Freshwater Molluscs of Tropical South Australia." By Prof. Ralph Tate, F.G.S.

"Abhandlungen aus dem Gebiete der Naturwissenschaften herausgegeben vom Naturwissenschaftlichen Verein von Hamburg-Altona," VII Band., II Abtheilung, 4to, 1883. From the "Verein."

"Systematic Census of Australian Plants, with Chronologic Literary, and Geographic Annotations." By Baron Fred. von Mueller, K.C.M.G., M.D., F.R.S., &c., Part I, Vasculares. From the author.

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PAPERS READ.

OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE  
NEIGHBOURHOOD OF SYDNEY. (No. 3.)

By E. HAVILAND.

During the short discussion that followed the reading of my last paper, I quoted some remarks, by Professor Asa Gray, on the fertilization of certain plants. As in those observations, he mentions *Lobelia*, I have made that genus the subject of this short paper.

Bentham gives, in the *Flora Australiensis*, a list of eighteen species of the genus indigenous in Australia; but he mentions, that it is widely spread over North America and South Africa; with a few species in Europe; while none had been found in Northern Asia. The eighteen Australian species, he divides into two sections. The first, consisting of ten species, having all the

anthers crested by a tuft of stiff short hairs. The second of eight species, having only the two lower anthers so crested. This second section he again divides into two. The first sub-division, containing five hermaphrodite species; the second, three species, which are more or less unisexual; although, in reality, they have both stamens and pistils; one or the other, however, being abortive. As an instance, he specially refers to *L. dioica* (a Northern Queensland species), the male flowers of which have the female organs perfect, so far only, as the stigma is concerned, but the ovary is short, and the ovules are abortive; the stamens and anthers, or male organs, are, however, perfect in every respect; producing perfect, fertile pollen, while the female flowers of the same species, have the female organs, ovary, style and stigma perfect; but the stamens, or male organs, although present, are rudimentary only, producing no pollen. This species, therefore, as well as the two others in this sub-division. *L. purpurascens* and *L. pratioides*, are, although possessing in each flower, to a certain degree, both male and female organs, virtually unisexual.

The genus is placed by Bentham in the order Campanulaceæ, but by most other botanists in a separate order, Lobeliaceæ; leaving Campanulaceæ for those plants having regularly-shaped corollas.

As my notes from which I write this paper, have been made from the examination of several species, excepting, however, for the present, those that are unisexual, I give the generic description only: not the specific characters of any individual member of the genus

#### LOBELIA.

“Calyx tube hemispherical, turbinate, ovoid or rarely linear; limb of five lobes, open or reduplicate, valvate in the bud. Corolla slit open on the upper side to the base; five lobed, the two upper lobes usually shorter, more deeply separated and erect or curved upwards, forming a more or less distinct upper lip. Stamens inserted at the base of the corolla, sometimes very shortly adnate to it; the filaments often united above the middle; the anthers

united in an oblique or slightly incurved tube round the style. Ovary two celled. Stigma broadly two lobed and often surrounded by a ring of retractile hairs. Capsule opening loculicidally within the calyx lobes in two valves : rarely splitting longitudinally below the calyx lobes also. Herbs, often acrid with a milky juice. The Australian ones either annual, or creeping and rooting at the base. Pedicels one flowered, either axillary or terminal, or in terminal racemes, sometimes having two small bracteoles, which however, are never constant in the same species. Flowers in a few species diœcious by the abortion or sterility of the anthers in the females, and the malformation of the undivided stigma, and abortion of the ovules in the males." I have been fortunate this season, in being able to examine and study a great number of *Lobelias*. On the mountains, at least as far as Springwood, as well as on the coast, they have been unusually plentiful. Those on the coast I have found chiefly at Curl Curl, which is the next bay north of Manly. Perhaps I may be allowed to digress here, just to say, for the benefit of other botanists that, leaving Manly by the Pittwater road, and after a walk of about a mile, turning to the right up a steep rough hill road, known in the locality as Rose Hill, following from the top of the hill, the fence running east to the ocean, then along the beach to a creek flowing into the sea, along the winding of the creek back to the Pittwater road, and thence to the point of starting ; the boundaries of a piece of country will be traversed of between three and four square miles in extent ; very rich indeed in specimens of our coast flora. Here, in their respective seasons, may be found *Utricularia*, *Xyris*, four or five different species of *Boronia*, *Blandfordia*, *Goodenias*, and a vast number of other plants of great interest to the botanist. Of the *Lobelias*, I have found in this locality, during the present summer *L. anceps*, *L. gracilis*, *L. gibosa*, and *L. debilis* (of the last however only one plant). From my notes of these, as well as of those examined in the mountains, especially with regard to their fertilization, I find the same process going on in all. Taking a flower of which the corolla has recently opened, the filaments of the stamens can be seen open and separated from each other at



the base, but connected at the top; the anthers forming a comparatively long fluted cylinder, so closely adnate, that considerable force with the dissecting needle is needed to separate them. In fact I have rarely succeeded in doing so cleanly, one anther generally tearing away part of its neighbour rather than separate from it. No trace of the apex of the pistel can be seen; it is, as yet, so completely closed in at the bottom of this anther tube. Choosing a more advanced specimen, pollen may be seen just beginning to emerge from the top of the tube. In one still more advanced the pollen is seen crowded out of the tube and falling over its side. In another the point of the style can be seen emerging from the tube, and following the pollen which it has pushed before it. When the style has so far advanced that its apex is quite clear of the anther tube, it will be observed that it is crested with short stiff hairs or bristles, which there is no doubt have been used as a brush to sweep the pollen before it. I have not, myself, as a rule, found the style retaining any of the pollen, except occasionally a grain or two. It appears to accumulate on, and cling for a short time, to the outside of the anther tube, allowing the apex of the style to pass beyond it. Examining other and still more mature flowers; the style will be found projected to different distances, from one to three-eighths of an inch beyond the anthers, but no trace of a stigma can be found, and it will be noticed by this time, that in almost every case the pollen has entirely disappeared. It is now that the apex of the style splits into two rather broad spreading lobes, and it will be seen that the inner surfaces of these lobes form the stigmas, which having been enclosed within the style, till all the pollen from their own flower had disappeared, are at last exposed to the visits of pollen bearing insects. As, however, a small portion of pollen is generally left inside the anther tube after the style has escaped, I thought it not unlikely that, at a subsequent period, and after the lobes of the style had opened exposing the stigmas, the anthers would also separate exposing the residue of the pollen. In such case an insect would, in passing from the anthers to the stigmas, undoubtedly self-fertilize the flower. I have, however, found no

instance in which the anthers have so separated, although I have watched especially for it from the maturing to the withering of the flower. Even, however, if it should happen in an isolated case, the stigmas would have been so long exposed in a mature state to the visits of insects as to make it more than probable that fertilization by their aid would have been already accomplished.

There is often much difficulty experienced in identifying the various species of this genus, as they frequently approach each other very closely—much assistance may, however, be gained by careful inspection of the anthers, as to whether they are all or only a portion of them crested; and also by closely examining the seeds (which are very small) with a low microscopic power, some species having them smooth; others with three prominent angles, and some even winged.

As to the *Lobelia* as a plant for domestication, I suppose the Amateur Gardener could find none amongst our Australian flora more easy to cultivate—massed together in groups in a bush house or fernery, it has a very beautiful effect. In the summer of 1880 I took home from Manly a small plant of *Lobelia gracilis*. I did not intend, at the time, to cultivate it, but to dry it for the herbarium, I did not therefore remove it as carefully as I should have done; the roots, in consequence, being considerably injured. I was however induced to plant it and take the chance of its growing. For a long time it struggled between life and death, till at last, in the spring of the following year, it started into vigorous growth and in a few weeks had become such a beautiful object that friends used to call especially to see it. At one time I counted one hundred and seventy-eight flowers upon it, and yet it was only a plant of sixteen inches in height, and it remained with a succession of flowers in this state all the summer.

All the species produce seeds in abundance, which may be readily collected in the bush, and there is no difficulty in raising strong healthy plants from them, but the plants must be kept moderately dry, as they are liable, as gardener's say, to "damp off," if unduly watered.

## ON TOOTH-MARKED BONES OF EXTINCT MARSUPIALS.

BY CHARLES W. DE VIS, B.A.

Whatever may have been the cause of the extermination of the herbivorous fauna of pliocene Australia, it is clear that while still in the zenith of its vigour, it was kept in check by carnivorous animals. About five per cent. of some hundreds of bones from the Darling Downs awaiting examination, are pitted, scored, cracked, chopped, and crushed by the teeth. They have in fragments passed with the fæces through the intestines of bone-eating beasts of prey. Fully eighty per cent. of the remainder tell, in their splintered fragmentary condition, the same tale of violence. On the one hand, there is piled up a heap of the heads of femurs—on the other are a few shafts, not one to the score of the heads. Of the shafts themselves, many were of young animals whose fallen epiphyses exposed a fairer grip to the jaws than was possible upon their rounder and harder surfaces. Of predaceous animals as yet unanimously recognized in the drifts, the only one capable of crushing large shankbones, say of *M. Titian*, is the fossil dog of South Australia, identified by Professor McCoy, with *Canis Dingo*—and to a dog which may be *C. Dingo*, the majority of the groovings and indentations on the bones spoken of, are very likely due. The indentations are generally angular pits, showing on their sides and at their bottom, portions of bone crushed in from the surface, and on applying to several of these pits, the major cup of the great sectorial of the existing dingo, it is found to fit them satisfactorily, or even exactly. Pieces of long bone again show very distinct marks of gnawing-marks, faithfully copied by the teeth of our yard dogs on the bones they delight in. By way of confirming this interpretation of the tooth marks, it may be mentioned that a coprolite, probably that of a dog, contains a good sized fragment of bone. But the dog was not the only bone-eater of the period. There is distinct proof, accepted by all who have examined it, that *Thylacoleo* also was an ossiphagous animal. It is yielded by a mandible of a young kangaroo, *M. affinis*, which has been seized in the middle between the jaws of a *Thylacoleo* with evident intention of crushing it. It was however, seized in an

awkward fashion. On either side of the alveolar ridge, immediately in front of the ascending process, is a conspicuous impression of a tooth forced against the yielding bone. The characteristically grooved upper tooth of *Thylacoleo* on the inner—the smooth lower one on the outer side. As the beast's jaws met, their strength was resisted by the row of teeth brought directly between the edges of teeth closing upon it above and below, and the only effects produced beyond the impression on the bone, were the splintering of one of the kangaroo's teeth, and the longitudinal splitting of its jaw on the inner side, below the dental canal. The upper thylacoleonine tooth has left the mark of its whole length—the lower of that elevation only which is seen on the posterior third of its cutting surface. On the mind of the observer there remains no doubt, that the so termed "marsupial lion" was indeed a carnivorous animal, but though it might certainly have attempted the fracture of the victim's jaw for the sake of its investment of flesh, as the cat breaks and swallows the bones of her prey, yet the first idea suggested by the specimen that it was one of the many bones crunched for their own sakes, is probably the true one, and for this reason some of the long bones of kangaroos bear across them marks which at a glance might be mistaken for the effects of blows of a tomahawk—marks produced by long straight-edged incisive instruments, which sometimes struck more than once in same groove—in a word, just the marks that would be left by a pair of shear-like teeth, actuated by powerful muscles. No such teeth save those of the thylacoleo, are known. From the present evidence then, it would appear that there has been no mistake made in pronouncing the animal to have been a carnivor, but that it was a carnivor resembling in its habits of feeding, the hyæna rather than the lion. That opinion is strengthened by the form of the claws of which two perfect specimens, together with a third suggesting a feebler species, have been obtained from the Chinchilla beds. However destructive to the kangaroos, or at least to the weaker of them it may have been, its mission was chiefly that of a scavenger, and it could hardly have been an efficient agent in the extermination of the Nototheridæ.

Since the foregoing notes were penned evidence has occurred of the existence of another carnivor, which may after all have been the chief strewer of broken bones over pliocene ground. Most of us are aware of the ease with which that euphemistically named animal, the Tasmanian Devil, discards bones of considerable size. *S. ursinus* has been proved to have been an inhabitant of South Australia in pliocene times by Professor McCoy, who notices the strangeness of the circumstance that it has survived in the island rather than on the mainland. The solubility of the enigma may not be increased by the probability that another and more powerful species of *Sarcophilus* lived at the same period in Northern Australia; but the full discovery of the fact will at least serve to explain in great part the matter under notice. The sole relic yet detected of this species (nominally *S. prior*) is the head with a little of the shaft of a right tibia. In *S. ursinus* the transverse and fore and aft measurements of the articular surface, including the deflected rotular process are equal—calling each of these 25, the measurements of *S. prior* are respectively, transverse 35, longitudinal 37—numbers indicating a greater size by one-half nearly, and a comparatively elongated head. The general form of the two bones is one, their peculiarities many. In both the cavity for the inner condyle is the deeper, but in *S. prior* it is proportionately more excavated than in *S. ursinus*, and it is differently situated. In the latter it is placed as backward as possible, its hinder border being the edge of the shaft—in the former it is brought more directly over the axis of the bone and a wide non-articular edge is left between it and the brim of the shaft. The outer cavity in *S. prior* is larger proportionately, but not deeper than in the recent species. The spine is considerably higher and stronger, and the ridge continued from it anteriorly, more sharply defined. The rotular process descending at the same angle is however longer, its edge is rather deeply emarginate. The intercondylar groove is deeper and extends on to the base of the spine. The fibular facet is further removed from the spine by the greater posterior expansion of the articular surface for the outer condyle. On the inner side of the shaft it

may be noted that the depression bounding that side of the column supporting the part of the head above is filled up, but on the other hand that a ridge runs down the hind edge of the inner side of the shaft from near the brim of the cavity for the inner condyle. On the whole the bone gives the impression of a better knit, and more muscular animal, of a size too superior, to be included in the same species with *S. ursinus*—one whose last molar must have equalled, or nearly equalled in size, the great sectorial of a large dog and must have been fully competent to the work whereof so many traces have been left.

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ON BRACHALLETES PALMERI AN EXTINCT MARSUPIAL.

BY CHARLES W. DE VIS, B.A.

A conspicuous feature in the skeletons of kangaroos is the inordinate elevation of the great trochanter of the femur. In the level of its apex above that of the 'head' of the bone there is an excess pervading the family, neither individual, specific, nor generic variation being carried to any great extent. The fact will appear more precisely evident if we measure the gluteal angle in several of the genera—and by gluteal angle is meant the angle made with the long axis of the bone by a straight line touching the top of the trochanter and the summit of the head. In *Macropus major* we find it to be  $52^\circ$  in *M. rufus*,  $54^\circ$  in *Halmaturus dorsalis*,  $56^\circ$  in the femur figured in the Foss. Mamm. of Aust. as that of *Palorchestes Azael*, it is  $46^\circ$  and in six other fossil species examined for the purpose it ranges from  $60^\circ$  to  $45^\circ$ . The value of this angle is the measure of the leaping ability of the animal, the propellers of the weighty trunk acting on the limb to be extended with a force proportionate, inversely to the inclination, and directly to the resultant length of the line of leverage. Whence we may conclude that any considerable depression of the trochanter is an index to concomitant modifications of the general economy sufficient to bring about at least very distinct generic differentiation. In this predicament stands a femur lately found

at Chinchilla associated with a number of bones which from their characters and condition may well have belonged to the same animal, and which have on the whole a strong macropodal facies.

Its gluteal angle is  $77\frac{1}{2}^{\circ}$ , three times the average of the measurements previously given. That so open an angle and consequent loss of saltatory power should be recognised in any member of the more typical genera of the Macropodidæ or Prote-mnodontidæ is hardly possible. The present femur, though equal in size to that of *Palorchestes Azael*, the largest of the Macropods described by Professor Owen, cannot therefore have belonged to a co-species, since the cranial characters of *Palorchestes* shew its approach to the normal kangaroos rather than to the Prote-mnodonts whose skull presents some incipient affinity with that of the Nototheres. It is rather in alliance with the Prote-mnodonts themselves that we must seek the extinct owner of the thigh-bone before us, and in *Procoptodon Goliath* we find an animal not much inferior in size. To this genus, however, we may reasonably hesitate to refer it. Of the once largely evolved Prote-mnodonts we have a surviving genus in *Halmaturus*, and though the trochanter in *Halmaturus*, at least in *H. dorsalis*, is not so much elevated as in *Macropus*, the gluteal angle is still  $30^{\circ}$ , and it can hardly be supposed that *Procoptodon*, one of its relatives, diverged from it so widely in the activity of its hind limb. It is, indeed, within the limits of possibility, that a creature with teeth so aberrant as those of *Procoptodon* may eventually declare itself but remotely allied to *Protemnodon*, *Sthenurus*, &c., and that the femur under examination may actually belong to it, but pending discovery, it appears to the writer prudent to give these bones a distinctive name. In the future a synonym of *Procoptodon* will probably cause less inconvenience than a mistaken identification with it of bones not belonging to it. The word *Brachalletes* is coined for the purpose of expressing a conception of the contracted gait of the animal—the specific name appended refers to the part taken by Sir A. Palmer in the discovery of its bones.

The greatest breadth of this thigh-bone between the lower and inner edge of the head and the middle of the outer edge of the trochanter is  $5\frac{1}{8}$  inches—its breadth at the distal end of the trochanterian pit is 3 inches, and its height from the same point to the top of the trochanter major is  $3\frac{1}{8}$  inches. The corresponding numbers in *P. Azael* are  $4\frac{3}{4}$ ,  $3\frac{3}{8}$ , and  $4\frac{1}{4}$ , in *M. Titan*  $3\frac{1}{4}$ ,  $2\frac{1}{8}$ , and  $2\frac{7}{8}$ , and in *M. major*  $2\frac{3}{4}$ ,  $1\frac{3}{4}$ , and  $2\frac{1}{4}$ . The breadth of the femur of *Brachalletes* being to that of the bone of a kangaroo six feet long from tip to tip as 41, 22, the length of the extinct animal represented by it may have been about 11 feet 6 inches.

The broad and low trochanter-major presents but a very dubious indication of a suture defining an anchylosed tuberosity; the antero-internal constriction is no less obscure. The upper surface of the neck is long and gently sloping; the head strongly convex, much more so than in *P. Azael*, and together with the neck is set on less obliquely with the transverse diameter of the shaft than in *M. major*. The lesser trochanter departs considerably from its position and form in typical macropods; it is much further removed downward from the level of the head, and in this respect resembles that of *P. Azael*; it consists of a strong round tubercle, from which suddenly slopes away a low ridge, or rather ridge-like expansion of the intero-posterior edge of the shaft; the depression between this ridge and the intero-anterior edge is long and deep; the broad surface between it and the trochanterian fossa is gently convex; the fossa itself is long and deeply excavated; the neck is relatively longer than in the true kangaroos, and the fossa more external, the space between it and the edge of the trochanter being but a fourth of the whole breadth of the bone, whereas in *M. Major* it is four-sevenths. The posterior ridge continued downward from the great trochanter for five inches does not terminate abruptly and sharply, but subsides gradually into the rough depression beneath. In *M. Major* a transverse line touching the bottom of the fossa cuts the lower third of the muscular scar above mentioned; in the fossil this rough tract is lower than that imaginary line by a space equal to half its own length. The shaft is antero-posteriorly compressed, and has a regularly oval-section;



it is broken off at the commencement of the rough surface above the "third" trochanter, where its diameter is 2 inches, that of *M. Major* being 1. In the head of the tibia we are struck with as great a deviation from macropodal form as in the femur; there is no anterior tuberosity prolonged in the plane of the articular surface. That surface is equilateral, measuring  $2\frac{7}{8}$  inches on each of its three sides. A broad and high intercondylar ridge slopes gently to the rounded anterior apex of the triangular surface, whence the profile of the bone descends almost vertically for  $\frac{3}{8}$  inch to the origin of the broad procnemial ridge; yet the transverse groove below the edge of the hinder-articular surface is as deeply cut as in existing kangaroos. In this characteristic feature, as well as in the depth and breadth of the excavation of the outer facet of the shaft, and in the sharp, longitudinal ridges separating the other facets, the tibia is entirely macropodal; but in the fore and aft contraction of its roundly triangular articulating surface it suggests a tentative departure towards the slow-paced giants of the class.

Of the rest of the remains, two distal ends of left femurs are alone sufficiently well preserved to merit notice. These possess the usual characters of the kangaroo femur. So far as can be estimated, they are of exactly the same size transversely as that of *P. Azael*, but have apparently a far greater length of the condylar surfaces. Besides this they present several minor differences which forbid their identification with the fossil figured by Professor Owen. Into these distinctive features it seems unnecessary to enter. Enough of detail has already been given to render the present communication tedious.

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ON THE HABITS OF THE MALLEE HEN, *LEIPOA OCELLATA*.

By K. H. BENNETT.

This singular bird as its trivial name implies, is an inhabitant of the arid dreary Mallee Scrubs that clothe a large area of the western portion of New South Wales, and even larger extents of some of the adjoining colonies, but as my experiences of the bird and its habitat are confined to the former colony, I can speak

with confidence only thus far. About the month of October, the birds (2 only) commence (if new to construct—if old to repair) their huge mound nests. In the former case they select a slight depression ; such as where a stump has been burned out, this they fill with a mass of leaves, fragments of “porcupine grass,” Mallee bark, &c., &c., and in doing this the whole surface of the surrounding ground for many yards is swept perfectly clean. The method of doing this is to go out some distance from the site of the intended nest, and then walking backwards, alternately raking with each of their powerful feet, and assisted by their wings, sweep everything loose to a common centre. In the case of an old nest, they clean out the sand used for covering the eggs the previous year, and should they deem it necessary place more leaves, &c., in the hollow. Should the weather be moist at the time, the work goes on uninterruptedly, but should it be dry, they wait until a passing shower has damped the mass of vegetable deposit, this they then cover with three or four inches of sand, when the female commences the work of depositing her eggs—this she does by laying the egg on the sand covering the leaves, &c., and then leaning backwards grasps the egg in both feet, placing it in an upright position (small end down), then holding it with one foot, she with the other gently rakes some sand around ; and changing feet does the same on the other side until the egg will stand ; it is then covered, as well as the other part of the nest with several inches of sand. And here comes in the immense amount of work the birds have to perform at each subsequent laying for the whole of the sand down to the level of the first egg (until the first layer or tier is completed) has to be removed, and so on with each successive layer ; and as the mound increases in height the labour increases in proportion, for should the weather be dry, as it usually is, the sand runs like so much water, and a person has only to open one of these mounds himself to understand the difficulty the birds have to contend with in keeping the sand from running back. The removal of the sand is effected by the aid of wings and feet, the bird dragging each small quantity thus obtained a sufficient distance to ensure its not running back.

The circumference of the cavity in the centre of the mound in which the eggs are deposited is about three feet, and around the edge of this space the eggs (usually three sometimes four) are placed, this completes the layer ; the whole are then covered with sand to the depth of four or five inches, which is allowed to remain and the second layer is commenced. and so on until the whole (generally four) are completed. The bird lays about twice a-week, thus a long time intervenes between the laying of the first egg and the last, and consequently eggs in all stages, from fresh laid to just on the point of hatching, and young birds, are to be found at the same time.

During the period of incubation the parent birds, as a rule, visit the nest morning and evening every day ; in the earlier stages this is done to repair the damages caused by native dogs and iguanas, who scratch at the nests in the hopes of obtaining the coveted eggs or young, and also to repair the damage often caused by their more destructive biped foes. As an instance of which I may mention that on one occasion I opened a nest about 10 o'clock in the morning, which contained three eggs. I took only one as I knew from its delicate colour that it was quite fresh. I left the nest open, and having occasion to repass it about two hours afterwards to revisit it, I found the bird had in my absence made it up again. Thinking it might be possible that the egg I had taken was not of that morning's laying, and that whilst I was away the bird laid another, I again opened the nest, but there was but the two eggs, On this occasion I opened the mound to a much greater extent, drawing the sand back to a considerable distance and again leaving it open. Shortly before sundown I returned to the nest again and found all damages repaired.

As the process of incubation progresses these visits have an additional motive, viz., that of assisting any young bird out of the superincumbent mass by opening the nest ; but that this is absolutely necessary, so far as the chick is concerned, I do not believe, for on many occasions when opening nests I have found the chick so near the surface that a few minutes more would have effected its liberation unaided, and if it could by its own exertions

come up from a lower layer, it could certainly have passed through the few inches of loose sand between it and the exterior of the mound, and from careful observations on this point I am convinced that the chick can liberate itself. The egg is of large size, consequently the chick is large and possessed of considerable strength; and on emerging from the shell, which is extremely fragile, its natural instincts prompt it to struggle for air and light; its struggles displace the sand, which runs down beneath the bird and thus gradually it gets higher and higher. Its passage through the warm dry sand completely removes any moisture clinging to it on emerging from the shell, and, when at last it reaches the summit of the mound, it is a fully developed bird able to fly, run, and take care of itself, which, in fact, it has to do, for the old bird, having so far conformed to maternal instincts as to assist it in getting out of the nest, now totally ignores its presence; whilst the young one, equally devoid of affectionate instincts, evinces fear of its parent and quickly runs off amongst the dense "porcupine grass," and commences its lonely existence, for lonely this bird decidedly is, leading a solitary life; for, except at the period of incubation, it is very rarely that two are seen together, and when met with quietly feeding its actions are suggestive of melancholy, for it has none of the liveliness that characterises almost all other birds, but stalks along in a solemn manner as if the dreary nature of its surroundings and its solitary life weighed heavily on its spirits. Its note (not often uttered) is a most mournful sound something like that of the bronze winged pigeon but much louder and each note much more prolonged. The food of this bird consists of insects, the seeds and berries of various shrubs, and the tender shoots of plants. In its wild state it is entirely independent of water, but will sometimes drink when domesticated. It is easily domesticated but evinces no intelligence or affection, and its habits and actions are marked by the same cheerlessness and love of solitude as in its wild state. Although I have had a number of them reared together until full grown, yet, when liberated, they would not associate but each go its own way, although so tame that they would take food from a person's hand and allow

themselves to be handled. The mounds are of great size, one I measured a few days since was 37 feet in circumference, and this was by no means an exceptional case. I have seen them much larger.

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NOTES AND EXHIBITS.

Mr. Macleay exhibited a specimen of *Dendrolagus Dorianus*, a new species of Tree Kangaroo from Mount Owen Stanley, New Guinea, described by Mr. E. P. Ramsay at the January meeting of the Society. He pointed out that the hair on the body all turned the wrong way.

Mr. Macleay also exhibited some specimens of a Moth, with a fungus upon which their larvæ had fed. He stated that the larvæ were inhabitants of portable cases, like the rest of the *Psychidae*, to which family they no doubt belonged. The genus and species—*Ecinia Scotti* were described and figured by Walker Scott, M.A. in his beautiful but, unfortunately, uncompleted work entitled "*Australian Lepidoptera*" The specimens exhibited (two females) were the only outcome of a large number of the larvæ collected by Sir John Hay, at Nepean Towers, some months ago.

Mr. Macleay also exhibited a very large and beautiful piece of Fire-opal, brought by Mr. F. A. Powell from Queensland.

Mr. F. B. Kyngdon exhibited some specimens of marsh-plants collected by himself and Mr. Whitelegge, at Waterloo.



WEDNESDAY, 25<sup>TH</sup> APRIL, 1883.

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THE Vice-President, the Rev. J. E. Tenison-Woods, F.L.S., &c.,  
in the Chair.

Mr. H. Deane, M.A., was present as a visitor.

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MEMBERS ELECTED.

G. LITTLEJOHN, Esq., Strathmore, Forest Lodge; G. A. CHEEKE,  
Esq., Tusculum, Macleay street; WILLIAM NEILL, Esq., City Bank,  
Sydney.

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DONATIONS.

"Feuille des Jeunes Naturalistes," Paris, Nos. 145 à 149,  
Nov. 1882 à Mars 1883. From the "Directeur."

"Mycologische Mittheilung von C. Kalchbrenner." From the  
author.

"Bulletin of the Museum of Comparative Zoology at Harvard  
College, Cambridge, Massachusetts," vol. x., Nos. 2, 3 and 4, and  
Annual Report of the Curator for 1882. From the Museum.

"Journal of the Royal Microscopical Society of London,"  
February 1883. From the Society.

"Report of the Trustees of the Free Public Library, Sydney,  
for the year 1882."

"Some Points in the Myology of the Common Pigeon," by  
WILLIAM A. HASWELL, M.A., B.Sc. From the author.

## PAPERS READ.

NOTES ON A COLLECTION OF FISHES FROM THE BURDEKIN AND  
MARY RIVERS, QUEENSLAND.

BY WILLIAM MACLEAY, F.L.S., &amp;C.

In September of last year the Trustees of the Australian Museum sent Mr. Alexander Morton to the Burdekin River for the express purpose of collecting and investigating the fishes of that river. The idea of making such an investigation was suggested some years ago by Professor Owen, who thought that a search in some of the inter-tropical rivers of Australia might lead to the discovery of existing species of palaeichthyan forms.

No such ancient fishes were found, still the collection, which I have looked over and named at the request of the Trustees of the Museum, is not without interest. Mr. Morton was well supplied with nets of various kinds, lines, dynamite, and every appliance for catching or trapping fish that could be procured, and I think it will be found that he managed to secure, during his short stay on the river, about all the varieties of fishes inhabiting its waters.

Mr. Morton's operations were confined to two very distant parts of the river. The first few weeks he was engaged in fishing the river near its mouth, but was unable to extend his search beyond the first rapids—a distance only of 15 miles from the sea—though for some distance below the falls the water was quite fresh and the current strong. The fishes found in this part of the river were, as will be observed, of a mixed character—some undoubtedly sea fish, others salt water fish, but habitually entering rivers, and a few strictly fresh water species. The only other part of the river visited by Mr. Morton was about 200 miles higher up, at or near Charters Towers, where of course there could be nothing but fresh water fishes.

The fishes from the Mary River were all collected in the vicinity of Maryborough. I make no attempt in the following notes to give synonyms, and the references to each species are limited to a few of the most useful and most accessible :—

PERCIDÆ.

1. LATES DARWINIENSIS. Macl.

Proc. Linn. Soc., N. S. Wales, Vol. 2 p. 345.

This fish was only found in Lillesmere Lagoon, a large sheet of fresh water on the Lower Burdekin, communicating with the river only in high floods. Probably this fish sometimes goes to the sea.

2. PSEUDOLATES CAVIFRONS. All. & Macl.

Proc. Linn. Soc., N. S. Wales, Vol. 1, p. 262, Pl. 3.

Hab. Lillesmere Lagoon, and in salt water, Lower Burdekin.

It is said to attain a gigantic size.

3. SERRANUS ESTUARIUS. n. sp.

D. 11/14, A. 3/8. L. lat. 70.

Head considerably longer than the height of the body; space between the eyes slightly convex, and more than the diameter of the orbit, distance of snout from eye about the same. The teeth are not large, the lower jaw projects slightly, the maxillary extends behind the vertical from the posterior margin of the eye. The præoperculum is roughly toothed at the angle, the operculum is armed with two spines, the tail is rounded. Colour brownish with numerous large spots and blotches of darker brown; fins dark, all with large whitish spots, except the pectorals. One specimen, length 16 inches, taken in the Mary River, but evidently a salt water fish. It closely resembles *Serranus Salmonoides*. Cur & Val.

4. APOGONICHTHYS GILLII. Steind.

Macl. Cat. Fishes, Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 347.

Burdekin River, a fresh water fish, found also in Cox's River, N. S. Wales.

5. OLIGORUS MACQUARIENSIS. Cur. & Val.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 352.

Mary River. I cannot detect any difference between this fish and the well known "Cod" of our western rivers.



## 6. THERAPON TRUTTACEUS. Macl.

Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 366.  
Mary River, fresh water lagoon.

## 7. THERAPON PERCOIDES. Gunth.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 362.  
Lillesmere Lagoon and Upper Burdekin.

## 8. THERAPON LONGULUS. Macl.

Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 367.  
Lillesmere Lagoon.

## 9. THERAPON FULIGINOSUS. n. sp.

D. 12/13. A. 3/9. L. lat. 52.

The height of the body is more than one-third of the total length, the length of the head about one-fourth. The head is wide at the base, and rounded at the snout, the profile descending in a rather concave sweep, the lips are fleshy, the mouth reaches to below the anterior margin of the eye, the maxillary shows largely above and behind the intermaxillary; the eye is large and nearly two diameters distant from the snout; the cheek is covered with small fixed little-imbricate scales; the præoperculum is uniformly rounded and finely serrated, the operculum has two spines, the lower one large and flat. The first spine of the dorsal fin is short, the second less so, the rest pretty uniform; the spines of the anal are of moderate thickness, the third a little the longest; the soft dorsal and anal are rounded behind; the caudal fin is slightly emarginate. The colour is dull black all over, with the tip of the tail slightly edged with a lighter hue. Upper Burdekin.

A thick heavy fish, attaining a length of 15 inches, and seemingly abundant.

## 10. THERAPON PARVICEPS. n. sp.

D. 13/10. A. 3/9. L. lat. 52.

Height of body about one-third of the total length, length of head less than one-fourth; space between the eyes broad and convex, head terminating in a small round muzzle; mouth very small; maxillary distinctly visible, triangular, and not nearly extending to beneath the eye. Eyes rather small, more than two diameters apart, and

distant from the snout about the same; præorbital not serrated, four series of scales on the cheek; præoperculum without scales on the limb, and strongly serrated posteriorly, operculum with two points, the lower strong and flat; the coracoid has about twelve strong serrations; the suprascapula about six. The first dorsal spine is small, the second larger, the fourth and fifth are the longest, the thirteenth not longer than the preceding one, and much shorter than the soft rays; the third anal spine is longer and more slender than the second: the caudal fin is deeply emarginate, the lobes pointed. Colour silvery, with a darkish centre to each scale, the fins blackish. Length eight inches. Upper Burdekin.

11. *DIAGRAMMA AFFINE*. Gunth.

Macl. Cat. Fishes Proc. Linn. Soc. N. S. Wales, Vol. 5, p. 370.  
Lower Burdekin. A salt water fish.

12. *DIAGRAMMA LABIOSUM*. n. sp.

D. 10/24. A. 3/7. L. lat. 95. L. transv. 18/30.

Height of body one-third of the total length; length of head less than one-fourth of the same; lips smooth, fleshy, and of a pale colour; eye of moderate size, distant about twice its diameter from the point of the snout; præoperculum straight and finely toothed on the posterior limb, rounded and sparsely serrated at the angle. Lateral line straight; scales small, firmly adherent and etenoid; those on the head and on the body above the lateral line smaller than those on the rest of the body, and appearing to have numerous minute scales fastened upon them. The first dorsal spine is rather less than half the length of the second, from the second backwards the fin gets gradually lower to the soft dorsal, which again gradually becomes higher to the extremity; the pectorals are short; the ventrals pointed; the anal has the first spine short, the second long and slight, the third still longer and slight; the caudal slightly emarginate. The general colour is a dark silvery bluish grey; the dorsal and anal fins tipped with black, and the soft dorsal and caudal densely spotted with brown. Length, 12 inches.

Wide Bay. A sea fish.

## 13. GERRES FILAMENTOSUS. Cur. and Val.

Bleek Atl. Ichth. Perc. p. 124, tab. 78, fig. 3. Macl. Cat. Fishes Proc. Linn. Soc. N. S. Wales, vol. 5, p. 379.

Lower Burdekin, Salt water.

## SQUAMIPINNES.

## 14. SCATOPHAGUS MULTIFASCIATUS.

Richards. Voy Ereb. and Terr. Fishes, p. 57, pl. 35, figs, 4-6  
Macl. Cat. Fishes Proc. Linn. Soc. N. S. Wales. Vol. 5, p. 396.

Lower Burdekin. Salt water.

## SPARIDÆ.

## 15. CHRYSOPHRYS HASTA. Bl.

Bleek Atl. Ichth. Perc. Tab. 67, fig 3. Macl. Cat. Fishes Proc.  
Linn. Soc. N. S. Wales, vol. 5, p. 418.

Lower Burdekin. Salt water.

## SCORPÆNIDÆ.

## 16. CENTROPOGON ROBUSTUS. Gunth.

Cat. Fishes, 2 p. 128. Macl. Cat. Fishes Proc. Linn. Soc. N. S.  
Wales, vol. 5, p. 436.

Mary River. Fresh water. This fish is found in most, if not  
all, the rivers of the east coast of New South Wales.

## POLYNEMIDÆ.

## 17. POLYNEMUS TETRADACTYLUS. Russ.

Gunth. Cat., 2, p. 329.—Cant. Mal. Fishes, p. 25.

Lower Burdekin—in salt water.

Mr. Morton informs me that this fish visits the estuary of the  
Burdekin at certain seasons in large shoals, and is much prized as  
an article of food. It is salted and dried in considerable quantity  
by the Chinese curers, and readily sold throughout the towns and  
mining villages at 6d. per lb. It is found all over the Eastern  
seas. Dr. Cantor, in his Catalogue of Malayan Fishes, p. 26, says  
of it:—"It is highly valued as an article of food, its flavour being  
compared with that of salmon." The same author informs us that  
this fish is also used by the Chinese in the Straits Settlement in

the preparation of a very favourite condiment. The air-bladder of this species will probably be found, like that of *P. plebejus* and *indicus*, to give a profitable yield of isinglass. It is said to attain a length of 4 feet.

## SCLENIDÆ.

## 18. CORVINA ARGENTEA. n. sp.

D. 10, 1/29; A. 2/7. L. lat. 52.

Height of body, about  $3\frac{1}{2}$  times in the total length; length of head, about four times in the same; snout obtuse, convex, rounded, the jaws equal, the maxillary extending to behind the middle of the eye, which is large and about its own diameter distant from the snout. An outer series of strong, curved, sharp teeth in the upper jaw. Præoperculum very slightly and distantly serrated; suprascapula crenulated; coracoid entire. The first dorsal spine is minute, the second and third very high, the other spines becoming gradually lower to the tenth, which is very small; the second anal spine is very large, nearly as long as the first ray; the tail is rather pointed. Colour, silvery all over, the extreme edge of the spinous dorsal fin is black.

Lower Burdekin, in salt water.

This is also an abundant and valuable fish, and is probably like its congeners in the Indian seas, a yielder of isinglass.

## CARANGIDÆ.

## 19. CARANX GEORGIANUS. Cur. and Val.

Richards. Voy. Ereb. and Terror Fishes, p. 135, pl. 58, figs. 1-3. Macl. Cat. Fishes, Proc. Linn. Soc. N.S.W., Vol. 5, p. 533.

Lower Burdekin; salt water.

## 20. CARANX COMPRESSUS. n. sp.

D. 7, 1/21; A. 2, 1/21. L. arm. 45.

The height of the body is contained  $3\frac{1}{2}$  times in the total length. Body very compressed, the back from the dorsal fin to the snout forming a very sharp, narrow ridge. Mouth oblique, the maxillary broad and triangular at its extremity, fitting into an emargination of the præorbital, and extending to below the anterior

margin of the eye. Eyes moderate, each about one diameter distant from the central ridge of the head. A single series of short, sharp teeth in each jaw, numerous teeth on the vover and palatine bones. The lateral line becomes straight and armed beneath the third dorsal ray, the armature at first slight, becoming tolerably strong towards the tail. Colour silvery, the opercular spot large and conspicuous; the anal and caudal fins are yellowish. In one of two specimens before me, the rays of the dorsal and anal fins terminate in long filaments, probably a sexual difference. Length, 9 inches.

Lower Burdekin, salt water.

#### 21. CHORINEMUS LYSAN FORSK.

Macl., Cat Fishes, Proc., Linn. Soc., N. S. Wales, Vol. 5, p. 543.

Lower Burdekin. Salt water.

#### 22. CHORINEMUS TOLOO. Cur. and Val.

Macl., Cat Fishes, Proc., Linn. Soc., N. S. Wales, Vol. 5, p. 544.

Lower Burdekin. Salt water.

#### 23. EQUALA EDENTULA. Bl.

Richards, Voy., Ereb. and terr., Ichth., p. 137, pl. 59, fig. 12-14.

Macl., Cat. Fishes, Proc., Linn. Soc., N. S. Wales, Vol. 5, p. 549.

Lower Burdekin. Salt water.

#### SCOMBRIDÆ.

#### 24. CYBIUM SEMIFASCIATUM, n. sp.

D. 16/17/viii. A. 2/19/ix.

Height of body about one-fifth of the total length, and equal to the length of the head. Snout very pointed, mouth oblique, teeth strong, compressed, triangular and distant, numbering about eight on each side above and below. Head between the eyes broad and flat; the maxillary extends beyond the vertical from the middle of the eye. The lateral line is wavy on its posterior portion, but

scarcely curved. There is a short skinny keel on the side of the tail, with a slightly oblique one a little behind it above and below, the lobes of the caudal fin very long and pointed. Colour bluish silvery grey, lighter beneath, with twelve or more blackish equidistant vertical bands on each side. Length 12 inches.

Lower Burdekin. Salt water.

#### COTTINA.

##### 25. PLATYCEPALUS MORTONI, n. sp.

D. 8/13. A. 12.

The length of the head is one-fourth of the total length, its width between the præopercular spines seven-eighths of its length; the upper surface of the head is quite flat, the ridges being very slight and unarmed. The eyes are two diameters from the snout, and one diameter apart. Two moderate præopercular spines, the upper shorter than the lower. Lateral line smooth. Colour above mottled dark brown, beneath yellow, the soft dorsal rays and upper half of the caudal fin spotted with black. Length 16 inches.

Lower Burdekin. Salt water.

The affinity of this species is to *P. insidiator*, from which it differs in the greater width of head, in the number of the anal rays, and in the differently marked tail.

#### GOBIIDÆ.

##### 26. PERIOPHTHALMUS AUSTRALIS. Casteln.

Macl., Cat Fishes, Proc. Linn. Soc., N. S. Wales. Vol. 5, p. 614. Burdekin and Mary Rivers, in Mangrove Creeks.

##### 27. ELEOTRIS PLANICEPS. n. sp.

D. 6. 1/8. A. 1/9. L., lat. 32.

Nine series of scales between the origin of the second dorsal fin and the anal. Height of body one-fourth of the total length, back from the second dorsal to the snout very flat, head scaly to the snout, the scales larger than those on the body, the eyes are about five diameters apart, the maxillary does not quite reach to the vertical from the anterior margin of the eye. Colour, brownish black, a little lighter on the belly. Length, 11 inches.

Lillesmere Lagoon, Burdekin River.

In many respects this species resembles *E. aporos*. I cannot find, however, any trace of the streaks on the cheeks, so conspicuous in the last named fish.

#### ATHERINIDÆ.

##### 28. ATHERINICHTHYS MACULATUS. n. sp.

D. 7. 1/8. A. 1/7. L., lat., 32. L., tr., 8.

Elongate, slightly compressed; height of body about seven times in the total length. Snout pointed, mouth very small, protractile; head broad and flat between the eyes, the space equal to the diameter of the eye, which is very large; præoperculum short with a double smooth edge. The ventral fin commences opposite the termination of the pectorals; the first dorsal commences opposite the middle of the ventrals, and the soft dorsal and anal opposite one another, and of equal size. The colour is silvery, with a black spot in the middle of each scale, giving the appearance of eight interrupted black lines along each side of the body, there is also a blackish band from the snout through the eye to the base of the pectoral fin. Length, 3 inches.

Lillesmere Lagoon, Burdekin.

#### MUGILIDÆ.

##### 29. MUGIL WAIGIENSIS. Quoy and Gaim.

Macl., Mugil., Aust. Proc. Linn. Soc., N. S. Wales, Vol. 4, p. 420.

Lower Burdekin. Salt water.

This fine mullett which rivals in size and excellence *M. grandis*, seems to be found along the whole coast of Queensland. I have specimens from Port Darwin. I found it abundant at Cape York in July 1875, and Mr. Morton found it in shoals in the Lower Burdekin, where it is extensively salted by Chinese curers, and sold readily at 6d. per lb.

A number of this fish salted and dried by Mr. Morton, were I believe, taken by Mr. Ramsay to the London Fisheries Exhibition.

30. MUGIL DOBULA. Gunth.

Macl. Mugil. Aust. Proc. Linn. Soc. N. S. Wales, vol, 4, p. 414.  
Burdekin and Mary Rivers. Fresh and brackish water.

This fish is found in all or nearly all the rivers of New South Wales, on the eastern water shed.

31. MUGIL RAMSAYI. n. sp.

D. 4. 1/8, A. 3/1. L. lat. 36, L. tr. 9-10.

The height of the body is one-fourth, and the length of the head is one-sixth of the total length. Body somewhat compressed, about equally and slightly convex above and below. Head convex between the eyes; snout short, convex, obtusely pointed; lips thin, very densely and minutely ciliated; no teeth; bony tubercles on the palate; maxillary small, but visible along its whole length, and not reaching to the vertical from the anterior margin of the eye. Eyes moderate, without adipose membrane, distant about one of their diameters from the snout, and more than two diameters from one another; the preorbital is finely crenulated above the maxillary. The pectoral fins are about as long as the head, with a dark spot at the insertion of the spine, and a pointed scale in the axil; the ventrals are situated below the middle of the pectorals; the first dorsal above the posterior half of the ventrals; the anal commences perceptibly in advance of the soft dorsal; and the caudal is slightly emarginate. Colour silvery all over, with a bluish tint on the back. Length, 8 inches.

Burdekin River, in brackish water.

SILURIDÆ.

32. NEOSILURUS HYRTLII. Steind.

Mac. Cat. Fishes, Proc. Linn. Soc. N. S. Wales, vol. 6, p. 208.  
Mary River, in fresh water.

33. COPIDOGLANIS TANDANUS. Mitchell.

Mac. Cat. Fishes, Proc. Linn. Soc. N. S. Wales, vol. 6, p. 205.  
Mary River, in fresh water.

Found also in all the rivers of the Murray system.



34. *ARIUS AUSTRALIS*. Gunth.

Macl. Cat. Fishes, Proc. Linn. Soc. N. S. Wales, vol. 6, p. 213.  
Burdekin and Mary Rivers, in lagoons.

## SCOMBRESOCIDÆ.

35. *BELONE KREFFTHII*. Gunth.

Macl. Cat. Fishes, Proc. Linn. Soc. N. S. Wales, vol. 6, p. 242.  
Burdekin River, in fresh water lagoons.  
A fine fish, attaining a great size.

## CLUPEIDÆ.

36. *ENGRAULIS HAMILTONI*. Gray.

Gunth. Cat. Fishes, vol. 7, p. 395.  
Lower Burdekin in shoals, Oct. 1882. Salt water.  
The largest and finest species of anchovy I have ever seen.

37. *CHATOESSUS EREBI*. Gunth.

Macl. Aust. Clup., Proc. Linn. Soc. N. S. Wales, vol. 4, p. 368.  
Lower Burdekin, in fresh water.

38. *CHATOESSUS ELONGATUS*. n. sp.

D. 14, A. 19, L. lat 42.

The height of the body is one-third of the length without the caudal fin, and is a little more than the length of the head. The eye which is two-thirds hidden by an adipose membrane, is distant from the point of the snout about one and a-half of its diameter; the profile of the head is longer and flatter than in *C. Erebi*. The abdomen is strongly serrated along its whole length, the scales are not deciduous. The last dorsal ray reaches to the commencement of the caudal fin; the ventrals commence opposite the third ray of the dorsal. The colour is silvery, with the back and fins darker. Length, 11 inches.

Lagoons, Mary River, in fresh water.

39. *CLUPEA SUNDAICA*. Bleek.

Atl. Ichth. Clup., p. 105, tab. 271, fig. 5.  
Lower Burdekin in salt water.

A full account of this valuable herring will be found in my monograph of the Clupeidæ of Australia, published in the 4th volume of our Society's Proceedings.

40. *ELOPS SAURUS*. Linn.

Macl. Aust. Clup. Proc. Linn. Soc. N. S. Wales, vol. 4, p. 382.  
Lower Burdekin, in salt and fresh water.

41. *MEGALOPS CYPRINOIDES*. Brouss.

Macl. Aust. Clup. Proc. Linn. Soc. N. S. Wales, vol. 4, p. 383.  
Lower Burdekin, in lagoons.

This herring is frequently kept in tanks in and about Pinang, where they rapidly multiply and fatten.

42. *CHANOS SALMONEUS*. Bl.

Macl. Aust. Clup. Proc. Linn. Soc., N. S. Wales, Vol. 4, p. 383.  
Lower Burdekin in fresh and salt water.

This, the finest of all the Herring tribe, both as regards size and quality, though rare on the New South Wales coast, becomes abundant in the tropical estuaries of Queensland. It can readily be domesticated and multiplied in tanks or lagoons, and certainly would prove much more worthy of a little care in cultivation than the much vaunted "gourami" (*Osphromenus olfax*).

43. *CHIROCENTRUS DORAB*. Forsk.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 6 p. 263.  
Lower Burdekin in salt water.

Dr. Cantor says that this Fish is common in Malacca, where it attains a length of six feet, and is much relished by the natives.

MURÆNIDÆ.

44. *ANGUILLA REINHARDTRI*. Steind.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 6, p. 267.  
Mary River and Lillesmere Lagoon.

45. *ANGUILLA MARGINIPINNIS*. n. sp.

Head broad, depressed and rounded in front; the lips are fleshy and form a reflexed fold on the sides; mouth large, the gape extending to a little behind the eye, which is small. Teeth small, in broad flat bands in both jaws, a band on the vomer of about the same size as the maxillary bands, but not quite so long

and tapering behind. The distance from the snout to the gill-opening is very nearly equal to that from the gill-opening to the commencement of the dorsal fin, which is double the distance from thence to the vent. The tail is only a little longer than the body. In a specimen measuring in all thirty-two inches, the distance from the snout to the vent measured fifteen inches, leaving seventeen inches for the tail. Colour dark brown, with the under side of the head and body of a pale yellow; all the fins are narrowly margined with white.

Lillesmere Lagoon. Burdekin.

#### SCLERODERMI.

##### 46. TRIACANTHUS BIACULEATUS. Bl.

Macl. Cat. Fish Proc. Linn. Soc., N. S. Wales, Vol. 6, p. 308.  
Lower Burdekin, salt water.

#### GYMNODONTES.

##### 47. TETRODON RETICULARIS. Bl.

Gunth. Cat. Fishes, Vol. 8, p. 296.  
Lower Burdekin, salt water.

##### 48. TETRODON LÆVIGATUS. L.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 6, p. 336.  
Lower Burdekin, salt water.

#### SIRENOIDEI.

##### 49. CERATODUS FORSTERI. Krefft.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 6, p. 347.  
Mary and Burnett Rivers.

Mr. Morton got twelve specimens of this Fish in the Mary, one only in a net, all the others were trapped by the blacks by being forced through a narrow passage in the river formed by a kind of weir of brushwood. A curious circumstance as regards the habits of this fish was noticed by Mr. Morton. At the time of his visit, a number of the *Eucalypti* on the banks of the rivers were in full flower, and the blossoms as they dropped into the water were eagerly seized and swallowed by the *Ceratodus*, and in every specimen which he got, he found the stomach literally crammed with these flowers.

Mr. Morton also ascertained from an old resident and fisherman, that he had observed the *Ceratodus* going in pairs in the months of June, July, and August, that they make slight indentations in the muddy bottom in from six to ten feet depth of water, in which they deposit their spawn; that the male and female seem to remain near the spawn, and are then not easily disturbed; that they frequent the same places every year, and that the spawn much resembles that of a frog. The same informant also says that he has taken the spawn, hatched it in a tub of water, and kept the young alive for some weeks.

## TRYGONIDÆ.

## 50. TRYGON UARNAK. Forsk.

Macl. Cat. Fishes Proc. Linn. Soc., N. S. Wales, Vol. 6, p. 377.  
Lower Burdekin, salt water.

## 51. TRYGON SEPHEN. Forsk.

Gunth. Cat. 8, p. 482.  
Lower Burdekin. Salt water.

## 52. TÆNIURA MORTONI. n. sp.

Disk sub-circular; tail one-half longer than the body, with a broad rayless fin beneath extending to the extremity. Disk in the centre dark brown, covered with close minute spines and with three or four round flattened tubercles in the line of the back on the scapular region. Sides of disk smooth, or finely granular and of a paler colour.

Lower Burdekin. Salt water.

In the foregoing list, I have included all the fishes taken by Mr. Morton within the mouths of the Burdekin and Mary Rivers, but it is evident that numbers of them are purely sea fishes, and have no more right to be classed as belonging to these rivers, than fishes caught in Port Jackson, have to be called Parramatta River fishes. Of the 51 species mentioned, 17 are essentially sea fishes. *Serranus estuarius*, *Diagramma affine*, and *labiosum*, *Gerres filamentosus*, *Scatophagus multifasciatus*, *Chrysophrys hasta*, *Caranx Georgianus* and *compressus*, *Chorinemus lysan* and *toloo*

*Equula edentula*, *Cybium semifasciatum*, *Chirocentrus dorab*, *Tria-  
canthus biaculeatus*, *Tetrodon reticularis* and *lævigatus*, *Trygon*  
*Uarnak* and *Sephen*, *Tæniura Mortoni*. Eleven may be classed as  
salt-water fishes occasionally ascending rivers into fresh water:—  
*Lates Darwiniensis*, *Pseudolates cavifrons*, *Polynemus tetradactylus*,  
*Corvina argentea*, *Platycephalus Mortoni*, *Periophthalmus aus-  
tralis*, *Mugil Waigiensis*, *Engraulis Hamiltoni*, *Clupea Sundaica*,  
*Elops saurus*, *Chanos salmoneus*. The freshwater fishes occa-  
sionally visiting the sea, are seven in number:—*Mugil dobula*  
and *Ramsayi*, *Chatoëssus Erebi*, and *elongatus*, *Megalops*  
*cyprinoides*, *Anguilla Reinhardtii* and *marginipinnis*. The  
entirely fresh water fishes are fifteen in number:—*Apogon-  
ichtys Gillii*, *Oligorus macquariensis*, *Therapon truttaceus*,  
*percoides*, *longulus*, *fuliginosus* and *parviceps*, *Centropogon*  
*robustus*, *Eleotris planiceps*, *Atherinichthys maculatus*, *Neosilurus*  
*Hyrtlii*, *Copidoglanis tandanus*, *Arius Australis*, *Belone Krefftii*,  
*Ceratodus Forsteri*.

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NOTES ON THE METHOD OF OBTAINING WATER FROM EUCALYPTUS  
ROOTS AS PRACTICED BY THE NATIVES OF THE COUNTRY,  
BETWEEN THE LACHLAN AND DARLING RIVERS.

BY K. H. BENNETT, ESQ.

The country situated between the Lachlan and Darling Rivers  
(in some places nearly 200 miles wide) was until recent years,  
before its occupation for pastoral purposes, even in ordinary  
seasons entirely destitute of water for several months in each  
year, and the natives who formerly claimed and roamed over the  
country for a distance of forty or fifty miles from the above  
named rivers, were compelled during the hot dry months to resort  
to their banks, and remain there until the uncertain rainfall of  
this region had replenished the shallow swamps and waterholes ;  
but with the scattered tribes or rather families who inhabited the  
still more arid intermediate portion, and between whom and the  
river natives a bitter feud existed, the case was different; here

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they had no river to fall back upon, and except in the rare intervals of peace, such was their dread of their more powerful and fortunate neighbours that they would not venture near where they knew a never failing supply of the much prized element was easily obtainable, and consequently as may be imagined by those unacquainted with the resources of the country would soon become the victims of that horrible fate, Death from thirst! Such, however, was not the case, for Nature as if to make amends for the scarcity of water above ground has in this inhospitable region provided a perennial supply in the roots of several species of trees, which for the most part are unknown on the country nearer the rivers. On these roots—the natives in former times as a rule—used to depend for their supply of water for four or five months of every year (and in times of drought for the whole of the year). All this, however, refers to a bygone time, the whole or nearly all of this country has of late years been occupied for pastoral purposes. Wells and tanks have been sunk, and permanent water by these means secured, the river blacks have been almost “civilized” off the face of the earth; the old feud has died out, and the remnant of the back country natives have abandoned—except when traversing a strip of unoccupied country—their time honoured and somewhat laborious method of obtaining water from roots. There are several kinds of trees from which water was obtained, including three species of Eucalyptus, a species of Hakea and Currajong. The Eucalypti consist of a gum (the largest of the back country trees), a box, and mallee. The first named was the most preferred, as yielding the greatest quantity, and as the method was the same in all cases—this one will serve for a description of the *modus operandi*. This tree which somewhat resembles the red gum in appearance—the leaves being narrower and of a silvery colour—grows chiefly on sandy or light loamy soil, and throws out numerous lateral roots at a depth of from six to twelve inches from the surface of the ground. The native having ascertained the position of one or more of these roots by repeatedly jobbing the point of a spear or sharpened stick into the soft earth, and at a distance of some six or eight feet from

the trunk of the tree, quickly removes the superincumbent soil with his wooden shovel for twenty or thirty feet, and cutting the root off at each end lifts it out of the trench and cuts it up into lengths of about eighteen inches or two feet, knocks off the bark and stands the severed portions on end in some receptacle to contain the water, (in former times a water-bag made of the entire skin of a male wallaby.) As soon as these pieces are placed on end the water commences to drip, and, when the whole of the root or roots are cut up and placed on end, the native beginning at the first placed, puts the end in his mouth and by a vigorous puff expels the remaining water. The roots chosen are—with the bark on—about the size of a man's wrist, the larger ones being more woody and less porous contain little or no water. The water is beautifully clear, cool, and free from any unpleasant taste or smell.

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NOTE ON A VIVIPAROUS LIZARD (*Hinulia elegans.*)

By J. J. FLETCHER, M.A., B.Sc.

In vol. ii., p. 167, of the late lamented Prof. Balfour's Comparative Embryology, it is said that "a few forms (of *Reptilia*) are viviparous, viz., some of the blind-worms amongst lizards (*Anguis*, *Seps*), and some of the Viperidæ and Hydrophidæ amongst the serpents. In the majority of cases, however, the eggs are laid in moist earth, sand, &c."

In Prof. Owen's Anatomy of Verteb., vol. i., p. 616, it is stated that "the common ringed snake excludes the eggs, sixteen to twenty in number, connected together with a glutinous coating, usually in some fermenting mass of decaying organic matter, whereby they are often transported and spread abroad in the manuring of fields and gardens. The viper is not subject to this ovipositing cause of dispersion, and the confinement to a limited locality would seem to be the condition of the viviparity of most or all poisonous snakes. It affects however, the harmless slow-worm (*Anguis fragilis*), and nimble lizard (*Zootoca vivipara*), both of which usually produce their young alive."

The lizards and snakes mentioned in the preceding paragraphs are European, but some of our Australian forms exhibit the same peculiarity of being viviparous; though I am able to find but few remarks on the subject. Dr. Günther in his Catalogue of Colubrine Snakes, says that *Hoplocephalus pallidiceps* and *H. coronoides* are viviparous, and that he took two perfectly developed embryos from the oviduct of a specimen of the former, and four embryos from a specimen of the latter.

The late Mr. Krefft in his "Notes on Australian Verteb.," says of *Trachydosaurus*, that "the female produces a pair of young ones of considerable size, about the end of January. This is the only recorded instance of a viviparous lizard that I have so far been able to meet with.\*"

At Burrawang, N.S.W., in January last I captured a lizard having a much swollen abdomen, and when this was squeezed, two almost fully developed young ones, each of which was still attached to a portion of unabsorbed yolk, and enclosed in a thin transparent chorion so-called, made their exit from the cloacal aperture. As this seemed interesting, more specimens were sought, and two were subsequently obtained and more carefully examined. In one of them the posterior portion of each oviduct, lodged a young one about 2 in. long, which had its limbs and tail completely formed, and was coiled round upon the remaining portion of the yolk. In the other, there were two slightly more advanced embryos in each oviduct; the two anterior embryos reached as far forward as the stomach, and when seen from the ventral aspect, were overlaid by the liver to a small extent. The gut was displaced and the abdominal cavity enormously distended. When uncoiled, the young ones measured  $2\frac{1}{2}$  in. from the snout to the tip of the tail, as compared with about 7 in. in the mother, in each case the tail being a little more than half the whole length. As is usual in the viviparous species, the chorion in each instance was thin and transparent, and quite devoid of the calcareous matter, with which in oviparous

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\* Mr. Krefft in his monograph on the "Snakes of Australia," mentions other viviparous species.



species it is more less impregnated. Prof. Owen figures the organs of a specimen of *Zootoca*, which had three ova in one oviduct and two in the other. The general arrangement in my specimens was just as is figured in this one.

The point dealt with in this note is not of any importance, but is I think sufficiently interesting to be recorded, in the hope that others may be induced to take up the neglected subject of the oviposition of our reptiles.

NOTE.—After the proof of the above had been returned to the printer, I met with Mr. Krefft's paper "On the Vertebrata of the Lower Darling," in the Proceedings of the Philosophical Society of N.S.W., Vol. I. In this paper the author enumerates a considerable number of oviparous lizards, and gives a good deal of information about them. In addition to *Trachydosaurus*, it is stated that *Cyclodus gigas* also is viviparous; but of three species of *Hinulia* met with—including *H. elegans*—Mr. Krefft says that it has not been ascertained how many eggs they lay, and he suggests that they may possibly be viviparous, and produce as many as ten or twelve young. I regret my inability to refer to this paper in its proper place. Mr. Krefft's communication shews that the subject of oviposition of Australian reptiles is not altogether a neglected one, and that there is yet room for further observations.

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#### NOTES AND EXHIBITS.

Professor Stephens exhibited a photograph and a sketch forwarded by Mr. C. Jenkins, representing a fossil from the Devonian formation of the Murrumbidgee Valley, near Yass. This very remarkable specimen is the head of some Ganoid fish, evidently belonging to the Devonian period, and characterised by strong bony scales, deeply sculptured, and united by close sutures. Two of these are perforated by large sub-circular orbits for the eyes. Other portions of the same specimen had been forwarded to the Australian Museum while Mr. Jenkins was engaged in the exploration of the Cavan Caves; and some other fragments have since, it is believed, been recovered. Mr. Jenkins is inclined to refer it to *Asterolepis* (which is closely connected with *Pterichthys*), but chiefly on account of the character of sculpture of the scales. On the same ground, he doubts its relationship to *Cocosteus* or *Cephalaspis*. Prof. Stephens added that without the actual specimen before them with all its collected fragments, it would be premature to

determine even the genus of this ancient fish ; but pointed out that it appeared to have some points of resemblance to *Macropetalichthys* of the North American Devonians.

Mr. Macleay exhibited specimens of a small Moth (*Tineidae*), the larva of which was creating great havoc in the vegetable gardens in and about Sydney, completely eating up the leaves of the cabbages and cauliflowers, and rendering the entire crop utterly useless. The Caterpillar, a number of which were exhibited, is an active, slightly hairy, green worm ; the pupa is also green and is fastened on the under side of the leaf on which it has fed, by a cocoon of beautiful open lace work. The rapidity with which this insect seems to reproduce itself is most astounding, and accounts for the short work it makes of a bed of cabbages. The insect was, it is said, first noticed last year, and then not in destructive numbers, so that it will probably be found to be an importation.

Mr. Macleay also exhibited the fœtus of *Halmaturus ruficollis*, taken from the pouch of the mother, with the umbilical cord attached, illustrating the extremely early age at which the young leave the uterus.

Mr. H. A. Gilliat exhibited a collection of cretaceous fossils from the Mount Brown diggings. With reference to this exhibit the Vice-President made a few remarks on its value and interest. He said that the cretaceous formation was known to extend throughout the whole eastern interior of the Continent, and probably through the centre, but not much was known of the fossils. The abundance of *Avicula alata*, Eth., in this collection showed such a wide-spread prevalence of this fossil, that he considered it the most characteristic species of the formation. The rock was curiously like the Greensand of Europe. The collection contained valuable additions to our knowledge of the fauna.

Mr. J. J. Fletcher exhibited (1.) A specimen of a Giant Earth-worm, 25 in. long, from Burrawang, N.S.W. It probably belongs to Prof. M'Coy's genus *Megascolides*, and its existence in this colony is now recorded for the first time. (2.) The plates *Dendrolagus inustus* and *D. ursinus* from Profs. Schlegel and Müller's

work on the Mammals of the Indian Archipelago, for comparison with the specimen of a new species of *Dendrolagus* exhibited by the Hon. Wm. Macleay at the last meeting, (3.) Specimens of the Lizard referred to in his paper.

Professor Stephens exhibited a pebble from Casino, containing an included drop of water, which did not entirely fill the space in which it was enclosed. The stone was a nodule of chalcedony, evidently washed out of a volcanic rock, in a cavity of which it had been formed by infiltration of hydrous silica, the process having been in all probability only arrested by the decomposition of the matrix and consequent liberation of the nodule. The cavity had been first lined by some (probably) zeolitic mineral, forming a mammillary surface, which had been subsequently covered by the inner and harder silicious substance which now enclosed, the drop of water accompanied by some gas. The phenomenon is not at all uncommon, but often escapes notice.

He also exhibited a Chrysalis of a *Danaïd*, secured by a silk line to a leaf of an exotic *Pelargonium*.



WEDNESDAY, MAY 30TH, 1883.

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The Vice-President, the Rev. J. E. Tenison-Woods, F.L.S., &c.  
in the Chair.

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MEMBERS ELECTED.

Thomas Whitelegge, Esq., and Henry Deane, Esq., M.A.,  
A.M.I.C.E., of Gladesville.

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DONATIONS.

"Bulletin de la Société Royale de Géographie d'Anvers," Tome  
vii., 6e Fascicule, 8vo, 1882.

"Science," a new American illustrated Journal, published  
weekly, vol. i., No 1, February, 1883. From the Editor.

"Mittheilungen aus der Zoologischen Station zu Neapel,"  
Vierter (iv.) Band, 1 Heft, 8vo, 1882.

"Journal of Conchology," vol. iii., Nos. 11 and 12, July and  
October, 1882. From the Conchological Society of Great Britain.

"Feuille des Jeunes Naturalistes," No. 150, April, 1883. From  
the "Directeur."

"Sydney University Calendar," 1882-83. From the Senate.

A series of Papers (12 in number), chiefly on recent and fossil  
Bryozoa. By Arthur W. Waters, F.G.S., &c. From the Author.

"New Zealand Journal of Science," vol. i., No. 9, May, 1883.  
From the Publishers.

"Bulletin de la Société Imperiale des Naturalistes de Moscou,"  
No. 1, 1882. From the Society.

"Report of the Trustees of the Australian Museum for the  
the year 1882. From the Trustees.

## NOTES ON A LOWER JAW OF PALORCHESTES AZAEL.

BY CHARLES W. DE VIS, B.A.

It may perhaps be allowed that a small accession to our scanty knowledge of Australian palæosteology may be useful, even though it merely tend to increase our acquaintance with known forms, and define their taxonomic relations. By the kindness of one of the Trustees of the Queensland Museum, W. H. Miskin, Esq., an opportunity is given of describing the lower dentition and form of jaw in a very young *Palorchestes Azael*, (Owen), and of noting thereby some features of interest. The fossil was obtained by Mr. Miskin from well-sinkers who met with it at a depth of 70 feet near St. Ruth, on the Darling Downs. In the original condition of the specimen the mandibles were displaced at the symphysis forwards and upwards, and in this position reconnected by the cementation of the mineralising agent, calcium carbonate. By the more unlucky accident of pressure acting upon the anterior third of the jaw transversely to its long axis, both rami have lost their natural flexure. The left being certainly much straighter—the right probably somewhat more strongly and abruptly curved inwards at the symphysis, than in the normal condition. On clearing away adhering matrix, the whole of the teeth, with the exception of the left premolar, which has been carried away with a piece of the bone, and the second molar of the same side, which is fractured, were found in excellent preservation. The combined length of the series  $d^4 m^1 m^2$ , is exactly as in the portion of an adult jaw figured by Professor Owen (Foss. Mant. Aust., Pl. cvi., fig. 1). The shallowness of the jaw below the growing molars, characteristic of the young macropod, is a conspicuous feature of the present fossil — its depth beneath the second molar being little more than half that of the adult mandible, and about two-thirds of the depth which it attains below the premolar. The evidence derived from this deepening of the mandible from behind forward, tending to show that *Palorchestes* was more nearly allied to the kangaroo proper, than to the *Protomnodontidæ*, is of some weight, since, though not confirmed, it is not belied by

the structure of the premolar. This tooth has a form peculiarly its own, differing equally from the subtrenchant bitubercular tooth of the former, and the long fluted, chisel-like tooth of the latter. It is eight lines long and three lines broad, of a semioval form, with its outer surface convex and sloping rapidly downwards. On this aspect it has two shallow indents at about equal thirds of its length, the posterior being the deeper and broader of the two. On its inner surface it rises vertically from the socket into a median lobe, separated from the fore and hind angles by indents, of which the anterior is long and shallow, the posterior shorter and deeper, each of them being separated from its anticlinal indent, by a short median ridge. The apex of the mid lobe is worn down sufficiently to expose an inwardly directed loop of dentine, and the general shape of the tooth being reniform with the pelvis turned inward a little more attrition would extend the dentine loop into the form of an open double curve. The prebasal ridge of  $d^4$  is developed on its outer two-thirds only, and is connected with the anterior lobe by a minute link. The anterior lobe, like all the other lobes of the teeth in place, has on its anterior aspect a broad and shallow indent. The median link is well developed and, rising from the middle of the posterior surface of the fore lobe, subsides on the outer angle of the anterior side of the hinder lobe. The post-basal ridge is equally broad on either side of the mid link—in other respects it is as described in the worn tooth by Prof. Owen. The same must be said of the other characters of this tooth—nor can anything be added of importance to Prof. Owen's description of  $m^1$  itself. All the teeth in place  $p^3$   $d^4$  and  $m^1$  are equally worn, in each there is a narrow line of dentine exposed by the abrasion of the enamel. The enamel of  $m^2$  is of course intact, the hinder lobe of the tooth having but lately risen fairly above the gum. The incisor is remarkable for the unusual expansion of its base, at the incisive outlet it measures twelve and a-half lines, a width exceeding its whole length by more than one-fifth. Its inner edge, in opposition to that of its fellow is straight, its outer has a parabolic curve from the outer angle of the socket to the lip of the inner edge. The internal or posterior surface is at the inner edge strongly concave,

the concavity gradually decreases towards the outer edge, but on the posterior surface of the outer edge itself is a strong fold (formed of a revolution of the edge backwards) running upwards from the base and subsiding as it reaches the cutting edge. The outer or fore surface of the tooth is curved longitudinally and transversely, and is covered with shallow confluent excavations. The diastema is long, being nearly equal in length to the space occupied by the three anterior grinders. It descends from the premolar with a gentle curve, and rises with a slighter curve to the incisive outlet. Commencing about four lines in front of the vertical from the premolar, the symphysis presents a long moderately deep and nearly horizontal syndesmotomic surface, with longitudinal rugæ. The union of the mandibles through much broader and firmer than in *Macropus*, is far inferior in those respects to that of *Procoptodon*, and corresponds rather with that of *Sthenurus*. The same observation applies to the direction in which the incisor is implanted. The dental foramen is midway between the vertical from the premolar and the incisive outlet, and is six and a-half times below the mediasternal ridge, in both respects differing much from its position in *Macropus*. A longitudinal groove commences at the vertical from the fore lobe of  $d^4$  and gradually deepening as it runs backwards, separates the lower border of the mandible from the sub-alveolar convexity, which increases rapidly below the permanent molars. The groove ends rather abruptly at the origin of the inflected angle. The postalveolar angle is prominent, the outer alveolar groove, narrow and shelving. On the outer side anteriorly, the alveolar ridge is well separated by compressure from the subalveolar convexity beneath the premolar, and is continued backwards from the diastema in a straight slope to the middle of  $m^1$ . The sub-alveolar convexity subsides considerably beneath  $d^4$ , but again increasing, is at its greatest at the base of the coronoid process. This process appears to rise at a comparatively low angle. On the same parallel with the base of the coronoid process, is the commencement of the ridge bounding the outer crotaphyte fossa posteriorly—but the lower brim of that fossa does not present itself between the two points as it does in *Macropus*.

We have in this jaw a diastema unlike that of any known macropod, but having its greatest similitude in *Sthenurus*. It is in the latter genus again that we find some approach to the greatly dilated incisor in the mandible before us. It has already been observed that the symphysis is that of *Sthenurus* rather than of *Macropus* on the one hand, or of the more aberrant macropod, *Procoptodon*, on the other. Concomitant with these indications of alliance with *Sthenurus*, we find however, a premolar departing from all others of the family. It seems, therefore, reasonable to surmise that *Palorchestes* was on the whole a true saltigrade of the macropodal type, and that the point of divergence whence its differentiation commenced, was *Sthenurus* or some form closely allied to it. The use to which the determination of such relationship may be put, is best known to those who have to deal with the disconnected bones of the numerous extinct species of kangaroos; without its guidance their identification, always doubtful in some degree, becomes the most unsatisfactory guess-work.

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SYNONYMY OF AUSTRALIAN AND POLYNESIAN LAND AND MARINE  
MOLLUSCA.

BY J. BRAZIER, C.M.Z.S., &c., &c.

1. PATELLA ACULEATA.

*Patella aculeata*, Reeve, Conch. Icon., pl. 32, sp. 90.

„ *squamifera*, Reeve, Coc. cit., sp. 94.

„ *aculeata*, Angas, Proc. Zool. Soc., p. 221, 1867.

„ *squamifera*, Angas, loc. cit., p. 221, 1867.

„ *aculeata*, Tenison-Woods, Proc. Roy. Soc. Tas., p. 22, 1877,

*Hab.*—Port Jackson near the Heads, and outside from the Clarence River on the north, to Twofold Bay on south; it is also found in Tasmania.

I have had some hundreds of specimens of the so-called species *squamifera*, but I can only identify them with *aculeata*. The very rough sculptured variety is of very common occurrence at the Old



Man's Hat, on the inner North Head of Port Jackson. The squamately ribbed depressed species of Mr. Reeve and Mr. Angas, are only the young and depressed species of *aculeata* of still very young specimens. Many hundred species might be invented from examples selected from the rocks all along the coast of New South Wales

## 2. NATICA INCEI.

*Natica Incei*, Philippi, Proc. Zool. Soc., p. 233, 1851, in Chem. Conch. Cab., Küster's ed., p. 142, pl. 19, fig. 5, 1852.

*Natica Inci*, Reeve, Conch. Icon., pl. 10, sp. 37, 1855.

„ *Baconi*. Reeve, loc. cit., pl. 20, sp. 89.

„ *fibula*, Reeve, loc. cit., pl. 27, sp. 130.

„ (*Neverita*) *baconi*, Angas, Proc. Zool. Soc., p. 167, 1865.

„ (*Lunatia*) *incei*, Angas, Proc. Zool. Soc., p. 90, 1871.

*Hab.*—Outer Manly Beach, Newcastle, Port Stephens, Manning, Macleay, and Nambuccra Rivers, Port Macquarie, Bellinger, Clarence, and Richmond Rivers, found on all beaches near the mouths of the above rivers and ports. Victoria and South Australia.

This very fine and well-known species was first described by Philippi in the Proceedings of the Zoological Society of London, 1851, and well figured in 1852, by Philippi in Martini and Chemnitz, second edition by Küster; then Reeve in 1855, gives it a new name as *Inci*, species 89. At species 37, he finds another large specimen in the Cumingian collection from South Australia, and being a little more conical than the *Incei* of Philippi, found on the east coast of Australia, Mr. Reeve, pen in hand, describes, figures and names it *Baconi*, only, I believe, to gratify Mr. Cuming. At species 130, in Reeve's Conch. Icon., he also figures the small form under another name as *fibula*, this is the most common form found on the beaches near the Bellinger River Heads, on sandy mud, well up from the sea break. The large specimens are found on the sand flats, close to the sea break. The extensive series that I have from all the above localities, convinces me that they are all of one species.

## 3. CANCELLARIA UNDULATA.

*Cancellaria undulata*, Sowerby, Conch. Illust., No. 15., pl. 10, fig. 16 only. Proc. Zool. Soc., p. 136-7, 1848; Thes. Conch., vol. ii., p. 443-4, pl. 92, fig. 12; pl. 95, fig. 79. Reeve Conch. Icon., vol. x., pl. 3, sp. 9, 1856; Crosse, Journal de Conch., third series, vol. ix., No. 43, p. 235, 1861; Angas Proc. Zool., Soc., p. 171, 1865. *Cancellaria granosa*, Angas. Proc. Zool. Soc., p. 208, 1867. *Cancellaria undulata*, Ten-Woods, Proc. Roy. Soc. Tas., p. 7, 1877.

*Hab.*—Middle Harbour, Sow and Pigs Reef, Port Jackson, Broken Bay, Port Stephens, Newcastle, Bellinger River, and all beaches between that river and the Clarence River Heads (*Brazier*).

There has been a great deal of confusion caused by one author and another in reference to the specific name and true locality of this species; first when it was figured in the Conchological Illustrations by Mr. Sowerby, he had two species before him and he named them as one, under the name of *granosa* in the Proceedings Zool. Society, 1848; he then points out that *undulata* was originally included with *granosa* in the Thesaurus; he also distinctly says "we separate the shell represented in the Conchological Illustrations, figure 16, as *undulata*, from Van Dieman's Land." Reeve, on the authority of Cuming gives Tasmania; the Rev. Tenison-Woods says the species is not known to the Tasmanian naturalists. Mr. Angas, in Molluscan Fauna of South Australia, Proc. Zool. Soc., 1865, quotes *undulata* from there, and says that it is very closely allied to *C. granosa*. So far Mr. Angas is wrong; *undulata* is confined to the coast of New South Wales, or in other terms, the east coast of Australia; the *granosa* is confined to the south-east and south coast of Australia. Mr. Angas, in the Proc. Zoological Soc, 1867, gets into still greater confusion when he persists in calling the *C. undulata*, *C. granosa*, and quotes Sowerby's Conch. Ill., figs. 16 and 17, in which fig. 17 is really *C. granosa*.

It was only recently, when going through the Cancellariidæ in the Hargraves Collection in the Museum, that I was astonished to

see specimens of *C. undulata* named *granosa*, Port Jackson, and *granosa* named *undulata*, South Australia. Of some hundred of *undulata* that I have seen, and in my late wife's collection, all are named by Mr. Angas *granosa*. We have for many years sent them away to our conchological friends in England and Europe as *granosa*, but now find that we have been deluded by authors. I hope this short note on *C. undulata* will be of some use in the future, and put an end to this confusion of names. Reeve and Cuming, to make matters more complicated, have given a locality of their own invention—Peru, South America—for *undulata*. M. Crosse, in *Journal de Conch.*, also follows with Reeve and Cuming's locality.

#### 4. TURRITELLA SOPHIÆ.

*Turritella incisa*, Tenison-Woods (non Reeve), *Proc. Linn. Soc. N.S.W.*, vol. ii., p. 262, 1877.

*Hab.*—Off Port Jackson Heads, 45 fathoms (Brazier).

The name *incisa* is preoccupied by Reeve in *Conch. Icon.*, pl. xi., sp. 65, 1849; also from Sydney in deep water, by Strange. I therefore name the species after my late wife, who was a devoted student of conchology for twenty-three years.

#### 5. TUGALIA INTERMEDIA.

*Parmophorus intermedius*, Reeve, *Proc. Zool. Soc.*, p. 50, 1842, *Conch. Syst.*, vol. ii., pl. 139, figs. 5-6. *Tugalia intermedia*, A. Adams, *Proc. Zool. Soc.*, p. 88, 1851. *Tugalia cinerea*, Sowerby, (non Gould), *Thes. Conch.*, vol. iii., p. 221, *Thes.*, pl. 249, figs. 15-17. *Tugalia ossea*, Sowb. (non Gould), *loc. cit.*, fig. 18. *Tugalia ossea*, Angas (non Gould) *Proc. Zool. Soc.*, p. 219, 1867. *Tugalia cinerea*, Reeve (non Gould), *Conch. Icon.*, vol. xvii, pl. 1, sp. 5 a b. *Tugalia Australis*, Tenison-Woods, *Papers and Proc. Roy. Soc. Tas.*, p. 21, 1877.

*Hab.*—Philippine Islands? (Cuming, Reeve), Port Jackson, New South Wales, from low water to 18 fathoms (*Brazier*), Victoria (*Bailey*), Tasmania (*Ten.-Woods*).

I have four specimens of a *Tugalia* from the Chatham Islands — *Tugalia elegans*, Gray, and identical with our Port Jackson *T. intermedia*; all the specimens of *Tugalia parmophoidea*, of authors that I have seen from New Zealand are *T. elegans*, Gray, they in no way correspond with *Tugalia parmophoidea*. Quoy and Gaimard, from New Holland (South Australia), evidently *Tugalia Tasmanica*, Ten.-Woods, Proc. Roy. Soc. Tasmania, p. 28, 1876, is only a variety of Quoy and Gaimard's species, as he says his description was drawn up from a single example. Neither do Reeve or Sowerby figure Gould's species of *Tugalia*, see Otia Conchologica, p. 12-13, 1862, and the Expedition Shells, 1846.

#### 6. COLUMBELLA TAYLORIANA.

*Columbella Tayloriana*, Reeve, Conch. Icon., vol. xi., pl. 35, fig. 5, 1859. *Albomaculata*, Angas, Proc. Zool. Soc., p. 111, pl. 13, fig. 5, 1867.

*Hab.*—North-west Australia? (*Reeve*), Port Jackson (*Angas*). Broken Bay, Port Stephens, Port Macquarie, Bellinger, Clarence and Nambuccra Rivers, and all intermediate bays and beaches between those rivers (*Brazier*).

This very pretty species is very often found under stones in Port Jackson and among the rocks at Bondi and Coogee Bays, after passing north from Sydney the specimens become much larger and more numerous at the localities given above. I very much doubt the locality given by Reeve of north-west Australia. I have not seen any species like it from there.

#### 7. HELIX (DISCUS) THORPEIANA.

*Helix (Discus) ceralis*, Cox (non Crosse) Proc. Zool. Soc. p. 147, pl. 16, fig 1; 1873. Pfeiffer, Mon. Helv. Viv. Vol. VII., p. 399. Nomenclator, Helv. Viv., p. 179.

*Hab.* Solomon Islands.

The specific name of Crosse having priority for a species described in 1868, from New Caledonia, name changed as above.

#### 8. HELIX (PAPUINA) WALLERI.

*Helix brencleyi*, Angas (non Brazier) Proc. Zool. Soc., p. 861, pl. 54, fig. 7, 1878.

*Hab.*—Ysabel Island ; Solomon Group (Brenchley and Brazier.)

My specific name of *Branchleyi* having priority for a species described in the Proc. Linn. Soc. of N.S.W., Vol. 1, 1875-6. See Pfeiffer, Mon. Helv. Viv., Vol. VIII., p. 582, 1877. Name changed as above.

At present I am preparing a Catalogue of the whole of the Land Mollusca known from the Solomon Islands, New Ireland, New Britain, New Hanover, Duke of York and Admiralty Islands. A very large number of species said to have been brought from the Admiralty Islands, on the authority of Mr. H. Cumming, never did exist on them, but on the Solomons, New Britain and New Ireland.

#### 9. LUCINA DENTATA.

*Tellina dentata* Wood. General Conch. p. 195, pl. 46, f. 7, 1817.

„ „ Dillwyns, Desc. Cat., Vol. 1, p. 103, 1817.

„ *divaricata* (part) Chem. Conch. Cab., VI. 134, pl. 13, fig. 129, 1782.

*Lucina divaricata*, Lam. (non Linn.) Anim. sans Vert. Vol. V, p. 541. 1818. Desh. 2nd ed. Vol. VI., p. 226, 1835.

*Tellina dentata*, Mawe's Linnean System of Conchology, p. 27, 1823.

*Lucina Chemnitzii*, Phil. Zeit. Spal. p. 157, 1848.

„ *arnata*, Reeve, Conch. Icon. Vol. VI., sp. 48, 1850.

„ *eburna*, Reeve, Conch. Icon. Vol. VI., sp. 49, 1850.

„ *strigilla*, Stimpson, Shells, N. E., 17, 1851.

„ *Americana*, C.B. Ad. Contrib. Conch, 243, 1852.

„ *pilula*, C.B. Ad. Contribu. Conch, 246, 1852.

„ *Lamarckii*, Dunker, Weinkauff, Journ. Conch, X, p. 315, 1862.

„ *quadrisulcata*, Orb. Voy. Amer. Merin., 584, Moll. Cuba II., 294, 394, pl. 27, f. 34, 36. Shells of South America, Brit. Mus. Cat. p. 72, 1854.

„ *Sechellensis*, Orb, Voy. Am. Merid, 384.

„ *ornatissima*, Orb. Voy. Am. Merid., 384.

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- Lucina serrata*, Orb. Voy. Am. Merid., 384, Moll. Cuba. II., 295, pl. 27, f. 37, 39, 1853. Brit. Mus. Cat., p. 41, No. 496, 1854.
- „ *divaricata*, Gray (non Linn.) Dieffenbach's Travels in New Zealand, Vol. II., p. 256, 1843.
- „ *Cumingi*, Ad. and Ang. Proc. Zool. Soc., p. 446, pl. 37, f. 20, 1863. Angas, P.Z.S. p. 651, 1865, p. 192, 1877.
- „ *ornata*, Angas, P.Z.S., p. 192, 1877.
- „ *divaricata*, Chenu. (non Linn.) Manuel de Conch, tome II., p. 120, fig. 572, 1862.
- „ *ornata*, H. V. A. Adams, Genera Recent Moll. Vol. II., p. 467.
- „ *eburna*, Op. Sit. Genera Recent Moll. Vol. II., 1857,
- „ *divaricata*, (Reeve (non Linn.) Conch Icon. Vol. VI., pl. 8, species 47, 1850.
- „ *dentata*, Jay's Catalogue, p. 30, No. 669, 1850
- „ *dentata*, Wood Index, Test. Hanley's Edit. p. 29, pl. 4, fig. 88, 1856.
- „ *dentata*, Catlow and Reeve. Nomenclator, p. 26, No. 7, 1845.
- „ *dentata*, Hanley. Catal. Rec. Biv. Shells. p. 16, 1842.
- „ *divaricata*, Hutton (non Linn.) Journ. de Conch, Vol. 26, p. 51, 1878.
- „ *quadrisulcata*, Pf. in Martini and Chem. Conch. Cab. Küster's Ed. p. 268, pl. 42, fig. 1, 1869.
- „ *dentata*, Tryon Proc. Acad. Nat Sc. Philad, p. 85, 1872.
- „ *dentata*, Tryon Jr. American Marine Conchology, p. 169, pl. 32, fig. 427, 1873.
- „ *divaricata*, Hutton (as of Lam.) Manuel of New Zealand, Mollusca, 1873, 1880.
- „ *divaricata*, Tenison Woods (non Linn), Papers and Proc. Roy. Soc. Tas. p. 40, 1877.
- „ *dentata*, Paetel, Catalogue, p. 143, 1873.
- „ (*Divaricella*) Sp. Von Marten's Critical List of New Zealand, Molluska, p. 46, 1873.

*Lucina quadrisulcata*, Dunker, Index, Moll. Maris. Japonica, p. 216, 1882.

*Hab.*—New England to Brazil, West and South America, East Coast of Asia, Seychelles, Island of Bourbon (Tryon), Wangaroia Harbour, New Zealand, Tasmania, South Australia, Victoria; Twofold Bay, Jervis Bay, Botany Bay, Port Stephens, Port Jackson, Port Macquarie, New South Wales; Moreton Bay, Port Curtis, Port Denison, Palm Island, North east Coast of Australia; Cape York, North Australia, 7 and 8 fathoms (Chevert Expedition. (Brazier.) Also, Port Darwin and Nicol Bay, North and North-west Australia (Brazier.)

This species has a very wide range over the earth's surface, but it does not differ in sculpture, although a number of authorities have constantly confused the little *Tellina* (*Lucina*) *divaricata*, Linneus from the Mediterranean Sea, with the *Lucina divaricata*. Lamarck from the West Indies, which is the *dentata* of Wood. Deshayes in the second edition of Lamarck's Anim. sans Vert. 1835, does not even mention *dentata*. Jay in his Catalogue is also confused; it gives *divaricata*, Lam. from the Mediterranean then makes *dentata*, Wood, a variety from St. Jago de Cuba, West Indies. There is not the least doubt that Jay had all West Indian specimens before him, the small size of the Linnean *divaricata* of the English Coast, and the Mediterranean cannot in any way get confused with the West Indian, New Zealand, and Australian species, so well known as *dentata*, for the past 60 years. Professor C. B. Adams in his Contributions to Conchology, Vol. 1, p. 243, 1852, re-names the species from West Indian examples under the name of *Lucina Americana*, then he goes on to say, "We wish to call the attention of geologists and others, who have believed in the great geological antiquity and the wide geographical distribution of the so-called *L. divaricata*, to the just remark of Phillippi (Zeit. f. Mal. 1848, p. 151.)" "Nomine *L. divaricatæ* plures species confusæ, omnes *divaricatim striatæ*." "When the types have been properly distinguished, we believe they will be found to have the ordinary restriction both in time and area. The Linnæan name should be reserved for the Mediterranean species, since Linnæus assigns his shell to a Mediterranean habitat."

Professor Von Marten's in his Critical List of New Zealand Mollusca, p. 46, 1873, distinctly says that *divaricata* is a collective name for several species; the true *divaricata* of Linné is a species of the Mediterranean Sea. I now quote Mr. Sylvanus Hanley from his *Ipsa Linnæi Conchylia*, p. 44, 1855. "The locality being here authenticated by the name of the authority for it, becomes of importance. The only Mediterranean species that will at all agree with the description in the "System" is the *Lucina*, which, originally termed *commutata* by Phillippi, (Moll. Sicil. Vol. 1, pl. 3, f. 15), was afterwards recognised by him for the true Linnean *divaricata*. That illustrious naturalist justly remarks, that "magnitudine pisigibba-striæ tenuissimæ" and "Habitat in M. Mediterraneo, Logie," clearly point to the little and delicately sculptured European shell, rather than to the coarser, larger, and now commoner West Indian species, which usurps the name in almost every collection." "As corroborative of these convincing arguments (not that our author would have scrupled to unite the two species), it may be mentioned that the figures of the larger species in the works of Bonanni, Lister, and Petiver, books habitually consulted by Linnæus, were passed over in silence by him."

Pfeiffer in Martini and Chemnitz Conch. Cab., second edition by Küster, p. 268, 1869, does not even mention Wood's name *dentata*, but makes use of a very recent specific name *quadrisulcata*, Orb. *Lucina dentata*, Wood must stand as a genuine species, its legion of synonyms are a disgrace to science, and should never have been created, if authors had paid a little more attention to the strict rules of priority.

The Rev. J. E. Tenison-Woods, in his Census of Tasmanian Marine Shells, Proceedings Royal Society Tasmania, p. 30, 1877, informs us that *Lucina divaricata*, Linn. was first found in the Mediterranean, and until lately, when found elsewhere, was thought to be another species. The opinion that Mr. Woods quotes, is not the opinion of Von Martens but his own. The shell quoted by Mr. Woods from Tasmania, is the *Lucina divaricata* Lam., and to please the egotism of Mr. Cuming, Messrs. Adams



and Angas re-named it *Lucina Cumingii*, from South Australian examples. Pætel in his Catalogue, p. 143, 1873, gives it *Lucina dentata*, New Zealand.

I here quote from the Proceedings of the Academy of Natural Sciences of Philadelphia, p. 85, 1872, in Mr. George W. Tryon, Jr.'s own words: "It is very curious to observe that most of the above distinguished authors finding that the West Indian *divaricata* of Lamarck, Gmelin, and Chemnitz is distinct from the European *divaricata* of Linn., have each immediately re-christened the former, without troubling themselves to ascertain whether any one else had previously made the same discovery. To this carelessness, and to the *insane* desire to describe species, are to be ascribed the terrors of the science to the novitiate, who in nine cases out of ten is frightened at the very threshold by an heterogeneous mass of a hundred thousand names, representing probably, not more than one-fifth that number of species. Long and familiarly known to Conchologists as this species is, they have permitted nearly all of the above synonyms to stand as distinct species. The geographical range is great, but well established by numerous authorities."

#### 10. MODIOLARIA BARBATA.

*Lithodomus barbatus*, Reeve, Conch. Icon., vol. 10, plate 5, sp. 27, 1858.

*Modiolaria barbata*, Angas, Proc. Zool. Soc., p. 11, pl. 44, fig. 12, 1867.

*Crenella barbata*, Angas, P.Z.S., p. 871, 1878.

*Hab.*—Sydney, in mud at the depth of six fathoms (*Strange*). Botany Bay, New South Wales, Port Jackson, from 2 feet to 12, and 18 fathoms. Port Stephens, New South Wales, 8-10 fathoms (*Brazier*). St. Vincent's Gulf, South Australia (*Professor Tate*).

This pretty little *Modiolaria*, is very common in some parts of Port Jackson, especially under George's Head in 13 fathoms, found attached to a sponge, and in the crevices of masses of large *Ascidians*, and at half tide, under the large roots of *Fucus* at Shark Island, Vacluse, and Watson's Bay, also outside Sydney Heads, at Bondi and Coogee Bay on the south. I see no difference in the species

described by Reeve in 1858, as *Lithodomus barbatus*, and *Modiolaria barbata*, described by Angas in 1867.

#### 11. TAPES POLITA.

*Tapes polita*, Sowerby, Thes. Conch. vol. ii., p. 682, pl. 145, fig. 15, 16, 1852. Deshayes in Cat. Conch. of Biv. Shells in Brit. Mus., p. 172, No. 37, 1853. *Tapes inflata*, Desh. Proc. Zool. Soc., p. 8, pl. 19, fig 3; Conch. Brit. Mus., p. 162, No. 6.

*Tapes polita*, H. and A. Ad. Rec. Moll., vol. ii., p. 435, 1857.

„ (*Pullastra*) *inflata*, H. and A. Ad., vol. ii., p. 436.

„ (*Textrix*) *polita*, Romer, Malk. Blat., p. 29, No. 13, 1864.

*Tapes polita* (*Textrix*) *inflata*, Romer, Malk. Blat., p. 29, No. 16, 1864.

*Venus inflata*, Pfeiffer in Conch. Cab., Küster ed. p. 210; p. 34. fig. 4, 1869.

*Hab.*—Port Jackson and Port Stephens, New South Wales, 8-10 fathom mud (Brazier.)

When Mr. Sowerby described and figured this species in the Thesaurus Conchyliarum, there was only one specimen known, found by the late Mr. Strange, in mud at a depth of six fathoms at Sydney. Mr. Cuming appears to have received another so-called species from Ceylon, but I very much doubt the specimen or specimens being finer and larger than *polita*. Mr. Deshayes describes it under the name of *Tapes inflata*, without ever comparing Sowerby's species with it; in Cuming's collection I have hundreds of specimens of *polita*, Sowerby, and *inflata*, Desh. in all stages of growth, that is half an inch, one inch, one inch and a-half, two inches, and three inches long, and broad in proportion near the ventral margin, there are two or three very slight riblets, these riblets are seen in nearly all specimen of *polita*, when the animal enlarges the valves, the riblets become ribs and get broader; of the *inflata* form, when fresh, the inside under the umbones is always orange, from the very youngest specimens of *polita* up to the psuedo species called *inflata*.

Pfeiffer in Martini and Chem. Conch. Cab., Küster edition, 1869, only figures Deshayes *F. inflata*.

## ON SOME MESOZOIC FOSSILS FROM CENTRAL AUSTRALIA.

BY THE REV. J. E. TENISON-WOODS, F.G.S., &amp;c.

WITH TWO PLATES.

The fossils described and figured in this paper were obtained by Mr. Gilliatt, one of the surveyors in the Mining Department. They were found in sinking a well on Mount Stewart Run, which is situated on the Grey Ranges. The fossiliferous bed was struck at a depth of 90 feet. The remains comprise many specimens of *Avicula*, some *Grypheæ*, a *Trigonia*. *Belemnite*, *Pecten*, *Ostrea*, *Pinna*, *Cyprina*, *Mytilus*, and many broken fragments. The only species which can be determined, are of *Avicula*, *Pecten*, *Trigonia* and *Belemnites*, the rest being too imperfect.

The sand is of a greyish green color, with numerous blackish grains. In places it is finely levigated, so as to preserve impressions of the faintest markings on the shells. Some portions are a coarse grey green sand, easily powdered. Under the microscope, this sand is seen to be composed of angular fragments of crystals, with small portions of shelly matter. There were very few rounded grains and none polished. When treated with hydrochloric acid, there was only a slight effervescence, confined I suppose to the fragments of shelly matter. I could not detect any Foraminifera. Some of the fragments of crystals were dark black or green, some opaque white, and some transparent. There were also a few brown opaque grains. The transparent grains seen in polarized light, all showed bands of color and some twin crystals and triclinic felspar. The large green crystals were dark and opaque; some of the smaller dark grains had almost a metallic lustre. From the absence of any glassy particles, as well as there being so little marks of ferric oxides, we may conclude that this sand was derived from the weathering of some of the ancient granite rocks, and not from volcanic or trap rocks. There is a general external resemblance in the rock to the greensands of Britain and France, but the resemblance is merely external. There is no trace of the glauconitic

materials, to which the color of so many of the European green sands is due. It is owing in that case, to a peculiar green deposit in the chambers and cells of Foraminifera, while in the Australian rocks, there are no Foraminifera and very little lime. The green color is due to small fragments of a material which I believe to be opaque hornblende. There is some admixture of iron pyrites, and a good deal of brown coal and fragments of coniferous wood mixed with fossil remains, but there are no notes to show whether they occurred in distinct bands or were indiscriminately mingled with the rest.

The fossils contained in this collection, comprise: One fine specimen of the guard of a *Belemnite*, which I regard as identical with *Belemnites australis*. Moore.\* Some valves too imperfect for satisfactory identification, but not unlike *Cucullaea inflata*. Moore (loc. cit. p. 250). Also fragments of a large *Cyprina*. (*C. expansa* Etheridge? Jour. Geol. Soc. 1872, p. 338), a *Mya*, *Tellina*, and finally numerous large and well-preserved specimens of *Avicula* with characters which belong to many of the species described by Moore, besides a single valve of a species of *Trigonia* which is certainly undescribed. I shall proceed to consider these fossils in detail.

*Belemnites australis*, Moore (loc. cit. Plate XVI. figs. 1, 2, 3, 4, 5.) Guard hastate, with a rather long, very slightly undulating outline, ventral face flattened but without a trace of a ventral groove; two lateral grooves sharply cut and approximating to the ventral face in the alveolar region, thence bending towards the dorsal aspect with a scarcely perceptible curve and continued in a fine stria on the ventral margin. The specimen is broken round the alveolar cavity, but the extreme length of what remains is 145 millim. width at the alveolar end 20, greatest width at the end of the lateral groove, and about the centre of the fossil 22, ventro-dorsal width greatest at the broken end, and gradually tapering thence to the point.

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\* Quart. Jour. Geol. Soc. Lon. 1870, p. 261.

In the foregoing diagnosis it will be seen that our specimen differs from *B. australis* in its greater length, in tapering to a point, and the slightly different curvature of the lateral groove. It resembles it in all other particulars, especially in the depression by lateral expansion of the post alveolar region, in the lateral grooves being so sharply cut in the alveolar and post-alveolar region and in the absence of the ventral groove.

I do not therefore think it advisable to erect it into a new species, but should it prove new I propose for it the name of *B. oxyis*. (Pl. XIII., figs. 1, 2 and 3.)

This species belongs evidently to the division *Hastati* of M. d'Orbigny as Mr. Moore has pointed out in the case of the specimen from Wollumbilla. In this group the guard is elongated and provided with lateral grooves for a portion of the length, but always with a long ventral groove, which is wanting in the Australian species. The typical species of the group is *B. hastatus*, Blainville, which is found in all the middle Oolitic beds from the Kellaways rock to Upper Oxfordian. Other members of the same group have been found in the Oolites of France, England, Russia, and the province of Cutch in India. Other forms of the *Hastati* are found in the Lower Cretaceous, so that the group is considered to belong to the middle and upper mesozoic rocks.

#### NEW SPECIES.

*Trigonia mesembria*, sp. nov. Pl. XII., figs. 1, 2 and 3. *T. t. oblongo-ovali*, *postice producta*, *tumida*, *crassa*, *umbonibus paullum anterioribus*, *prominulis*, *haud curvatis*; *marginē superiore concavo*, *elongato*, *marginē posteriore curvato*, *sed postice truncato*; *Antice tumide producta*, *rotundata*; *sulco posteriore lato*, *conspicuo*, *minime profundo*, *marginibus valde divergentibus a natibus ad marginem*; *costis transversalibus*, *haud prominulis*, *costulis aliquando intercalantibus antice parum undulosis sulco posteriore evanescentibus*; *carina levi*, *sulcis tribus latiusculis munita*, *lunula longa levi ovata*, *2 sulcis longis latis*, *sculpta*, *basin versus striata*; *dentibus cardinalibus crassis conspicuis marginibus superioribus bi-sulcatis*, *sulcis lateralibus 13*, *crebris*, *concinnis*.

Shell ovately oblong, produced posteriorly, thick, tumid, very convex, umbones somewhat anterior, not recurved, superior border moderately concave, rather elongate, posterior border curved, slightly truncate at the siphonal margin ; anterior border tumidly produced and rounded, posterior groove wide, conspicuous, shallow, widening rapidly from the umbones to the margin, costa irregular, not prominent, some smaller ones occasionally intercalated, all passing horizontally across the valve, slightly undulating anteriorly, disappearing on the posterior groove ; siphonal ridge smooth, with three narrow rounded ridges, three rather wide, shallow, grooves between, which become faint as they widen out towards the margin, escutcheon long, ovate, with a flat groove on each side, striæ on the lower part, the rest smooth, margins raised ; hinge teeth thick, large, prominent, with two grooves on the upper edge and about 13 close, neat, parallel, lateral grooves. The shell is of considerable thickness and is separated into two layers the outer of which is the thicker.

This fossil manifestly belongs to that section of the large genus *Trigonia*, which is classed as *Glabræ* or smooth. The section is characterised by sub-quadrangular or elongately ovate shells moderately compressed, area not margined or indicated by a distinct groove, sides ornamented with smooth concentric ribs, sometimes extending over the area, or becoming quite obsolete before reaching it. The type is *T. longa*, Agassiz.

The group of *Glabræ* is decidedly Cretaceous, most of the species belong to that period, though one or two species rarely extend into the Jura.

The above fossil comes nearest in its form to *T. eccentrica*, Park, and *T. duncombensis*, Lycett, both Greensand species or Lower Cretaceous in Britain. There is a single elongated species of the *Glabræ* division, from the Cretaceous rocks of America. It comes from Columbia. *Trigonia semiculata*, Stol., of the Cretaceous rocks of Pondicherry, is a short globose species, with the transverse costa interrupted about the middle of the shell by the usual smooth anti-carinal space, but it is not grooved as in the present species, is short, has not the posterior carina, and has the costa much more regular.

It may be as well here to review all the described Australian mesozoic species of *Trigonia*. They are *T. costata*, Clarke, which is the same as *T. morei*, Lycett, *T. lineata*, Moore, *T. nasuta*, Etheridge.

The name *T. costata*, was applied by the Rev. W. B. Clarke, F.R.S., to a species from Western Australia (Greenough River), under the belief that it was *Trigonia costata* of Parkinson.\* In Moore's paper already referred to, the differences between the species are pointed out by the late Mr. Lycett, and the Australian one, named *T. morei*. It is one of the group called *Costate*, and therefore entirely different from the new fossil described here.

*Trigonia lineata*, Moore (loc. cit. p. 255) was described from two imperfect specimens, one a cast showing the teeth, and the other much abraded. It is a gibbous form, as broad as long, and therefore quite distinct from our species. Professor McCoy placed it with the Permian and Rhætic genus *Myophoria*, but Mr. Moore considered that the absence of the oblique keel and the acute posterior side, precluded such a reference

*Trigonia nasuta*, Etheridge (Jour. Geol. Soc. Lond. 1872, p. 339, pl. xix., figs. 2, 2a). This fossil was described from a cast only, but which Mr. Etheridge says, belongs to a type unknown in Jurassic rocks. It is much higher and deeper than our fossil, and was referred to the group *Scabræ* nearest to *T. sanctæ crucis*, Pictet and Camp., but a discovery of the external surface, might show it to be much nearer to the present species.

*Pecten psila*, sp. nov. *P. t. parva, trigonali-orbiculari, æquivalva, valde depressa, vix convexiuscula, omnino levi, vel marginem versus tenuissime concentricè striata, auribus inæqualibus, radiatim costatis, antice elongata triangulata producta, posteriore flabelliformi.*

Shell small, suborbicular, equivalve, depressed, hardly convex, entirely smooth, and without ornament of any kind, except one or two very faint lines of growth near the exterior margin; ears

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\* Organic Remains. vol. 3, pl. 12, fig. 4; Paleontograph Soc. Monograph, Lycett and Moore, Mollusca of the Great Oolite, pl. 5, fig. 23; Lycett. Brit. Foss. Trigonia, vol. 33, p. 227, a wood cut of *T. Moorei*.

unequal, radiately ribbed, the anterior one in the form of an elongated triangle, produced along the dorsal margin for half the length of the shell, posterior smaller, fan-shaped.

This small, smooth, depressed *Perten*, belongs to a type which is common in the mesozoic rocks, the middle mesozoic especially. In a genus so abundantly represented in species during almost every geological period resemblances can be found on every side. But it is particularly like *P. socialis*, Moore, which is a sub-orbicular shell moderately convex, umbones convex and pointed, auricles unequal, anterior one much the largest. Mr. Moore says that the external ornamentation of the shell is not well preserved, but it appears to have been nearly smooth, without visible concentric striæ but with depressed radiating ribs. In general form it is not unlike *P. rigidus*.\* It is one of the most abundant shells in the boulders from Wollumbilla, many specimens of various ages appearing on their fractured surfaces.

The fossil I have described might well be a young state of Mr. Moore's fossil. It is much smaller, the average dimension from hinge to margin is about 6 millimeters with a transverse diameter of 5. It is found abundantly scattered over some fragments of dark, olive greenish marl, looking not unlike *Nummulites*. As I have only seen the figures and descriptions of *P. socialis*, and as the details are very imperfect, I think it better not to make too hasty an identification but point out the resemblance for future enquiry.

*Avicula barklyi*, Moore, *vel reflecta*, Moore var. *gilliatti*, pl. XII., figs. 4, 5 and 6. The great mass of the fossils in this collection is a large species of *Avicula* of which a figure is given. It possesses all the characters of both the fossils above-named in different specimens and I think that the specific distinctions between the two will be found on examination to disappear. Any one who examines the series figured by Mr. Moore from Wollumbilla including eight species, will be inclined to refer them all to one, differing from each other merely in size and mode of growth. The posterior wing auricle is lengthened and undulating in the large and old specimens

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\* A fossil species of the Great Oolite, Wiltshire. See Sowerby's Mineral Conchology, plate 205, fig. 8.



(those of about 90 millimeters long), and the produced posterior wing makes the transverse and longitudinal diameters quite equal. *A. barklyi*, has been recognized by Prof. Tate, from Cape Creek, and other fossils described by Moore as associated with that fossil from Primrose Springs and Lake Eyre, in Central Australia. (See Trans. Roy. Soc. S. Australia, Vol. VI., p. 144.) They were scattered on the surface much in the way the fossils are at Wollumbilla.

## SUMMARY.

From the occurrence of some cretaceous forms in this deposit, I am inclined to think that it belongs to the so-called great Cretaceous formations of Central Australia, and North-eastern Australia. There is certainly also a mixture of jurassic types, but their evidence is not so marked, and I am inclined to think that there has been a mixture of fossils from different localities in Mr. Moore's collection. There are true Oolitic beds near the Peak Downs, and amongst these I have recognized some of Moore's species, but never the *Aviculæ*, and *Belemnite* here referred to. It is possible, however, that our Australian Cretaceous rocks may be very low in the series, and contain moreover as in the Australian strata a fusion of those well-marked specific boundaries which paleontologists are accustomed to elsewhere. In any case I am rather disposed to regard the Central Australian beds about Lake Eyre, the Peake and Primrose Springs as cretaceous. I propose to examine the Wollumbilla beds, carefully at my earliest leisure and then will try for its position more certainly.

## EXPLANATION OF PLATES,

## Plate XII.

- Fig. 1.—*Trigonia mesembria*, inner surface of valve.  
 „ 2.—Upper surface showing concentric costa.  
 „ 3.—Anterior end with tooth.  
 „ 4.—*Avicula barklyi*, upper valve.  
 „ 5.—Ditto ditto, lower valve of same specimen.  
 „ 6.—Another upper valve with better defined ribs.

All figures reduced one-half nat. size.

## Plate XIII.

Fig. 1.—*Belemnites australis*, Phillips? or *B. oxyis*, nobis. ventral aspect.

„ 2.—Ditto lateral aspect showing the slight curve of the lateral groove.

„ 3.—End view with alveolar cavity, lying on ventral surface.

All figures two-thirds natural size.

## A SECOND HALF-CENTURY OF PLANTS NEW TO SOUTH QUEENSLAND.

BY THE REV. B. SCORTECHINI, F.L.S.

## DILLENIACEÆ.

*Hibbertia fasciculata*, R. Br. in Dc. Syst. Veg. i, 428

On moist ground near Burleigh Head It departs from the typical species in the smaller size of its flowers. Having a wide geographical range, variations must occur, caused by its adaptability to different climates and various soils.

## PITTOSPORÆ.

*Pittosporum phillyræoides*, Dc. Prod. i., 347.

It is somewhat strange to find this plant on the eastern side of the dividing range. It looks like a straggler from its home. Although ubiquitous through the Australian continent on the western slopes and desert regions, the height of the Australian divide limits its geographical distribution towards the east. A few solitary trees of this *Pittosporum* may be seen growing on knolls of loose stones, which here and there give rise to tufts of vegetation close by the Dugundan jungle along the Teviot Brook.

## BIXINEÆ.

*Scolopia Brownii*, F. v. M., Frag. iii., 11.

The flowers of the collected specimens being imperfect, afford no conclusive proof of the identity of this species; still there is left enough available to form a very probable opinion. There was no

other Queensland abode nearer than Rockingham Bay recorded for this plant. As on the other hand, records are extant of its being found on the Clarence in New South Wales, its presence at Tallebadgera, where my specimens were gathered, is not to be wondered at. In intermediate stations between South Queensland and Rockingham Bay, it may yet be discovered.

## CARYOPHYLLÆ.

*Stellaria flaccida*, Hook, Comp. Bot. Mag. i., 275.

Years ago, specimens of this plant were obtained by me at Lytton, and later still, at Bundaberg on the Burnett.

## SAPINDACEÆ.

*Castanospora Alphandi*. F. v. M. Frag. II.. 92.

Like *Scolopia Brownii*, F. v. M., there is no record of its existence in South Queensland, although it has been noticed at the Tweed River. This beautiful tree with an attractive foliage and large panicles of flowers, grows along the banks of Tallebadgera Creek, and a few miles further north on the Mudgeraba Creek. Several years ago it attracted my notice, and its flowers awakened an interest in it. For want of fruits, it was then impossible to assign to it any genus of the Sapindaceæ, to which order evidently it belonged. Only last summer the fruits were seen by me, and their shape, which reminds one of the chestnut, suggested the genus *Castanospora*, and on further examination it was found to be *Castanospora Alphandi*. Before the fruits were known, this tree was relegated among the *Cupania*. It is only within the present decade that that it was raised to generic rank. The name chosen by Baron von Müeller, is a most happy one, as at the first sight of the fruit, no one can mistake it for any other genus. Would that all botanists selected appropriate names for their new genera and species. Much trouble would be thus avoided.

## LEGUMINOSÆ.

*Goodia latifolia*, Salisb. Par. Lond. i., 41.

Close to dense forests on the upper Nerang Creek. Its height reaches over fifteen feet, and its beautiful obovate leaflets exceed an inch in diameter. A very wide distribution may be claimed for this plant.

*Hovea linearis*, R. Br. in Ast. Hort., Kew iv., 275.

At Burleigh Head and other localities through the district.

*Indigofera saxicola*? F. v. M. in Fl. Austr. ii., 199.

It cannot with certainty be determined whether the specimens gathered at Coodria on the Teviot Brook, belong to this species or to an extreme variety of the widely distributed *I. australis* Willd. approaching *I. saxicola*. The number of leaflets in the Coodria specimens is invariably five, rather orbicular in shape, with latent veins; characters belonging to *I. saxicola* exclusively. Other characters obtained from the calyx and indumentum of the plant, point likewise to *I. saxicola*. Besides its habit, which gives a name to the species, is to grow among stones, where this plant is generally to be found. As the original specimens from which *I. saxicola* was described, are from such distant stations as North Australia, and Port Essington, and seemed to be confined there, a reasonable doubt may arise that the Coodria specimens are not of *I. saxicola*, but pertain to some extreme variety of the proteiform *I. australis*. If so, a link exists between *I. saxicola* and *I. australis*, which would render unstable the position of *I. saxicola* as a distinct species.

*Acacia viscidula*, A. Cunn. in Hook. Lond. Jour. i., 363.

At Minto's Craig on the Upper Teviot. The same species has been observed to grow in abundance in the neighbourhood of Stanthorpe.

*Albizzia Hendersoni*, F. v. M. Trin. Jour. 1872, p. 10.

This and its congener, *A. Tozeri*, F. v. M., grow very luxuriantly on the banks of Tallebadgera Creek. As graceful shrubs to adorn a garden, they can be compared to few plants. The characters on which the generic distribution of *Albizzia* and *Pithecolobium* rests, have been deemed of too slight importance by Baron von Müller to warrant the antonomy of both genera; and thus they have been fused by him into one genus, under the name of *Albizzia*. The extra-Australian genera so closely allied to them. *Calliandra*, Benth, *Enterolobium*, Mart. *Serianthes*, Benth, follow the same course, lose their independent status, and are admitted only as sections or sub-genera of *Albizzia*. These genera are difficult to

separate ; their union seems to be more natural. Still in practice they will long be kept distinct ; because their distinctive characters, although not strongly marked and highly important, yet afford artificial means for the easy recognition of their species. Baillon in his "Hist. des Plant," although omitting the genus *Albizzia*, still does not merge its species into the genus *Pithecolobium*, or allied genera, but frames for them a section under the prolific genus *Acacia*, while *Caliandra*, *Enterolobium*, *Serianthes* still keep their generic position. The genus *Albizzia* reconstructed according to Baron Müller's views forces some changes in the nomenclature of the species it embraces. What Bentham describes in Fl. aust. II., 424, as *Pithecolobium grandiflorum*, the occurrence of which on South Queensland soil, I noticed in a former paper to this Society, should be *Albizzia grandiflora*. But as *Serianthes* now becomes *Albizzia*, and *Serianthes grandiflora* of Bentham, should likewise become *Albizzia grandiflora*, we would have two quite different plants belonging to different botanical regions designated with the same specific name. The Australian *Albizzia grandiflora* therefore must surrender its name as already preoccupied by another *Albizzia*, and remains open to accept a new one. Thus a new name was conferred on it by the learned Baron, a most appropriate name, because it is a monument that science builds to one of its devotees, a monument which perpetuates the recollection of the sad fate, which befell Mr. Tozer while in search of the pods of this very scarce plant. This a very touching act of devotion ! Mr. Tozer lost his life in drawing from obscurity one of God's creatures, and his zeal deserves to be preserved.

#### ROSACEÆ.

*Acaena Sanguitorbæ*. Wahl. Enum. Pl. 1, 294.

This rosaceous plant so common through N. S. Wales, and southern colonies, becomes very scarce near the Queensland borders. Close to the heights of Wilson's Peak, touching N. S. Wales, and Darling Downs boundaries, some plants of the species may be noticed.

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## SAXIFRAGEÆ.

*Argophyllum Lejournanii*, F. v. M. Frag. V., 33.

Not uncommon along the watercourses of the southernmost portion of the district. North and west of Tallebudgera one loses sight of this silver-leaved plant. Its graceful slender aspect, its silvery leaves, and golden flowers should recommend it to the gardener.

*Cuttsia viburnea*. F. v. M. Frag. V., 42.

Very rare at Wilson's Peak on the road to Warwick.

*Quintinia Verdonii*. F. v. M. Frag. II., 225.

Both on the top of Tambourine Mountain, and at Tallebudgera in the jungles.

*Polyosma Cunninghamsi*. J. J. Benn. Pl. Yor. Rar. 196.

This tree not small as described, but large, attaining near one hundred feet in height, is known to the settlers living close to the N. S. Wales littoral boundaries under the vernacular name of "Hickory," and enjoys a good repute as serviceable timber. Many trees of this description were noticed felled on the ground in the clearing of forests.

*Weinmannia lachnocarpa*. F. v. M. Frag. VIII., 2.

Most plentiful in the scrubs that crown Tambourine Mountains, the Tallebudgera, and Mudgeraba Ridges, if we are to judge from the great number of woolly capsules, which cover spots on the ground all over these jungles.

## DROSEDERACEÆ.

*Drosera peltata*. Sin. in Willd. Sp. Pl. I, 1546.

Common throughout the Logan district.

## HALORAGÆ.

*Haloragis alata*. N. J. Jacq. Jc. Pl. I, p. 69.

Rare on the Logan.

*Haloragis teucroides*. A. Gray. Bot. Wilk. Expl. Exp. I., 625.

On the Logan very scarce. As the main specific difference between *H. tetragyna* R. Br., and this species consist in the upper bracts being longer than the flowers in *H. teucroides*, and consequently shorter in *H. tetragyna*. There is no doubt as to the

few specimens gathered on the Logan belonging to *H. teucroides*. *H. tetragyna* is very common in these localities, whereas *H. teucroides* seldom occurs in the district.

*Myriophyllum varicefolium*. J. Hook, Jc. Pl. t. 289.

In many swamps, and slow running creeks.

#### RHIZOPHOREÆ.

*Rhizophora mucronata*, Lam. Encyc. meth. VI., 169.

This and the following species reach from the tropics to our southern shores. Not uncommon on the saline swamps at the mouth of the Nerang Creek. I learn from Baron von Müeller, that its bark possesses medicinal properties. It has been tried in cases of hæmaturia. The stripping of the bark, which is of unusual thickness and heavy consistence, may prove a remunerative occupation if a market was open for its ready disposal.

*Ceriops Candolleana*, Arn. Ann. Nat. Hist. I., 364.

Found in salt-water estuaries. It mingles with *Brugiera Rheedii*, Bl., *Avicennia officinalis*, L., *Ægiceras majus* Gært, all along the southern coast.

#### MYRTACEÆ.

*Bæckeia crenulata*, R. Br. in Flind. voy. 548.

There are two most remarkable varieties of this plant, one at Burleigh Head, and the other at Stradbroke Island, each occupying the utmost opposite limit within the circle of specific range. The aspect, habit, leaves of both, proclaim them utterly distinct. The one of Stradbroke Island, presents a trailing habit of growth through the mass of entangled vegetation among swamps, with long branches almost flagellate, with closely appressed leaves nearly thrice the size of those of the other variety. The other growing at Burleigh Head, on the other hand is virgate, with smaller and more spreading leaves. Its resemblance with *B. densifolia* Sm., is very striking. When gathering the two on the swampy ground near Stanthorpe, it was no easy matter to discriminate one from the other. *B. densifolia* and this variety of *B. crenulata*, seem more like one another, than the two varieties above mentioned.

*Melaleuca thymifolia*, Sm. Trans. Linn. Soc. III, 278.

Rather common on wet gullies dividing the ridgy and sandy ground of the Logan. Although it has been recorded by Mr. Bailey in his census of the Brisbane Flora, there is no record placed in any page, of its occurrence in this district.

*Eucalyptus robusta*, Sm. Spec. Bot. N. Holl. 40.

It was noticed by the writer some years ago, growing in wet places not far off the banks of the Nerang Creek. Since then, herborizing with Mr. F. M. Bailey at Stradbroke Island, we saw it growing there close to Dunwich. Afterwards I followed its course to the Brisbane River, and as far inland as Brown Plains, not far away from the Logan. In all instances, this gum tree was found growing on wet marshy ground, having for its companion, *Melaleuca leucodendron* Lin. Whether this tree crosses over to the north side of the Brisbane River, remains to be proved by further investigation. In that excellent work of Baron von Müller on Eucalypts, the Queensland abode for this Eucalypt is not recorded. To the uses to which it is here mentioned to be applied, it may be added that of its suitability for piles, to be driven in salt or brackish water. Its exceptional fitness to withstand the ravages of what is commonly known as "cobbera," may be ascribable to the presence of Kino-red, to which Müller attributes its freedom from destructive insects.

*Eucalyptus leucoxydon*, var. *minor*, F. v. M. Trans. Vict. Inst. I, 33.

It barely crosses the boundaries of our Colony near Wilson's Peak. Few trees of this species may be seen among the robust vegetation, which clothes the rugged ridges of Macpherson's Range. It is not the normal type that we see here, but a variety called by Baron von Müller, *minor*. It differs not alone in the smaller size of the flowers, to which I presume its name as a variety has reference, but in its whitish bark, whereas the typical form presents a bark so decidedly dark and rugged as to resemble our iron-barks, by which name it is known to southern colonists. These features afford sufficient ground to keep it as a distinct variety.



*Myrtus Beckleri* F. v. M. Frag. II., 85.

Tallebudgera Creek.

*Eugenia humilampra*. F. v. M. IX., 145.

In the jungle along Nerang Creek, close by the sea. A large tree once doubtfully admitted by Baron von Müeller, in Frag. IX., as a new species, and which has now received its full specific rank in his Systematic Census of Australian plants. It could scarcely be confused with *E. Smithii* Poia., its nearest ally.

*Eugenia Moorei*. F. v. M. Frag. V., 33.

Abundant in the littoral forests towards the boundary lines of the colony. A handsome tree, compact, and of beautiful foliage; it would well answer for shade planting. The fruit is large, round, somewhat flattened, white and not unpalatable. This plant has been considered by Bentham Fl. Austr. III., 285. as identical with *E. Jambolana* Lann. but the much divaricate trichotomous panicles, which arise from the older branches, and as I would observe from the trunk of the tree, the red filaments longer than in *E. Jambolana*, and other characters have induced Baron von Müeller to separate it from the true *E. Jambolana*, and distinguish it with a name commemorative of the services to botanic researches of Mr. C. Moore of the Sydney Botanical Gardens.

*Eugenia corynantha*. F. v. M. Frag. IX., 144.

A tree of lesser dimensions than the preceding one, with which it may be well associated for the purpose of shade and beauty. It grows in abundance about Tallebudgera. Flowers are not very conspicuous.

*Eugenia Hodgkinsoniæ*. F. v. M. IX., 145.

In general aspect of foliage and stature similar to *E. corynantha*, F. v. M., and like it a desirable addition to shrubberies. It excels all the others. The copiousness of large flowers in terminal panicles, which emit a sweet perfume even long after they have been plucked renders it superior in a garden to any other rose apple. It is frequently met with in the Tallebudgera jungles, and at the time of flowering the sweetness of its scent spreading for a long distance through the thickness of that rich vegetation makes its presence felt.

*Eugenia oleosa*. F. v. M. Frag. V. 15.

Either a low undershrub in the open sand banks at Nerang Creek, or a slender tree in the forests both at Nerang Creek and at the southern end of Stradbroke Island. The berries somewhat resemble those of *E. mystifolia*, yet they are more globular, of a deep red colour tending to purple with a tinge of blue. In taste they are quite different. The acid principle which renders the berries of *E. mystifolia* palatable is absent in those of *E. oleosa*.

## ONAGRARIÆ.

*Epilobium tetragonum*. Linn. Sp. Pl., 348.

Very scanty in few localities of the Logan district. Six species of Australian *Epilobium* were kept distinct, and enumerated by Bentham in his *Flora Australiensis*. The gradual passages of one form into another have persuaded Baron von Müller not to acknowledge but one good species, the Linnean *E. tetragonum*. Many species which now are deemed good ones, will undergo the same fate, when inspections of more abundant material show the imperceptible transitions of one form into another.

## FICOIDEÆ.

*Macarthuria neocambrica*, F. v. M. Frag. II, 11.

Both at Stradbroke Island and near Burleigh Head, it grows rather abundantly on sandy soil.

*Mollugo spergula*, Linn. Sp. Pl. 131, Sec. ed.

At Wilson's Peak. I believe it grows near Brisbane.

## UMBELLIFERÆ.

*Hydrocotyle laxiflora*, DC. Prod. IV., 61.

At Dugundan on the Teviot.

*Hydrocotyle tripartita*, R. Br. Ann. des sc. phys. VI., 46.

Throughout the Logan.

*Hydrocotyle pedicellosa*, F. v. M. Frag. IV., 182.

Most plentiful on Tambourine Mountain at Tallebadgera, close to edges of the jungles on damp ground.

*Trachymene linearis*, Spreng. Sp. Umb., 7.

*Trachymene Billardieri*, Benth. Fl. Austr. III, 356.

Both have been gathered near Point Danger. All the species included in the genera *Siebera* and *Trachymene*, have been united by Müeller into one genus under the latter appellation. Many characters once held good to distinguish one species from another in the genus *Siebera*, now break down, and these forms become untenable as species. Further discoveries will call for further reduction of species.

#### ARALIACEÆ.

*Panax sambucifolius*, Sieb. in Dc. Prod. III, 255.

At Tambourine Mountain.

#### LORANTHACEÆ.

*Loranthus Bidwillii*, Benth. Fl. Aust. III., 390.

On branches of *Callitris cupressiformis*, Vent.; it grows at Nerang Creek Heads. The same mistitoe is more widely spread at Stanthorpe on the same kind of pine, and at the mouth of the Mary, from which district the original specimen sent by Mr. Bidwill, whose name it bears, probably came.

#### RUBIACEÆ.

*Randia Moorei*. F. v. M. in Fl. Austr. III., 411.

A small tree growing at Yatala near the banks of the Albert, a main tributary to the Logan.

*Randia Benthamiana*. F. v. M. Frag. IX., 180.

At Tallebudgera this small shrub occasionally may be met with. The inflorescence, flowers, shape of fruit globular in outline, all bespeak a species quite distinct from *R. charbacea* with which it may be confused in its living state.

*Randia dentiflora*. Benth. Fl. Hough., 153.

On the Coomora. I gathered specimens of the same species in the Burnett district, where it attains larger dimensions.

*Ixora Beckleri*. Benth. Fl. Austr. III., 415.

On the Coomora.

*Timonius Rumphii*. Dc. Prod. IV., 461.

At Peel Island and Stradbroke Island.

*Knoxia corymbosa* Willd. Spec. Pl. I., 582.

At Mudgeraba, and Knapp's Creek. Even in these two places it seems to be scarce.

*Asperula oligantha* F. v. M. in Heerl. Kamid. Arch. IV.

The variety *conferta*, once acknowledged as a distinct species is very common on the flats of the Upper Lagoon. Another variety *elongata* was gathered by the writer at Stanthorpe. Under the name *A. oligantha* Baron von Müeller, in Frag. IX., 187, has collected *A. subsimplex* Hook. *A. scoparia*, Hook. *A. Gumui*, Hook. *A. pusilla*, Hook. *A. mimina*, Hook.

*Galium australe*. Dc. Prod. IV., 608.

On the Logan. Under *Galium australe*, the forms *aporinc*, and *albescens* are now included; and under *G. umbrosum* of Solander we have varieties of *G. geminifolium* F. v. M. *Gaudichaudi* Dc. and *ciliare* Hook. Without much hesitation the genera *Galium* and *Asperula* may be thrown into one, as they do not present important generic differences. The reduction of species in both genera may portend generic reduction.

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CONTRIBUTION TO A KNOWLEDGE OF THE FISHES OF NEW  
GUINEA, No. 4.

BY WILLIAM MACLEAY, F.L.S., &c.

In my three previous papers on this subject, I gave a list of all the fishes collected by Mr. Goldie at and about Port Moresby, and a few places on the coast lying north and west from it; I now give the results of his labours in the extreme south east of New Guinea, including collections made at Hood Bay and eastward to the D'Entrecasteaux Group of Islands. A few only are from the Gulf of Papua.

## PERCIDÆ.

275. PSAMMOPERCA WAIGIENSIS. Cuv and Val.

Macl. Cat. Proc. Linn. Soc., N. S. Wales, Vol. 5, p. 307.

*P. datnioides* Richards, Voy., Ereb. and Terr., p. 116, pl. 57, fig. 1-2.

"Ganu Ganu" of the natives.

*Hab.*—Gulf of Papua.

276. ANTHIAS MORTONI. n. sp.

D. 10/17. A. 3/8. L. lat. 40, L. tr. 4/13.

Height of body one-fourth of the total length; snout shorter than the diameter of the eye; mouth oblique, small, the maxillary broad and triangular, reaching to below the middle of the eye; the space between the eyes convex, and equal to nearly two diameters of the orbit. The first dorsal spine is small, the second a little longer, the third is produced into a filament, and is thrice the length of the following ones; the second and third anal spines are about equal in length, the third and fourth rays are elongate; the caudal fin is long and forked, with the lobes produced. Mr. Goldie's description of the colouring, is "slate blue, with crimson stripe on gills, and flame colour fins and tail, the latter has a light edge. Eye green."

"Maru-watti-kerara" of the natives.

*Hab.*—Pitt Bay, Moresby Island.

277. SERRANUS MICRODON. Bleek.

*Epinephelus microdon*, Bleek, Atl. Ichth. Perc., p. 57, tab. 3, fig. 3.

"Curan" of the natives.

*Hab.*—Engineer group.

278. SERRANUS HOWLANDI. Gunth.

Journ. Mus. Godff. Heft. 3, p. 8, Tab. IX., fig. B.

"Bulavu" of the natives.

*Hab.*—Hood Bay.

279. *SERRANUS DAMELII*. Gunth.

Ann. and Mag. Nat. Hist. 1876, Vol. XVII.. p. 391. Casteln, Proc. Linn. Soc., N. S. Wales, vol. 3, p. 365.

“Keborria” of the natives.

Mr. Goldie found this fish in fresh water at Normanby Island, D’Entrecasteaux Group. It seems to me to be identical with our black rock cod.

*Serranus Hædtii*, *argus* and *urodelus*, were also taken in or near China Straits, but I do not number them as they have been already recorded from other parts of New Guinea.

280. *MESOPRION MARGINIPINNIS*. n. sp.

D. 10/13. A. 3/7. L. lat. 50.

The height of the body is about equal to the length of the head, and is rather less than a third of the total length. The profile is straight, the eye large, the snout is a little longer than the diameter of the orbit, and the space between the eyes is about equal to it. The maxillary reaches almost to the vertical from the middle of the eye. The top of the head and the præorbital are scaleless, the præoperculum is finely denticulated, and has a broad shallow notch above the angle; the operculum is unarmed, and the coracoid is serrated. The scales are small, adherent and ciliated. The dorsal fin after the first spine is nearly uniform in height throughout, the longest spine (the fourth) is in height rather less than one-third of the height of the body, the second anal spine is slightly thicker and about the same length as the third; the pectorals are slightly falcate and reach beyond the vent; the caudal is emarginate. The colour seems to have been silvery-grey, darker on the back than on the sides and belly, the scales on the sides seem to have had a pearly spot in the centre of each giving a striped appearance to the fish; the dorsal fin has a deep black margin along its whole length with the extreme tips of the rays white, the caudal is blackish with white tips; the other fins are yellow. Length, 7 inches.

*Hab.*—Normanby Island. From fresh water.

## 281. MESOPRION SEXFASCIATUS. n. sp.

D. 10/13. A. 3/7. L. lat. 50.

Of compressed form ; the height of the body is one third of the total length ; the profile is straight, the space between the eyes rather flat, and less than the diameter of the orbit, which is about equal to the length of the snout. The canine teeth in the upper jaw are large, the maxillary reaches to below the middle of the eye, the præoperculum is minutely serrated on the posterior limb and finely denticulated at the angle and on the lower limb, the notch above the angle is very slight. The dorsal fin is very slightly notched, the second spine of the anal is stronger but not longer than the third, the pectorals reach to the vent, the caudal is truncate. The colour according to Mr. Goldie, is greyish green, there are six narrow light coloured fasciæ on each side ; the fins and tail are according to the same authority reddish, but there has evidently been some black on the anal fin.

“ Malabrunna ” of the natives.

A small fish, said to be from fresh water. Normanby Island.

*Mesaprian rubens, Goldiei, parvidens, fulviflamma, monostigma, and vitta* were also got at Hood Bay.

## 282. GRAMMISTES ORIENTALIS. Bl.

Gunth. Cat. Vol. 1 p. 171. Macl. Cat. Proc. Linn. Soc. N. S. Wales, Vol. 5, p. 326.

“ Arctiatoma ” of the natives. Hood Bay,

## 283. AMBASSIS COMMERSONI.

Gunth. Cat. I p. 223. Proc. Linn. Soc, N. S. Wales, Vol. 5, p. 337.

Milne Bay. From fresh water.

## 284. APOGON BURUENSIS. Bleek.

Atl. Ichth. Perc. p. 102, tab. 75, fig. 2. Gunth. Cat. 1, p. 245. From fresh water. Normanby Island.

## 285. APOGON MACROPTERUS. Cur. and Val.

Bleek. Atl. Ichth. Perc. p. 103, Tab. 68, fig. 2. Gunth. Cat. 1, p. 244.

Syn. *A. fucatus, macropteroides, and Bleekeri*. Gunth. Cat. Fish.

## 286. APOGON TRIMACULATUS. Cuv. and Val.

Gunth. Cat. 1 p. 233. Less. Voy. Coq. Zool. p. 237.

*Apogon Amboinensis* previously recorded, was also included in this collection.

## GENUS TETRACENTRUM.

Six branchiostegals. Teeth viliform with an outer series of larger ones; teeth on the vomer and palatine bones. One dorsal fin; the anal fin with four spines. Operculum without spine; præoperculum with a double denticulated edge. Scales large, rather deciduous.

I place this genus with that section of the Percidæ named by Dr. Gunther *Apogonina*, on account of a general resemblance in form, its large deciduous scales, and double-ridged præoperculum. The continuous dorsal fin, and four spined anal, are however foreign to the group.

## 287. TETRACENTRUM APOGONOIDES. n. sp.

D. 9/10. A. 4/9. L. lat. 30. L. tr. 4/7.

Body elevated, compressed, the height being about one-half the length, exclusive of the caudal fin; the length of the head is one-third of the same. The profile from the first dorsal spine to above the eye, is much curved and forms a narrow ridge, above the eye it becomes broad and concave, and towards the snout convex and swollen. The eye is large, its diameter being about equal to the space between the eyes. The mouth is oblique, the lower jaw rather prominent; the maxillary reaches to the vertical from the anterior third of the eye. The inner double præopercular edge is strongly toothed at the angle, the outer is very strongly denticulated along its entire edge, the suborbital, præorbital, interoperculum and sub-operculum, are also denticulated on the lower edges. The dorsal fin takes its rise a little behind the vertical from the base of the pectorals, the first spine is less than half the size of the second, the ninth is a little longer than the eighth. They are all strong and curved a little backwards. The anal spines are strong, the first less than half the length of the others. The caudal fin is somewhat long, with the lobes rather produced.



The scales cover the whole body except the top of the head, a single row of smaller scales protects the base of the soft dorsal and anal fins. The colour of the larger specimens is uniform dull silvery gray, but young specimens show a black blotch above the anal spines, and something resembling a black vitta on the posterior portion of the lateral line; there seems also to have been a black opercular patch.

A number of specimens were brought from Goldie River and other fresh water streams, varying in size from 7 to 2 inches in length.

288. *DULES GUAMENSIS*. Cur. & Val.

Gunth. Cat. 1, p. 269. Dum. D'Urv. Voy. Pole Sud. p. 42, Pl. 3, fig. 1.

"Paamana" of the natives.

Taken in fresh water, Normanby Island.

289. *DULES PAPUENSIS*. n. sp.

D. 10/11. A. 3/11. L. lat. 42.

Height of body one-third of the total length, and length of head about one-fourth of the same. Eyes large, the space between them slightly convex and about equal in width to the diameter of the orbit; snout short, rounded; mouth oblique, the lower jaw slightly the longest, the maxillary reaches to the vertical from the middle of the eye, the præorbital is very narrow and serrated, the præoperculum is minutely serrated on the inferior edge; the operculum has two spines. The first spine of the dorsal fin is very small, the fourth and fifth are the longest, the tenth is nearly twice the length of the ninth; the anal spines are of about equal thickness, the third longest; the caudal is emarginate. The colour is a steel blue towards the back, and silvery on the sides and belly, with a few scattered blackish spots on the side towards the tail, the soft dorsal and anal fins are black-edged, and the caudal is narrowly tipped with black. Length, 7 inches.

*Hab.*—Goldie River. Fresh water.

*Dules ciliatus*, from fresh water, Milne Bay, also formed part of the collection.

## 290. THERAPON NASUTUS. n. sp.

D. 12/9. A. 3/8. L. lat. 58.

The height of the body is more than one-third of the total length, and considerably more than the length of the head. The profile from the occiput to the snout is straight, the space between the eyes is flat and its width is more than the diameter of the orbit, the snout is long and roundly pointed, the distance from the eye, which is large, to the snout nearly equals two diameters of the orbit; the maxillary only reaches to the vertical from the anterior margin of the eye, the lower jaw is shorter than the upper and shuts into it; the præorbital is large, naked, and without serration; the præoperculum is strongly denticulated and without scales on the limb, the operculum is armed with two acute spines placed rather close together; the coracoid is of truncated form, and is strongly denticulated. The spines of the dorsal fin are very strong, the first is small, the fourth and fifth are the longest, they can all be received into a scaly sheath on the back grooved on each side; the anal spines are also very strong, the second the largest; the caudal is slight emarginate.

Colour silvery grey, a broad band through the anal fin, and the anterior rays of the ventrals, blackish. Length, 11 inches.

From fresh water, Normanby Island.

## 291. THERAPON INTERRUPTUS. n. sp.

D. 12/10. A. 3/8. L. lat. 50.

The height of the body is less than one-third of the total length, and very little more than the length of the head. The profile is of uniform convexity from the dorsal fin to the snout, which terminates in a rounded point. The eyes are of moderate size, the space between convex, and in width equal to nearly twice the diameter of the orbit; the distance from the eye to the point of the snout is rather more than twice the diameter of the orbit. The lips are thick, the upper one completely overlaps the lower, the maxillary reaches to below the anterior margin of the eye, and is only slightly visible above the posterior part of the upper lip. The præorbital is broad, naked, and apparently without serration, the

præoperculum is regularly but not strongly denticulated; the operculum has two spines, the upper one small; the coracoid is rounded behind and with a few denticulations. The dorsal spines are moderately strong, the first minute, the fifth and sixth longest; the anal spines are very strong, the second largest; the caudal fin is slightly emarginate. The colour is silvery grey, with three longitudinal more or less interrupted brown bands on each side below the lateral line, and four or five vertical brown blotches above the lateral line. Length, 10 inches.

Fresh water. Normanby Island.

292. THERAPON CHALYBEUS. n. sp.

D. 12/10. A. 3/8. L. lat. 60.

Of compressed form. Height of the body one-third, and length of head one-fourth of the total length. Profile almost straight, a very slight prominence over the eyes. Eyes large, distance from one another about equal to the diameter of the orbit, the length of the snout about the same. The mouth is small, the maxillary not nearly reaching to below the anterior margin of the eye; the præorbital is serrated; the præoperculum is strongly denticulated particularly towards the angle; the operculum is two-spined, the upper one small; the coracoid and scapular are finely denticulated. The dorsal spines are moderate, the fifth longest, the anal spines are very strong, the second largest; the caudal is emarginate. The colour seems to have been of a chalybeate hue all over, the fins hyaline with some black on the anal and tip of the ventrals. Length, 4 inches.

Fresh water. Normanby Island.

293. THERAPON TRIMACULATUS. n. sp.

D. 13/11. A. 3/11. L. lat. 50.

Height of body half the length excluding the caudal fin. The profile is convex, the space between the eyes is rounded and equals two diameters of the orbit, the snout is rounded, the lips thick, the maxillary reaches to below the anterior margin of the eye, and is rounded behind; the præorbital is unarmed, the præoperculum is slightly serrated, the lower of the two opercular spines is rather

large: the coracoid is large and serrated. The dorsal spines are strong, the fifth and sixth longest, the anal spines very strong but not very long, the third quite as long as the second; the soft dorsal and anal fins have the middle rays longest, giving them a rounded appearance; the caudal fin is very slightly emarginate. The colour seems to have been dark brown on the back and sides and yellow on the belly, every scale appearing to have a central yellow or pearly spot, increasing in size towards the belly, two or three indistinct longitudinal blackish bands are discernable on the sides on the posterior portion of the body, there are three indistinct black spots placed vertically on the base of the caudal fin; the extremities of the soft dorsal, anal and caudal fins seem to have been whitish. Length, 8 inches.

Fresh water. Goldie River.

294. THERAPON CAUDOVITTATUS. Richards.

Voy. Ereb. and Terr. Fish., p. 24, pl. 18, fig. 3-5. Gunth. Cat. 1, p. 284.

Gulf of Papua.

*Therapon servus* and *Cuvieri*, were also in this collection.

295. DIAGRAMMA PARDALIS. Cuv. and Val.

Gunth. Cat. 1, p. 323. *D. chaetodontoides*, Lacep. Gunth. Cat. 1, p. 326.

*Plectorhynchus chaetodontoides*, Bleek. Atl. Ich. Perc., tab. 23, fig. 3, and tab. 25, fig. 2.

"Deboro-gabu-gabu" of the natives.

*Hab.*—China Straits.

296. DIAGRAMMA LESSONII. Cuv. and Val.

Gunth. Cat. 1, p. 329. Lesson. Voy. Coq. Zool., vol. 2, p. 199, pl. 24.

*Plectorhynchus Lessoni*, Bleek. Atl. Ichth. Perc., p. 19, tab. 39, fig. 3.

"Kidali" of the natives.

*Hab.*—Hood Bay.

297. *DIAGRAMMA HÆMATOCHIR.* Bleek.

Gunth. Cat. 1, p. 332.

Dr. Bleeker first described this species, but subsequently in his Atlas Ichthyologique, makes it a synonym of *D. Goldmanni*. I believe the species to be distinct.

*Hab.*—Hood Bay.

299. *DIAGRAMMA POLYTÆNLA.* Bleek.

Atl. Ichth. Perc., p. 23, tab. 17, fig. 3. Gunth. Cat. 1, p. 23.

“Manaha-cila-cila” of the natives.

China Straits.

298. *DIAGRAMMA RADJA.* Bleek.

Atl. Ichth. Perc., p. 26, tab. 14, fig. 1. Gunth. Cat. 1, p. 331.

*Hab.*—Hood Bay.

300. *DIAGRAMMA UNICOLOR.* n. sp.

D. 12/20. A. 3/7. L. lat. 70.

The height of the body is about  $2\frac{1}{2}$  times in the total length, the length of the head four times. The eyes are large, the space between them convex, covered with minute scales, and equal in width to about one and a-half diameter of the orbit; the distance from the eye to the extremity of the snout, is about two diameters of the orbit. The mouth is small, the lips thick, the maxillary does not reach to the vertical from the eye, the cheek is clothed with minute scales, the præoperculum is minutely serrated on the posterior limb; the dorsal spines are strong, the fourth and fifth largest; the second and third anal spines about equal, the soft dorsal is rounded behind, the anal pointed; the caudal is spreading and truncate. Colour uniform, dark gray in spirits, with a greenish yellow tinge towards the belly. Length, 16 inches.

“Sopa-sopa” of the natives.

China Straits.

301. *GERRES POETI.* Cuv. and Val.

Gunth. Cat. 1, p. 341. Bleek. Atl. Ichth. Perc., tab. 77, fig. 1.

From river in Milne Bay.

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302. *SYNAGRIS FURCOSUS*. Cuv. and Val.

Gunth. Cat. 1, p. 373. Macl. Cat. Fish., P.L.S., N. S. Wales, vol. 5, p. 383.

“Rea-rea” of the natives.

Pitt Bay. Moresby Island,

303. *CÆSIO LUNARIS*. Cuv. and Val.

Gunth. Cat. 1, p. 390. Less. Voy. Coq. Zool. 3, p. 186, pl. 34. Bleek. Atl. Ichth. Perc., p. 37, tab. 56, fig. 4.

Exact locality not given.

304. *CÆSIO CHRYSOZONA*. Cuv. and Val.

Gunth. Cat. 1, p. 392, Bleek. Atl. Ichth. Perc., p. 39, tab. 29, fig. 2.

“Gawanni” of the natives.

Pitt Bay.

This may be a distinct species, there is a second golden longitudinal band above the first, not mentioned in the descriptions and plates of *C. chrysozoma*.

*Cæσιο cœrulaureus* was also taken at the Eastern end of New Guinea.

## SQUAMIPINNES.

305. *CHÆTODON ORNATISSIMUS*. Cuv. and Val.

Gunth. Cat. 2, p. 15. Less. Voy. Coq. Zool. 2, p. 179, pl. 30, fig. 1. Bleek. Atl. Ichth. Chætod., tab. 13, fig. 2.

South East New Guinea.

306. *CHÆTODON CITRINELLUS*. Cuv. and Val.

Gunth. Cat. 2, p. 33. Jour. Mus. Godeff. Heft. 5, p. 47, pl. 35, fig. B.

South East New Guinea.

307. *CHÆTODON MELANOTUS*. Cuv. and Val.

Bleek. Atl. Ichth. Chætod., tab. 14, fig. —, *C. Reinwardtii*. Gunth. Cat. 2, p. 23.

South East Coast.

308. *CHÆTODON PLEBEJUS*. Cuv. and Val.

Gunth. Cat. 2, p. 5. Journ. Mus. Godeff, Heft. 5, p. 35, pl. 32, fig. B. South East Coast.

*Chaetodon ephippium*, *Rafflesii*, *speculum*, *unimaculatus*, *baronessa* and *lineolatum*, all previously recorded from Port Moresby, were also taken on the South East Coast.

## 309. HENIOCHUS MACROLEPIDOTUS L.

Gunth. Cat. 2, p. 39. Bleek. Atl. Ichth. Chætod., tab. 5, fig. 1.  
"Kino-kino" of the natives. Hood Bay.

## 310. HENIOCHUS CHRYSOSTOMUS. Cuv. and Val.

Gunth. Cat. 2, p. 41. Bleek. Atl. Ichth. Chætod., tab. 4, fig. 4.  
Hood Bay.

## 311. HOLACANTHUS SEMICIRCULATUS. Cuv. and Val.

Gunth. Cat. 2, p. 53. Less. Voy. Coq. Poiss., p. 173, pl. 30,  
fig. 3. Bleek. Atl. Ichth. Chætod., tab. 8, fig. 5.  
"Tua-mari" of the natives. Engineer group.

## 312. HOLACANTHUS NAVARCHUS. Cuv. and Val.

Gunth. Cat. 2, p. 49. Bleek. Atl. Ichth. Chætod., tab. 9, fig. 3.  
South Cape.

## 313. HOLACANTHUS DIACANTHUS. Bl.

Gunth. Cat. 2, p. 48. Bleek. Atl. Ichth. Chætod., tab. 6, fig. 3.  
"Umure" of the natives. South Cape.  
Specimens of *Holacanthus bicolor*, from D'Entrecastreaux  
Group; *Scatophagus argus* from Normanby Island, and *Toxotes*  
*jaculator* from Normanby Island, were also in the collection.

## MULLIDÆ.

## 314. MULLOIDES FLAVOLINEATUS. Lacep.

Gunth. Cat. 1, p. 403. Bleek. Atl. Ichth. Mull., tab. 4, fig. 3.  
"Duru-apata" of the natives. Hood Bay.

## 315. UPENEUS SEMIFASCIATUS. n. sp.

D. 8/9. A. 7. L. lat. 31. L. tr.  $2\frac{1}{2}/6\frac{1}{2}$ .

The height of the body is about one-third of the total length, the length of the head a little less; the profile is very convex, the space between the eyes quite two diameters of the orbit in width, and the distance between the eye and the snout, two diameters and

a-half ; the mouth is small, the lips thick, the maxillary broad, and not reaching to the level of the eye ; a flat acute opercular spine ; the longest dorsal spine, rather more than half the height of the body ; caudal fin emarginate. Colour red or yellow, with two broad brown bands extending from the back to below the middle of the sides, under the spinous and soft dorsal fins respectively.

“Igomar” of the natives. Hood Bay.

316. *UPENEUS FILAMENTOSUS*. n. sp.

D. 8/9. A. 7. L. lat. 28. L. tr. 2/5.

Height of body one-fourth of the total length ; length of head greater than the height of the body, profile straight, space between the eyes a little convex, and as wide as two diameters of the orbit. Snout long and rather pointed, the distance from the eye to the snout being equal to four diameters of the orbit ; the mouth is small ; the lips thick ; teeth strong and blunt. The spinous dorsal terminates in filaments, the third spine equals the height of the body. Colour pink, with yellow and blue lines about head and soft dorsal. Length, 9 inches.

“Mara-aga of the natives. Hood Bay.

*Upeneus barberinoides*, *multifasciatus*, and *tragula* were also brought from Hood Bay.

SPARIDÆ.

317. *LETHRINUS HÆMATOPTERUS*. Bleek.

Bleek. Atl. Ichth. Perc., p. 112, tab. 57, fig. 4.

“Carri-carri” of the natives. Engineer group.

Specimens of *Lethrinus lentjanus*, and *ornatus* were also got.

318. *PEMILEPTERUS WAIGIENSIS*. Quoy and Gaim.

Gunth. Cat. 1, p. 498. Bleek. Atl. Ichth. Chætod., tab. 2, fig. 2.

“Saborre” of the natives. Engineer group.

319. *SPHÆRODON GRANDOCULIS*. Forsk.

Gunth. Cat. 1 p. 465. Bleek. All. Ichth. Perc. p. 105, tab. 21, fig. 1.

“Mattabossi” of the natives. Engineer Group.



## 320. CHRYSOPHRYS HASTA. Bl.

Gunth. Cat. 1 p. 490. Bleek. Atl. Ichth. Perc. p. 103, tab. 67,  
fig. 3.

“Dubu” of the natives, Gulf of Papua.

## CIRRHITIDÆ.

## 321. CIRRHITES ARCATUS. Cuv. and Val.

Gunth. Cat. 2, p. 72. Bleek. Atl. Ichth. Perc. p. 144, tab. 25,  
fig. 3.

South East Coast.

## SCORPÆNIDÆ.

## 322. SCORPÆNA CIRRHOSA. Cuv. and Val.

Gunth. Cat. 2 p. 120. Bleek. Atl. Ichth. Scorp. tab. 3 fig. 6.

South East Coast.

## 323. SCORPÆNA DIABOLUS. Cuv. and Val.

Gunth. Cat. 2, p. 117. Bleek. Atl. Ichth. Scorp. tab. 1, fig. 5.

“Pacura” of the natives. Hood Bay.

## TEUTHIDIDÆ.

Of this family, one species *T. vermiculata* was taken in fresh water on Normanby Island.

## BERYCIDÆ.

## 324. MYRIPRISTIS MICROPHthalmus. Bleek.

Gunth. Cat. 1 p. 24. Bleek. Atl. Ichth. Trachich. tab. 4, fig. 2.

“Kurulu” of the natives. Hood Bay,

Of this Family *Myripristis adustus* and *Holocentrum sammara* and *rubrum*, were also taken in Hood Bay.

## KURTIDÆ.

## 325. PEMPHERIS OTAITENSIS. Cuv. and Val.

Gunth. Cat. 2 p. 508. Bleek. Atl. Ichth. Pempher. tab. 1 fig. 4.

“Iga-iga” of the natives. Hood Bay.

## ACRONURIDÆ.

## 326. ACANTHURUS GLAUCOPAREIUS. Cuv. and Val.

Gunth. Cat. 3 p. 339. Jour. Mus. Godeff, Heft. 9 p. H. 4,  
Pl. 71, fig. A.

“Wanaka of the natives.” Hood Bay.

## 327. ACANTHURUS DUSSUMIERI. Cuv. and Val.

Gunth. Cat. 3 p. 335. Jour. Mus. Godeff. Heft. 9, p. H. 2, Pl. 72.

“Dabua” of the natives. Millport Harbour.

*Acanthurus matoides*, *lineatus*, *hepatus*, and *olivaceus* were also taken in the vicinity of Hood Bay. Also *Naseus unicornis*, and *Marginatus*.

## CARANGIDÆ.

## 328. CARANX BOOFS. Cuv. and Val.

Gunth. Cat. 2 p. 431.

“Pogari” of the natives. China Straits.

## 329. PSETTUS ARGENTEUS. L.

Gunth. Cat. 2 p. 487. Richards. Voy. Ereb. and Terr. Fishes p. 57, Pl. 35, fig. 1-3.

“Gémo” of the natives. Normanby Island.

## 330. EQUULA EDENTULA. Bl.

Gunth. Cat. 2 p. 498. Richards. Voy. Ereb. and Terr. Fishes p. 137, pl. 59, fig. 12-14

“Pya-Pya” of the natives. Normanby Island.

## SCOMBRIDÆ.

## 331. CYBIUM COMMERSOHNII. Lacep.

Gunth. Cat. 2 p. 370. Macl. Proc. Linn. Soc. N. S. Wales, Vol. 5, p. 558.

Hood Bay. Caught on trolling line.

Specimens of *Scomber loo* were got in Pitt Bay, Moresby Island.

## 332. ECHENEIS NAUCRATES. L.

Gunth. Cat. 2, p. 384. Macl. Proc. Linn. Soc. N. S. Wales, Vol. 5, p. 561.

Hood Bay.

## MALACANTHIDÆ.

A specimen of *Malacanthus latovittatus* said to be from fresh water. Goldie River.

## BATRACHIDÆ.

333. *BATRACHUS DUBIUS*. White.

Gunth. Cat. 3 p. 169. Richards. Voy. Ereb. and Terr. Fishes p. 16, Pl. 10,  
South East Coast. Apparently identical with the Australian species.

## COTTINA.

Young specimens of *Platycephalus Quoyi* from several places.

## GOBIIDÆ.

334. *GOBIUS ORNATUS*. Rüpp.

Gunth. Cat. 3 p. 21. *G. interstinctus* Richards. Voy. Ereb. and Terr. p. 3, Pl., 5 figs. 3-6.

“Sumato” of the natives. Milne Bay.

335. *GOBIUS MACULIPINNIS*. n. sp.

D. 7/11. A. 10. L. lat. 26.

The height of the body is one sixth of the total length, and is about equal to the length of the head; the snout is convex and obtuse; the eyes are near the top of the head, and less than half their diameter apart; the space between the eye and the snout is equal to one and a-half diameter of the orbit. The mouth is small, the cheek is scaly with two impressed lines running from the maxillary backwards for some distance; the scales are a little pointed at the free end, with lines radiating backwards; the fin-rays all more or less terminate in filaments, the second dorsal spine very elongate, the caudal is long and pointed. The colour seems to have been greenish yellow, with bluish spots; the fins are all spotted brown and white, excepting the ventrals and anal, which are tinged with black.

Normanby Island, Fresh water.

336. *GOBIUS CIRCUMSPECTUS*. n. sp.

D. 7/10. A. 9. L. lat. 30.

Height of body one-sixth and length of head one-fourth of the total length. Head rather flat, terminating in a rounded muzzle, the lower jaw broader and longer than the upper; the eyes are close

together (about a third of their diameter apart) and situated on the top of the head ; the teeth are numerous, the outer series very acute ; the cheek is naked, a few scales on the upper part of the operculum. The second dorsal spine is long, terminating in a filament, the caudal is rounded behind. Colour greenish-yellow, with indistinct darker markings, a large ill-defined brown spot on the root of the tail, the dorsal and caudal fins brown spotted.

Milne Bay. Fresh water.

336. *APOCRYPTES FASCIATUS*. n. sp.

D. 6/15. A. 15. L. lat. 56.

Of compressed form ; the height of the body and length of the head are about one-fourth of the total length. The head is less compressed than the body, convex between the eyes and rounded on the snout ; the eyes are moderate, less than a diameter apart, and about a diameter from the snout ; there is a strong bony elevation on the front orbital margins ; the mouth is oblique, the gape extending to below the middle of the eye, the cheek is naked or nearly so. The dorsal spines are filamentose, the connecting membrane not nearly extending to the middle ; caudal rounded. Colour dark with six broad darker fasciæ on the sides ; soft dorsal and anal with small blue or light coloured dots.

338. *ELEOTRIS IMMACULATIS*. n. sp.

D. 6/10. A. 9. L. lat. 63.

Form depressed in front, compressed towards the tail ; height one-fourth of the total length without the caudal fin. Length of head one-third of the total length with the caudal fin. Back from the dorsal fin to the snout very broad and nearly flat, becoming somewhat concave between the eyes, which are quite  $4\frac{1}{2}$  diameters apart ; the snout is broad and rounded, and without scales, the lower jaw considerably exceeding the upper, the cleft of the mouth extends to the vertical from the posterior margin of the eye. The caudal fin is rounded. The colour (in spirits) is of a dull uniform brown, but in life probably each scale had a pearly lustre. A large heavy fish 18 inches long.

Kéremma River. Gulf of Papua.

## 339. ELEOTRIS OPHIOCEPHALUS. Cuv. and Val.

Gunth. Cat. 3, p. 107. Journ. Mus. Godeff. Heft. 13, p. 185, Pl. 112, fig. a.

“Wénému” of the natives. Normanby Island. Fresh water,

## 340. ARISTEUS GOLDIEL. n. sp.

D. 1/5, 1/13. A. 1/22. L. lat. 34.

In stature like *A. rufescens*, and indeed resembling that species in everything excepting colour and the number of fin rays. The colour in this species is silvery all over, but darker towards the back, a broad black line extends from the snout, under and above the eye to the tail.

This fish was got in abundance in the Goldie River; the largest specimens were under 4 inches in length.

## BLENNIIDÆ.

## 341. BLENNIUS PERIOPHTHALMOIDES. n. sp.

D. 12/16. A. 18. V. 2.

Body much compressed, its height about one-sixth of the total length. Head as high as long, and broader than the length, quite round in front, and with two very prominent eyes nearly together on the top of the head. Mouth terminal, extending to below the middle of the eye. Gill membranes entirely united below. Pectoral fins strong, of 14 simple rays; dorsal distinctly notched; caudal rounded. All the fins seem to have been marked with alternate brown and white bars, giving them a spotted appearance, according to Mr. Goldie the body was of an inky-drab-colour.

“Pici” of the natives. Dufaure Island.

## SPHYRAENIDÆ.

*Sphyræna Forsteri*, previously recorded. Hood Bay.

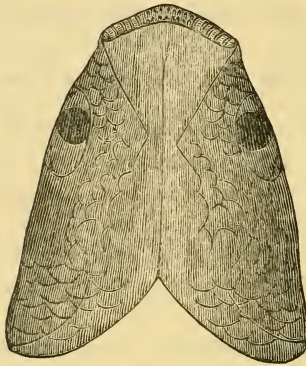
## MUGILIDÆ.

## 342. MUGIL COMPRESSUS. Gunth.

Gunth. Cat. 3, p. 451. Macl. Proc. Linn. Soc. N. S. Wales, Vol. 4, p. 421.

Normanby Island. Fresh water.

## 343. MUGIL PAPILLOSUS. n. sp.



D. 4.  $\frac{1}{7}$ . A.  $\frac{3}{9}$ . L. lat. 38.

The height of the body is one-fourth of the total length; the head is depressed, the body compressed, and the back rather more convex than the belly. The eyes are large, near the snout, nearly two diameters apart, and without adipose membrane. The snout is rounded in front and above. The upper lip is thick in the middle where it fits into a broad emargination of the head, and has along its lower edge a groove filled with verrucose papillæ as shown in the accompanying woodcut. The lower jaw is very obtusely angled at the symphysis, but is acutely angled at the sides; no open space on the chin. The first spine of the anal fin is very short; the caudal is emarginate. Colour silvery, darker along the back; a black spot above the root of the pectoral fin. "Nyiari" of the natives.

Normanby Island. Fresh water.

## 344. AESCHRICHTHYS GOLDIEI. Macleay.

Proc. Linn. Soc. N. S. Wales, vol. 8, p. 2.

Goldie River. Fresh water.

## FISTULARIDÆ.

## 345. FISTULARIA SERRATA. Cur.

Gunth. Cat. 3, p. 533. Macl. Cat., Proc. Linn. Soc., N. S. Wales, vol. 6, p. 49. Hood Bay.

## CENTRISCIDÆ.

## 346. AMPHISILE STRIGATA.

Gunth. Cat. 3, p. 528.

South East Coast.

## POMACENTRIDÆ.

## 347. AMPHIPRION MELANOPUS. Bleek.

Gunth. Cat. 4, p. 8. Bleek. Atl Ichth. Pomac., tab. 2, fig. 7.

D'Entrecasteaux Group.

## 348. AMPHIPRION PAPUENSIS. n. sp.

D. 10/14. A. 2/12. L. lat. 50.

The height of the body is one-half of the length including the caudal fin. The colour is black, the muzzle and breast, as far as the root of the ventrals are yellowish, the soft dorsal, tail and caudal fin are white, and there are two broad cross bands, as in *A. bicinctus*, one from the nape to the edge of the sub-operculum, the other across the body, from the back part of the spinous dorsal to the vent.

“Becua” of the natives. D'Entrecasteaux Group.

## 349. GLIPHIDODON NIGRIFRONS. n. sp.

D. 13/11. A. 2/11. L. lat. 26.

Height of body more than half the total length including the caudal fin, head very round in front and rather flat between the eyes, the space between them being equal to nearly two diameters of the orbit. The snout is shorter than the diameter of the eye; the mouth is very small. The second anal spine is large and strong. The colour seems to have been an uniform silvery-greenish, with darker marks on the scales of the upper and anterior portions of the body; the forehead is black.

South East Coast.

## 350. GLIPHIDODON BIMACULATUS. n. sp.

D. 12/11. A. 2/12. L. lat. 26.

Height of body half the total length. Eyes large, close to the snout, and about a diameter apart. Mouth very small. Colour

silvery-gray, a black spot above and below the root of the tail, extremities of dorsal and anal fins, blackish. Length,  $1\frac{1}{2}$  inch.

South East Coast.

*Premnas biaculeatus* and *Pomacentrus prosopotaenia*, were also taken in Hood Bay.

#### LABRIDÆ.

##### 351. LABROIDES PARADISEUS. Bleek.

Atl. Ichth. Labr., tab. 44, fig. 2. Gunth. Cat. 4, p. 119.

South East Coast.

##### 352. DUYMERIA NEMATOPTERA. Bleek.

Atl. Ichth. Labr., p. 70. tab. 23, fig. 5. Gunth. Cat. 4, p. 123.

South East Coast.

##### 353. CIRRHILABRUS SOLORENSIS. Bleek.

Atl. Ichth. Labr., p. 76, tab. 23, fig. 3. Gunth. Cat. 4, p. 124.

Pitt Bay.

##### 354. ANAMPSES CÆRULEOPUNCTATUS. Rüpp.

Bleek. Atl. Ichth. Labr., p. 104, tab. 24, fig. 2. Gunth. Cat. 4, p. 135.

“Aviko” of the natives. Hood Bay.

##### 355. ANAMPSES PTEROPHTHALMUS. Bleek.

Atl. Ichth. Labr., p. 102, tab. 24, fig. 3. Gunth. Cat. 4, p. 138.

“Yessuma” of the natives. Engineer group.

##### 356. STETHOJULIS TRILINEATA. Bl.

Bleek. Atl. Ichth. Labr., p. 131, tab. 43, fig. 3. Gunth. Cat. 4, p. 140.

Millport Harbour.

##### 357. STETHOJULIS PHEKADOPLEURA. Bleek.

Atl. Ichth. Labr., p. 134, tab. 43, fig. 5. Gunth. Cat. 4, p. 143.

South Cape.



358. *STETHOJULIS AXILLARIS*. Quoy. and Gaim.

Bleek. Atl. Ichth. Labr., p. 136, tab. 44, fig. 7. Gunth. Cat. 4,  
p. 142.

Pitt Bay.

359. *STETHOJULIS ALBOVITTATA*. Lacep.

Bleek. Atl. Ichth. Labr., p. 132, tab. 44, fig. 5. Gunth. Cat. 4,  
p. 141.

South East Coast.

360. *STETHOJULIS STRIGIVENTER*. Benn.

Bleek. Atl. Ichth. Labr., p. 135, tab. 43, fig. 1. Gunth. Cat. 4,  
p. 140.

South East Coast.

361. *STETHOJULIS KALOSOMA*. Bleek.

Atl. Ichth. Labr., p. 134, tab. 43, fig. 4. Gunth. Cat. 4, p. 142.

South East Coast.

362. *PLATYGLOSSUS HEVENII*. Bleek.

Atl. Ichth. Labr., p. 111, tab. 42, fig. 3. Gunth. Cat. 4, p. 153.

Hood Bay.

363. *PLATYGLOSSUS TRIMACULATUS*. Quoy and Gaim.

Bleek. Atl. Ichth. Labr., p. 138, tab. 32, fig. 1. Gunth. Cat. 4,  
p. 153.

Hood Bay.

364. *PLATYGLOSSUS MODESTUS*. Bleek.

Atl. Ichth. Labr., p. 126, tab. 35, fig. 2. Gunth. Cat. 4, p. 157.

Engineer Group.

365. *PLATYGLOSSUS PÆCILUS*. Richards.

Bleek. Atl. Ichth. Labr., p. 115, tab. 39, fig. 4. Gunth. Cat. 4,  
p. 152.

Engineer Group.

366. *PLATYGLOSSUS MELANURUS*. Bleek.

Atl. Ichth. Labr., p. 109, tab. 46, fig. 1. Gunth. Cat. 4, p. 148.  
South Cape.

367. *PLATYGLOSSUS GEOFFROYI*. Quoy. and Gaim.

Bleek. Atl. Ichth. Labr., p. 129, tab. 37, fig. 5. Gunth. Cat. 4,  
p. 145.

Hood Bay.

368. *PLATYGLOSSUS GUTTATUS*. Bl.

Bleek. Atl. Ichth. Labr., p. 124, tab. 35, fig. 1. Gunth. Cat. 4,  
p. 155.

369. *PLATYGLOSSUS MARGARITACEUS*. n. sp.

D. 7/11. A. 2/11. L. lat. 25.

Of compressed form. The height of the body rather more than one-fourth of the total length; snout pointed, teeth prominent. Eyes small; tail truncate. Colour (in spirits) yellowish, darker on the top of the head, with a broad pearly stripe more or less edged with black, extending from the operculum to, or nearly to, the tail, there seems to have been also a large oval pearly spot on the operculum. The fins are yellow, with a small black spot on the first dorsal spine, the last anal ray, and on the middle of the uppermost and lowest caudal rays. Hood Bay.

370. *NOVACULA MACROLEPIDOTA*. Bl.

Bleek. Atl. Ichth. Labr., tab. 31, fig. 6. Gunth. Cat. 4, p. 174.  
Hula, Hood Bay.

371. *NOVACULA PENTADACTYLA*. L.

Bleek. Atl. Ichth. Labr., tab. 30, fig. 4. Gunth. Cat. 4, p. 177.  
Hood Bay.

372. *JULIS DORSALIS*. Quoy. and Gaim.

Bleek. Atl. Ichth. Labr. p. 94, tab. 34, fig. 4. Gunth. Cat.  
4, p. 190.

Engineer Group.

373. *JULIS JANSENI*. Bleek.

Atl. Ichth. Labr. p. 91, tab. 34, fig. 5. Gunth. Cat. 4, p. 187.  
Engineer Group.

374. *JULIS GUNTHERI*. Bleek.

Alt. Ichth. Labr. p. 94, tab. 34, fig. 1. Gunth. Cat. 4, p. 189.  
Engineer Group.

375. *GOMPHOSUS TRICOLOR*. Quoy and Gaim.

Bleek. Atl. Ichth. Labr. p. 85, tab. 21, fig. 6. Gunth. Cat.  
4, p. 193.

Pitt Bay, Moresby Island.

376. *GOMPHOSUS VARIUS*. Lacep.

Gunth. Cat. 4, p. 193.

Hula, Hood Bay.

377. *CORIS VARIEGATA*. Rüpp.

Bleek. Alt. Ichth. Labr. p. 106, tab. 36, fig. 4. Gunth. Cat.  
4 p. 198.

Pitt Bay.

378. *CORIS PAPUENSIS*. n. sp.

D. 9/14. A. 2/11. L. lat. 52.

Of compressed form. The height of the body is one-fourth of the total length, and about equal to the length of the head. Snout long and pointed; eyes very small; caudal fin truncate. Colour (in spirits) pale yellow, with three or four or more indistinct dark cross bands from the back towards the belly, and with a small bright pearly spot on every scale on ventral half of the body. On the head are three black spots one before the eye, another behind and the third behind that, probably forming a black streak, in the fresh specimens. The fins are colourless, there is a minute black dot on the membrane between the first and second dorsal spine, a still more minute one on the ninth dorsal ray, and a bright ocellus on the second.

South East Coast.

## 379. SCARICHTHYS AURITUS. Cuv. and Val.

Bleek. Atl. Ichth. p. 15, tab. 1, fig. 3. Gunth. Cat. 4, p. 213.  
Hula, Hood Bay.

## 380. CALLYODON MOLUCCENSIS. Bleek.

Gunth. Cat. 4 p. 216. Bleek. Atl. Ichth. p. 12, tab. 2, fig. 1.  
"Péolé" of the natives. Hood Bay.

## 381. CALLYODON SPINIDENS. Quoy and Gaim.

Bleek. Atl. Ichth. p. 13 tab. 2, fig. 2. Gunth. Cat. 4, p. 215.  
Hula, Hood Bay.

## 382. PSEUDOSCARUS PENTAZONA. Bleek.

Atl. Ichth. p. 46, tab. 11, fig. 1. Gunth. Cat. 4, p. 231.

Species of Labridæ from the South East Coast, previously recorded from other parts of New Guinea, *Cheilinus radiatus*, *oxycephalus*, and *fasciatus*; *Epibulus insidiator*; *Hemigymnus fasciatus* and *melanopterus*; *Julis lunaris*.

## PLEURONECTIDÆ.

## 383. PSEUDORHOMBUS GUTTULATUS. n. sp.

D. 75. A. 63.

The height of the body is nearly half the total length. The dorsal fin commences in front of the eyes, which are large, almost in the same plane, and separated by a narrow ridge. Teeth acute, sloping backwards. Colour (in spirits), uniform grey, fins lighter, the whole covered with minute brown dots. Length, 4 inches.

Hood Bay.

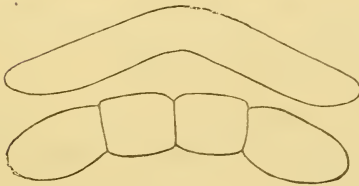
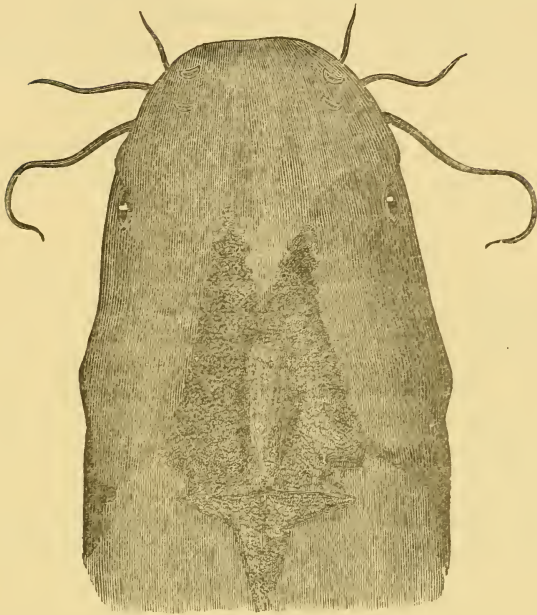
## SILURIDÆ.

## 384. PLOTOSUS ANGUILLARIS. Bl.

Gunth. Cat. 5, p. 24. Arab., Bleek. Atl. Ichth. Silur., p. 98, tab. 95, fig. 2.

"Déréwa" of the natives. Hood Bay.

385. *ARIUS LATIROSTRIS*. n. sp.



D. 1/7. A. 14. P. 1/9.

The height of the body is one-fifth of the total length. Head broad and depressed in front, and broadly rounded at the snout; the diameter of the eye is one-sixth of the width of the interorbital space. Teeth in the upper jaw in a semicircular band, as in the wood cut, vomerine and palatine teeth, also represented in the

T

wood cut, in square masses divided by a line; top of head and occiput sculptured, as in wood cut. The barbels are shorter than the head, pectoral spine as high as the dorsal. Adipose fin shorter than the dorsal; caudal strongly forked. Length, 20 inches.

Goldie River.

#### SCOMBRESOCIDÆ.

386. *EXOCÆTUS ARCTICEPS*. Gunth.

Cat. 6, p. 289.

South East Coast.

#### CLUPEIDÆ.

387. *DUSSUMIERA ACUTA*. Cuv. and Val.

Gunth. Cat. 7, p. 466. Cant. Mal. Fish., p. 286.

"Caru-Caru" of the natives. Hood Bay.

388. *MEGALOPS CYPRINOIDES*. Brouss.

Gunth. Cat. 7, p. 471. *M. setipinnis* Richards, Ann. Nat. Hist. xi., p. 493.

Goldie River. Fresh water.

*Engraulis encrasicholoides* and *Albula conorhynchus*, were also taken near Hood Bay.

#### MURÆNIDÆ.

389. *CONGER MARGINATUS*. Valenc.

Gunth. Cat. 8, p. 38. *C. noordvicki*. Bleek. Atl. Ichth. Mur., p. 20, tab. 23, fig. 2.

"Navia" of the natives. Hood Bay.

390. *MURÆNESOX CINEREUS*. Forsk.

Gunth. Cat. 8, p. 46. *M. bagio*. Bleek. Atl. Ichth. Mur., p. 24, tab. 26, fig. 2.

"Tya-Tya" of the natives. Hood Bay.

391. *MURÆNA CANCELLATA*. Richards.

Voy. Ereb. and Terr., p. 87, pl. 46, figs. 1-5. Bleek. Atl. Ichth. Mur., p. 93, tab. 32, fig. 3. Syn. *M. undulata*, Lacep. Gunth. Cat. 8, p. 110.

"Rupa-rupa" of the natives. Hood Bay.

## SYGNATHIDÆ.

392. *GASTROTOKEUS BIACULEATUS*. Bl.

Gunth. Cat. 8, p. 194. Cant. Mal. Fish., p. 387.  
South East Coast.

393. *HIPPOCAMPUS GUTTULATUS*. Cuv.

Gunth. Cat. 8, p. 202. Many synonyms.  
South East Coast.

## SCLERODERMI.

394. *BALISTES PAPIUENSIS*. n. sp.

D. 3. 1/26. A. 25. L. lat. 26.

Tail with five rows of minutely armed scales on each side of the tail, the longest numbering as many as fourteen indistinct spines; scales of the body very warty and rough. A patch of osseous plates above the gill opening. No groove in front of the eye; soft dorsal and anal fins with rounded profile; caudal rounded; ventral spine movable. Colour greenish with roundish dark spots scattered over the sides of the body, one or two darkish cross bars on the soft dorsal and anal fins, and three on the caudal.

"Aremela" of the natives. Hood Bay.

395. *MONACANTHUS PRIONURUS*. Bleek.

Atl. Ichth. V. p. 138, tab. 227, fig. 1. Gunth. Cat. 8 p. 234.  
Hood Bay.

396. *MONACANTHUS SCRIPTUS*. Valent.

Gunth. Cat. 8, p. 252. Bleek. Atl. Ichth. V. p. 141, tab. 227,  
fig. 4.  
Hood Bay.

397. *MONACANTHUS MELANOCEPHALUS*. Bleek.

Atl. Ichth. V. p. 127, tab. 223, fig. 1. Gunth. Cat. 8 p. 242.  
Engineer Group.

398. *MONACANTHUS MONOCEROS*. L.

Gunt. Cat. 8 p. 251. Bleek. Atl. Ichth. V. p. 140, tab. 226,  
fig. 2. Hood Bay.

399. *OSTRACION SEBÆ*. Bleek.

Atl. Ichth. Ostrac. p. 41, tab. 4 fig. 2. Gunth. Cat. 8 p. 261.  
"Porrone" of the natives. Engineer Group.

## GYMNODONTES.

## 400. TETRODON VALENTINI. Valent.

Gunth. Cat. 8, p. 305. Bleek. Atl. Ichth. Gymnod., p. 80, tab. 4, fig. 1.

Hood Bay.

## 401. TETRODON LATERNA. Richards.

Voy. Sulph. Zool., p. 124, pl. 61, fig. 8. Bleek. Atl. Ichth. Gymnod., pl. 1, fig. 3. *T. hispidus*, Gunth. Cat. 8, p. 297.

## 402. TETRODON BENNETTII. Valent.

Gunth. Cat. 8, p. 301. *T. ocellatus*, Bleek. Atl. Ichth. Gymnod., p. 80, tab. 10, fig. 5.

Hood Bay.

## 403. TETRODON SCELARATUS. L.

Gunth. Cat. 8, p. 276. *P. argentine*. Bleek. Atl. Ichth. Gymnod., p. 64, tab. 6, fig. 1.

Hood Bay.

## 404. DIODON HYSTRIX. L.

Gunth. Cat. 8, p. 306. Bleek. Atl. Ichth. Gymnod., p. 50, tab. 3, fig. 2.

Hood Bay.

## BATIDÆ.

## 405. RHINOBATUS THOUINI. Mull. &amp; Henle.

Gunth. Cat. 8, p. 442. Dum. Elasm., p. 500, pl. 9, fig. 2.

Hood Bay.

## NOTES AND EXHIBITS.

Mr. Macleay exhibited a cast of the right mandible of *Palorchestes Azael*, the fossil which was the subject of Mr. De Vis Paper.

Dr. Mackellar exhibited portions of the liver and lungs of a sheep with large hydatid cysts, and also showed under the microscope specimens of the enclosed embryos. These probably belong to a Tapeworm (*Tenia echinococcus*), the proscolex stage of which



is the cause of hydatids in the human subject, and which is developed as a tapeworm only in the dog; in the hydatid stage these are probably innocuous to the human subject, but further experiments are being carried out with a view of throwing additional light on the life-history of this tapeworm.

Professor Stephens exhibited a collection of fossils from "Sturt's Stony Desert," close to the Grey Ranges. Among them were specimens of *Ammonites biflexuoides*, *Belemnites* sp., besides other mollusca, all found at a depth of over 100 feet. Also a specimen of petrified wood, part of a tree met with in sinking a well on the Dunlop station, 50 miles north of the Darling, at 300 feet below the surface; Dendrites from Wittabreena, 30 miles north of Mount Brown; Gypsum (selenite) from the Grey Ranges, where high cliffs of this substance occur; fossil wood from the same place; shell-breccia from the district between the Paroo and Warrego, found at a very great depth, &c. He also exhibited a rare fungus from Springwood, both in the dry state and by drawings. It was regarded by Mr. Tenison-Woods as probably a species of *Stereum*. Also a specimen of Opal in reniform nodules, obtained by Mr. Gilliatt from a well in the Paroo district. The matrix is understood to have been clay, presumably a deposit from hot springs.

Mr. Whitelegge exhibited a living and vigorous specimen of *Plumatella* obtained in the Botany swamps. It appeared to be identical with *P. repens*, Linn. Also dried specimens of *Nitella gelatinosa* from Randwick, one of the Characeæ which had not been previously recorded from this district.

Mr. Asher exhibited a "holy dollar" and several "dumps," as an interesting illustration of the early history of the colony, and read the proclamation of Governor Macquarie, determining their values in the standard currency.

Mr. Macleay read the following letter from Mr. Meyrick relative to the caterpillar exhibited by him (Mr. Macleay) at the last meeting:—

“Warwick House, Armagh Street West,

“Christchurch, N.Z., 21st May, 1883.

“Dear Sir,

“I observed in the Abstract of Proceedings of the last meeting of the Linnean Society, a note by yourself on the injury caused to cabbages by the great numbers of larvæ of one of the *Tineina*, and thought you might be interested to know the specific name. The habits of the larva, and your mention of the lace-work cocoon, enable me to say for certain that the species is *Plutella cruciferarum*, Zeller (family *Plutellidæ*) which, as you rightly conjecture, is an importation from Europe. It occurs now throughout the whole world from Greenland to New Zealand, and is apparently abundant everywhere, not regarding climate; it is the only known Lepidopterous insect of which this can be said. It swarms in many parts of Australia, especially at Adelaide. It has probably been imported with the cabbage, but will eat almost any *Crucifera*. Its numbers are, I think, principally kept down in the larval state by small birds. The moth, though small and inconspicuous, may be readily recognised by unpractised persons from its habit of projecting its antennæ forward when at rest, as the *Trichoptera* do.

“Believe me,

“Yours truly,

“EDWARD MEYRICK.

“Hon. William Macleay, M.L.C.”

WEDNESDAY, JUNE 27<sup>TH</sup>, 1883.

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Professor W. J. Stephens, M.A., in the Chair.

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MEMBERS ELECTED.

Thomas Richards, Esq., Government Printer.

Patrick Hayes, Esq., The Oaks, Neutral Bay.

John Laskey Woolcock, B.A., Brisbane.

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DONATIONS.

“Feuille des Jeunes Naturalistes,” Paris, No. 151, May, 1883.  
From the Editor.

“Bulletin de la Société Impériale des Naturalistes de Moscou.”  
Tome lvii., No. 3, 1882. From the Society.

“Verslagen en Mededeelingen der Koninklijke Akademie van  
Wetenschappen te Amsterdam.” Deel. xvii., 8vo, 1882. Also,  
“Jaarboek voor 1881.” From the Society.

“Catalogue of Books added to the Radcliffe Library, Oxford,  
during the year 1882.” From the Oxford University Museum.

A large number of copies of Vols. I. to IV. of the “Proceedings,”  
presented by the Hon. W. Macleay, for the use of the Society  
also, a number of copies of “Proceedings,” Vols. III., IV., V. and VI.,  
presented by Professor W. J. Stephens.

“Abhandlungen herausgegeben vom naturwissenschaftlichen  
Vereine zu Bremen,” VII. Band, 1 Heft., mit 4 Tafeln., 8vo, 1883.

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PAPERS READ.

DESCRIPTIONS OF NEW GENERA AND SPECIES OF AUSTRALIAN  
FISHES.

BY CHARLES W. DE VIS, B.A.

GIRELLA CARBONARIA. n. sp.

D. 13/11. A. 3/11. L. lat. 50. I. transv. 8/18.

Height of body less than one-third, and head less than one-fifth of  
the total length; diameter of orbit one-fifth, and length of snout  
two-fifths of the length of the head. Teeth petaloid, incurved, edge

entire, slightly arched, in several imbricate series. Colour (recent) dark grey; edges of scales, belly, and hinder edge of the anal fin pale.

Long, 15 inches.

*Loc.* Moreton Bay. Black Bream of the Market.

GIRELLA MENTALIS. n. sp.

D. 13/14. A. 3/12. L. lat. 56. L. transv. 8/18.

Height of body three times and one-third, and length of head five times, in the total length; diameter of orbit four times and one-third in the length of the head, and the length of the snout and width of the interorbital space twice and two-thirds in the same; upper third of opercle scaly; teeth tricuspid, a bare space between the outer and inner ones. The maxillary subtends the posterior nostril; upper and lower profile equally convex; nape slightly elevated; caudal deeply emarginate. Colour (recent) dark purplish grey with several obscure vertical bands, cheeks and chin yellow; pupil black, iris silvery, head shining greenish black, separated from the scales of the neck by a yellowish crescent.

Long. 15."

*Loc.* Moreton Bay.

NEW GENUS DACTYLOPHORA. Fam. Cirrhitidæ.

One dorsal fin with sixteen spines. One of the simple pectoral rays elongate; anal short; lower teeth in a single series; upper in several in a lunate patch; cheeks naked; preorbital and preoperculum entire; four branchiostegals; scales cycloid, of moderate size; caudal forked.

D. SEMIMACULATA.

D. 16/24. A. 3/10. L. lat. 52. L. transv. 4/11.

Height equal to length of head, one-fourth of total length; circa-orbit four-and-a-half, snout three, interorbital space nearly four times, in the length of the head. Five simple pectoral rays, the uppermost free for one-sixth of its length and reaching the origin of the anal. A curved ascending ridge on the preoperculum; lateral eminences between the posterior nasal orifices. First dorsal spine the shortest, spines gradually lengthening to sixth, which is one-third of the

height of the body and equals the longest dorsal ray ; profile of the soft dorsal arched ; caudal peduncle long, its depth one-third of the length of the head ; caudal broad, moderately forked. Color in spirit yellowish brown ; tail with large, black spots, and the lobes pale-tipped ; trunk with black spots passing into blotches anteriorly and superiorly ; a dark line from the eye and another from the preoperculum across the operculum ; a row of spots along the middle of the soft dorsal.

Long. 9."

South Australia.

PLATYCEPHALUS SEMERMIS.

D1. 7/12. A. 11. L. lat. 50.

Head one-third of the total length, its breadth two-fifths of its length ; orbit two and-half, interorbit four times in the length of the snout ; snout two and three-fourths in the head ; head unarmed, with low irregular ridges, the superciliary forming a hook before the orbit ; a short spine at the upper angle of the operculum ; two preopercular spines sub-equal in length, the lower much the broader at the base. Brown above (in spirits) white beneath, the colors defined by a marbled line ; a broad black bar across the head ; anal white spotted with brown ; the other fins yellowish brown spotted with blackish brown.

Long. 5."

South Australia.

POLYNEMUS SPECULARIS.

D. 7, 1/15-16. A. 3/17-18. L. lat. 56.

Height of body equal to the length of the caudal lobes, and one-fourth to four-seventeenth of total length ; head one-fourth to one-fifth of same ; orbit three and a-half in the head, snout one-half of the orbit. Seven pectoral filaments, the upper one not quite or as long as the pectoral, and reaching the anus ; orbit covered by a thick semi-opaque membrane. Lateral line with a short arch beneath the posterior third of the soft dorsal ; preoperculum entire on lower limb, with some serrations at the angle and a notch above it ; soft dorsal fin sub-falcate. Colour (recent)

golden on postabdomen, back and head ; silvery pink on abdomen, the two colours being sharply defined ; anal and caudal fins greenish yellow ; middle or whole of the pectoral densely speckled with black, of spinous dorsal less or not at all so.

Long. 9—12."

*Loc.*—Brisbane River.

## FAM. AMBLYOPINA.

### LEME. NEW GENUS.

Body elongate, compressed ; head large, oblong, quadrilateral ; cleft of the mouth directed upwards ; lower jaw prominent ; eyes nearly hidden ; chin with barbels ; teeth strong, protruding on the edge of the jaws ; one long dorsal fin almost continuous with caudal and anal ; all the fin rays simple, flexible ; anterior dorsal rays not separate, ventrals of one spine and five rays united into a disk, thoracic ; pectorals short. Branchiostegals four. Scales rudimentary.

### L. MORDAX.

Fin formula doubtful, the investing membrane preventing satisfactory enumeration. Height one-seventeenth, head one-eighteenth of the total length ; ventral fin two-thirds of the head ; pectoral one-fourth of the same. Dentition  $\frac{6}{8}$  strong canines in front—two or three small ones on each side above—a small one alternately with the large ones below ; behind the upper and lower canines, a band of viliform teeth ; teeth on the palate, none on the vomer ; six barbels in two converging rows on the chin, with one intermediate near the angle, all small. The dorsal and anal fins are separated from the caudal by a slight notch. There are rudimentary embedded scales on the hinder part of the trunk and on half of the caudal. Ventral disk pointed, and placed on a stout pedicle. The dorsal arises between the operculum and the anal papilla. Caudal moderate, pointed. Color in spirits, uniform yellowish brown.

Long. 12."

*Loc.*—Murray River, Queensland.

## SPHYRÆNA STRENUA.

D. 5, 1/9. A. 1/9. L. lat. 82 (?).

Height nine and a-half in the length, s.c. ; head more than one-fourth of the length ; orbit and interorbital space one-fifth of the head, snout (from upper lip) half. Maxillary reaches a little beyond the vertical from the nostril. Mandible without appendage. The origin of the spinous dorsal is over the tip of the pectoral and middle of the ventral. Soft dorsal midway between the spinous and the caudal—the space between the two dorsals is seven and three-fourths in the total length. The anal commences below the anterior third of the soft dorsal. Body silvery, head golden. Scales very deciduous.

Long. 10."

Loc.—Moreton Bay.

## TROCHOCOPUS SANGUINOLENTUS.

D. 12/10. A. 3/12. L. lat. 33. L. transv. 7/11.

Height three and one-third ; head three and two-thirds in the total length ; snout two and a-half in the head ; pectoral more than two-thirds of the head. Scales of cheeks in six series below the eye, caudal fin rounded medially with elongated outer rays ; soft dorsal and anal pointed ; anterior canines 4 laterals small, enlarging posteriorly, forming the outer row of a broad band of tubercular molars, which is not continued distinctly across the symphysis ; posterior canine small. Color (recent), crimson ; on head, opercles and base of pectoral, numerous, guttated spots of yellow ; eight anterior dorsal spines and webs jet black ; scales of posterior part of trunk with a faint blue median streak.

Long 16."

Loc. Hutchinson Shoal, Cape Moreton, in deep water.

## LABRICHTHYS DUX.

L. lat. 25. L. transv. 3/9.

Height one-third of the length, s.c., head two-sevenths of same ; snout two and three-fourth, orbit five, interorbit four, in the length of the head, Aposterior canine ; a large, flanked by a smaller canine

in each jaw on each side, Four series of scales below the eye, two behind it, the front one large; scales of opercle large; Tubules of lateral line dichotomously branched on the loins, simple posteriorly; lower profile more convex than the upper. Colour (recent), reddish olive, with several indefinite dark cross bars. On the trunk a number of rather more distinct longitudinal bands, the median three radiating from the orbit; cheek and lips reddish orange; dorsal fin crimson, a deep blue spot between the second and third spines; pectoral pink, a small deep blue spot above the axilla.

Long. 7."

Loc. Moreton Bay.

PLAGUSIA NOTATA.

D. + C. + A. 190. V. 4.

Height less than three and a-half in the total length; head four and one-fourth in the same. Rostral reaching somewhat behind the lower eye. Nostril in a papilla about one-eighth of an inch long. Three lateral lines on the left side, communicating with each other by vertical ones upon the head and operculum. Dorsal fin commencing nearly on a level with the upper eye; on the left side a long veined papilla with an orifice (nasal?) near its base. Color (recent) dark brown, becoming ruddy in front of the eyes. The ground color is broken up by black lines enclosing pale angular spots, whereof congeries of four or five of larger size are scattered over the body pretty closely, their interspaces being filled with the smaller ones. Fins with short vermiculate lines and small spots of white. Left side, uniform white.

Long. 11."

Loc.—Moreton Bay.

SYNAPTURA CINEREA.

D. 57. C. 14. A. 39. V. 4. P. 4.

Height one-half, and head one sixteenth of the total length Pectoral (right) one-half, snout one-third, and interorbit one-sixth of the length of the head. Ventrals continuous with, but somewhat removed from the anal. Dorsal and anal in similar confluence with the caudal, the connecting webs notched. No ocular tentacles. Barbels fringing lips and surrounding nasal tube, which is not



prolonged. Left pectoral shorter and much weaker than the right. Upper eye in advance of lower. Scales edged with 10 (circa) spikelets. Color (recent) grey, blotched with black, black vertical bars at regular intervals on the dorsal and anal; left side white, with a purple blush, orange spots, and the fins orange.

Long.

*Loc.*—Moreton Bay.

#### CROSSORHINUS.

Under the common name of "Tiger Shark," two fish commonly associated in habitat, seem to be considered by Queensland fishermen as varieties of one and the same. One of these is certainly *Crossorhinus barbatus*, and the other does not appear to have been as yet discriminated by ichthyology. It is in the style of colouring, a matter too much neglected in describing these sharks, allied to *C. tentaculatus*. Pet., but differs from that species as characterised by possessing the tentacular fringe of *barbatus*. It is a much smaller fish than *barbatus*, never apparently exceeding three feet in length, whereas six, ten, and twelve feet are attained by the latter.

#### C. ORNATUS.

Tentacles as in *C. barbatus*. Distance between the dorsals less than the length of either. No supraciliary tubercles; fifth gill opening nearly twice as long as the fourth. Color yellowish, with broad dark cross bands, the hinder ones encircling the tail. The two dorsal bands have deeply fretted edges, and enclose pairs of ocelli. On the snout, a pair of dendritic brown markings. On the occiput, a symmetrical brown pattern, and between each of the caudal zones is a black spot.

*Loc.*—Moreton Bay, &c. \_\_\_\_\_

#### OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE NEIGHBOURHOOD OF SYDNEY. No. 4.

BY E. HAVILAND.

I suppose there are few persons, who, having rambled about the coast in the neighbourhood of Sydney, have not become acquainted with a shrub or small tree, ranging from two to six or eight feet

high ; and bearing a profusion of white flowers, which, at a distance have the appearance of almond or apple blossoms. It is the large variety of *Leptospermum flavescens*. The genus *Leptospermum* belongs to Myrtacea ; perhaps our most valuable order. Dr. Woolls has enumerated eight species indigenous in the County of Cumberland ; but the genus extends from Victoria and Tasmania on the south to Port Denison on the north. In the immediate neighbourhood of Sydney, however, I have most frequently met with *L. flavescens* and its numerous varieties, and *L. attenuatum*. The former seeking comparatively dry and stony localities, while the latter rejoices in the margins of creeks, with its roots almost in water. Like the *Lobelias*, the species of this genus are exceedingly difficult to identify. Bentham, in referring to this difficulty, says, "The whole of those with five celled ovaries, different as some of them appear at first sight, pass so gradually, the one into the other, that they might readily be admitted as varieties of one species." Of *L. flavescens*, he adds, that "It is scarcely to be distinguished from *L. lanigerum*, except by the absence of hairs or down," and that "the extreme forms of either one or the other, are so dissimilar, that it requires the examination of a large number of specimens to believe in their specific identity." My attention was first directed, in a special way, to this genus, by the *apparent* absence in many otherwise perfect flowers, of the style and stigma, especially was this the case in *L. attenuatum*. Knowing that the genus was neither monœcious or diœcious ; I was certainly astonished to find many flowers with stamens only, until, after a more careful examination, I found that in several the style and stigma had, from some cause, withered as soon as formed, and appeared only as a small black spec (as though scorched) on the top of the ovary. In other flowers, although the stamens and anthers were fully formed ; the stigma, still healthy, was but a mere speck sessile on the ovary. The stamens, of which there are about thirty in each flower in this genus, being so curved inwards, that the anthers were immediately over the stigma. In other flowers, I found the style and stigma in so many different stages, and the relative positions of the stamens and pistils so different as they

progressed in their growth, and yet these differences so uniform, that I felt satisfied that some special purpose was to be effected by them. Taking therefore the larger species, *L. flavescens*, I have examined very carefully, and without removing them from the plants, a great number of flowers; taking notes in almost every instance for comparison with each other. I have also examined a great many flowers at home microscopically; perhaps therefore I cannot do better than to read two or three of these notes. I have selected those that will best shew the progressive stages through which the organs of fertilisation of the plant pass. As in these notes I make use of the word, cup, I may explain, that in this genus, the calyx-tube is adnate with the ovary, but rising somewhat above it, while the top of the ovary is itself a little depressed, a hollow cone or cup is formed; round the edges of which, but on the margin of the disk, the stamens are arranged, with the style rising from the depression in its centre. I may also say, that the whole of my notes could be arranged in groups similar to that I now read.

Note No. 1.—Stamens all perfect and bent over the stigma, Anthers not yet open. Stigma scarcely formed; being a mere speck sessile upon the ovary.

No. 2.—Stamens perfect. Anthers fully developed and apparently ready to open; all bent over the stigma. Style scarcely a quarter of a line high. Stigma very small, not the tenth of a line wide.

No. 3.—Stamens perfect; bent over the stigma. Anthers seem almost bursting. Style half a line high. Stigma wider than in number two, but far from maturity.

No. 4.—Stamens all perfect, but much more erect than in number three. Anthers open, but retaining their pollen. Style a line high. Stigma still small; but becoming somewhat peltate.

No. 5,—Stamens perfect; all erect but five, which are still bent over the stigma. The anthers of the erect stamens open; those of the bent ones still closed. Style one and a-half lines high. Stigma broad and peltate, but not mature. Some loose pollen in the cup, round the base of the style.

No. 6.—The stamens perfect ; all quite erect but three, most of those erect, open. The three stamens not erect, are bent down inside the cup, so that the anthers are below the stigma. The anthers of these are also open, and there is a considerable amount of pollen in the cup ; but none on the stigma. Style two lines high. Stigma broad and peltate, but not mature.

No. 7.—Stamens all reflexed but two, *i.e.*, bent outwardly from the flower ; and many of the anthers empty ; those not reflexed are so bent down that the anthers are below the stigma. Style exceeding two lines high. Stigma mature and viscid. No pollen either in cup or on the stigma.

No. 8.—Stamens all reflexed, most of them withered ; those still perfect have the anthers quite open, and exposing the ripe pollen. None of this pollen can possibly fall on the stigma. Still there is pollen upon the stigma, which is large, mature and very viscid.

No. 9.—Stamens all reflexed, most of them spreading out across the petals and away from the centre of the flower ; many of them withered. Anthers all empty but one. Style three lines high. Stigma broadly peltate and very viscid. Some pollen in the cup, and a few grains on the stigma.

In addition to these, I found, after carefully searching another plant, three flowers which I considered required careful watching. In one of them, five of the stamens with fully ripe pollen, were bent so directly over the stigma, which was also near maturity, as to lead me to expect a case of self-fertilization. In another flower one stamen was left, not only not reflexed ; but with the anther burst and pressing upon the fully mature and viscid stigma. In a third flower, seven of the stamens, with the anthers fully mature, but not open, impended directly over the stigma, which was mature and viscid. These three flowers I marked A, B and C, by my usual plan of attaching very small tin labels to them. In A, having five stamens, with the anthers fully mature, bent over the nearly mature stigma ; I found, on the second day, that two of the stamens had become reflexed ; and were hanging with others over the outside of the flower. The remaining three were bent down inside the flower, so that the anthers were below the stigma and

could not fertilize it. B was in much the same state as on the preceding day; the single stamen, with its open anther, still pressing on the stigma. C, in which the seven stamens impended over the mature stigma, had the whole of these stamens reflexed, but the anthers still closed. B, therefore was the only one requiring further attention. Three days afterwards, I re-examined this flower and found the filament of the stamen withered; the stigma mature and bearing pollen from the anther of its own flower. This pollen could not easily be brushed off. A proof, I think, that some of the pollen tubes had already penetrated the stigma. I took this flower home, and with a microscope power of 300 diameters, could distinctly trace the pollen tubes for some little distance, but could not follow them into the ovary; still there can be no doubt, that if I had left this flower on the plant, it would have been self-fertilized. I have also, as I have already mentioned, found in some cases, pollen in the bottom of the cup, at the base of style; showing that occasionally the anthers shed their pollen after the stamens have become erect, but before they are reflexed; and as I have sometimes found very small apterous insects also in the cup amongst this pollen, and loaded with it; I have no doubt that it is occasionally conveyed by them to the stigma of the same flower. I may say that although what I have written refers more especially to *L. flavescens* and *L. attenuatum*, yet, from what I have seen of the other species, I think it will equally apply to the whole genus

The impression made upon my mind, with regard to this genus, is, that, as a rule, the plant must be cross-fertilised. This cross-fertilisation being brought about by two means. First, by the difference in the times of maturing of the anthers and the stigma, and secondly, by the change in their relative positions. For I think that these notes show, that even after the stamens and anthers are perfectly formed, the stigma is very far from maturity, often indeed but a mere speck upon the ovary. That as the style lengthens and the stigma takes its proper hollow-peltate form, and becomes mature and viscid; so the anthers avoid it by the stamens becoming first erect and then reflexed or bent quite away from it.

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Nevertheless, as occasionally one or two of the stamens fail to leave their first position, remaining still over the stigma till both it and the anthers are mature ; and especially as this flower seems to be the favourite resort of the insects I have alluded to, and which may carry pollen from the cup to the stigma ; I have no doubt that self-fertilisation occasionally takes place.

In concluding this paper, I should like to add a word of caution, for the benefit of young botanists who may perchance read it ; and who may feel inclined to study this matter of fertilization. Neither in this or in any other question of physiological or structural botany, should undue reliance be placed on the examination of cultivated plants ; and even in the case of collected wild flowers, great care is necessary to avoid being misled. Most plants are more or less altered by cultivation. Petals are gained by the sacrifice of stamens ; and varieties are produced, which in a great measure destroy typical specific forms. I need only refer to the vast difference between the wild and the garden rose. The first with its five petals and numerous stamens ; the second with its numerous petals and, if the gardener can help it, no stamens. With regard to collected wild flowers ; of course they must be collected for microscopic or home study ; but it will very often be found that those whose stamens assume any one position relatively to the stigma while on the plant, have that position quite changed, by the drying and contortion of the filaments very soon after they are collected. It is on that account that I have been careful to study the *Leptospermums in situ*. To arrive at a correct conclusion of any matter touching the physiology and habits of plants, they must be studied in their own homes.

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LOCALITIES OF SOME SPECIES OF RECENT POLYNESIAN MOLLUSCA

BY J. BRAZIER, C.M.Z.S., &c.

1. PIRENOPSIS COSTATA.

*Melania costata*, Quoy and Gaimard (non Reeve), Voy. de l'Astr. Zool. Vol. 3, p. 155, pl. 56, fig. 34-37. *Melasma costata*, H. & A. Adams, Recent Mollusca, Vol. 2, p. 302. Chenu.

Manuel de Conch, Vol. I., p. 292, fig. 2,000. *Melania costata*, Brot. Matériaux la Famille des Melaniens I., p. 47, 1862. *Pirena Lamarei*, Brot. Mater. III., p. 52, pl. 2, fig. 1-2. *Pirenopsis costata*, Brot. in Conch. Cab. Küster's edition, p. 408, pl. 44, fig. 2 and 2 A.E., 1874.

*Hab.* Vanikoro. (*Quoy*), Vate or Sandwich Island, New Hebrides. (*Young and King*.)

Some few weeks ago I received from Mr. E. L. Layard, British Consul at Noumea, New Caledonia, a number of shells for identification. In the lot I observed one typical specimen of the *Melania costata* Quoy and G., and two specimens of the shell described and figured by Dr. A. Brot in his Matériaux pour servir a l'étude de la famille des Mélaniens III., p. 52, pl. 2, fig. 1-2, as *Pirena Lamarie*. I quite agree with Dr. Brot that his species is only a mere variety of *costata*, Quoy. One of Mr. Layard's specimens has sharp spiny nodules on the centre of the last whorl the other specimen is in a much younger state, and gives the shell the aspect of a *Scalaria* with rather bold longitudinal ribs; the last whorl has ten ribs sharply spined, spirally ridged below. Vanikoro is in about 11° 40' S. Lat. Vate or Sandwich 17° 50' S. Lat.

## 2. MELANIA ACANTHICA.

*Melania acanthica*, Lea. Pro. Zool. Soc. p. 194, 1850. Hanley Conchological Miscellany, pl. 1, fig. 8.

*Tiara acanthica*, H. & A. Ad. recent Mollusca, Vol. 1, p. 295.

*Melania spinulosa*, Reeve (non Lam.), Conch. Icon. Vol. XII., pl. 22, fig. 156, A.B., *pugilis*, Reeve (non Hinds), B.C. pl. 26, f. 180,

*Hab.* San Christoval, Florida, Ysabel, Solomon Islands, (*Brazier*), Vate or Sandwich Island, New Hebrides. (*Young and King*.)

This species is not very common on Vate. The few that I have seen from Mr. Layard are thickly incrustated with oxide of iron; it is soon removed with the point of a penknife. In the Solomon's I secured specimens quite free from oxide. Messrs. Young and King also found *Melania tuberculata*, Muller, an almost universal species, enjoying about fifteen other specific names. *Melania*

*Arthuri*, Brot was also found, a species also common to New Caledonia and the Loyalty Islands. It is the *M. speciosa*, Morelet *M. Moreleti*, Reeve. The species of Neritinae also found, were *N. variegata*, Less. *N. Souleyetana*, Recluz. *N. corona*, Linn. *N. crepidularia* Lam. *N. Roisyana*, Recluz, this is also the *cuprina*, Recluz. *chrysocolla*, Gould and *Navigataria*, Reeve.

*Pythia Argenville*, Pf. It is very common in Fitzroy Island on the north-east Coast of Australia.

Reeve in his Monograph of the Melanidae is very confusing with some of the species.

Of the species figured on plate XXIII., fig. 164, A.B.C., as *Melania lateritia*, Lea. only B. and C. are *lateritia*, Lea. 164, A. is *Melania granifera*, Lam. figure 165 A. B., on the same plate Reeve considers to be only *lateritia*, Lea. but it is *Melania spectabilis*, Brot. figured in Küster second ed. of Chem. Conch. Cab. Evidently Reeve's figure 166 is another species; or else a variety of *M. spectabilis*, Brot.

The *Melania* figured by Reeve on plate VI., fig. 28-29 as *M. costata*, Quoy is *M. hastula* Lea. from the Philippine and Fiji Islands.

On plate XXVII., fig. 186 A. B., are *Melania setosa*, Swainson I found specimens of it at Wanga Creek, San Christoval, Solomon Islands, figure 185 A. B. On the same plate are *Melania setigera*, Brot. Cat. of recent species of *Melania*, p. 300. Reeve makes it a variety of Swainson's species, but they are totally distinct in character. It is found in the Philippine Islands.

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NOTES AND EXHIBITS.

Baron Maclay exhibited some beautifully preserved specimens of very delicate forms of marine life, such as *Oceania pileata*, *Salpa democratica*, *Acyonium palmatum*, &c., &c. These were prepared at the Naples Biological Station, under the direction of Dr. Dohrn



and may be obtained there at a reasonable cost, for study or illustration. Even large specimens of *Rhizostoma* are perfectly and permanently preserved by this process. Baron Maclay also gave an account of various large animal preparations which had been preserved in the Berlin Museum by the Wickersheimer fluid, pointing out that the failures which had attended its use here, were due to too protracted immersion in the fluid. The objects, when once well penetrated by the solution, should be withdrawn and kept in a dry state.

Mr. Whitelegge exhibited a decayed leaf of some aquatic plant covered with a thick growth of *Plumatella repens*. Also a specimen of fresh water sponge, undetermined. Both from a waterhole in Moore Park.

Mr. Trebeck showed the claw of a very large crab, *Pseudocarcinus gigas*, which had been washed ashore in Lane Cove. This species is of common occurrence in Bass' Straits, but is seldom found much to the northward of that district.

Professor Stephens exhibited for the Rev. J. M. Curran, some good specimens of *Sphenopteris*, *Alethopteris* and *Merianopteris*, as described by the Rev. J. E. Tenison-Woods in his paper, vol. viii., pt. 1. Also of *Thinfeldia odontopteroides*, and a photograph of the male amentum of *Walchia Milneana*, all from Ballinore near Dubbo. Also a quantity of *Coccus* infesting a species of *Casuarina* from near Warren.

Professor Stephens exhibited, for Mr. J. Anderson, of Newstead, near Inverell, several specimens of Leaves and fresh-water Molluscs (*Unio*). They were clearly tertiary, were, though much fractured by the pick, excellently preserved, and probably all capable of identification. The matrix was hardened mud, the detritus of basaltic rock mixed with much vegetable debris, and dotted with numerous little spheres of pisolitic iron ore. The pool in which this mud was deposited must have been of very still water, and may probably have been formed by a lava stream damming some small rivulet.

Dr. Schuette showed a plaster cast of an impression which Mr. De Vis had previously exhibited. This cast was therefore a model of the original fossil, and was regarded by Baron Maclay, as consisting of the Occipital and Parietal bones of a gigantic Wombat, seen from within.

Mr. Deane exhibited a portion of sandstone penetrated by a number of burrows, formed in all probability by some Hymenopterous insect.







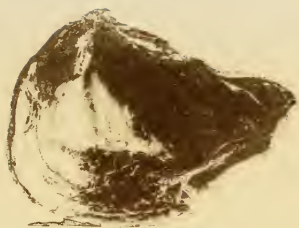


FIG. 1.

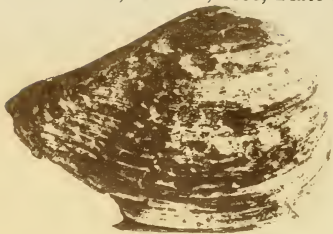


FIG. 2.

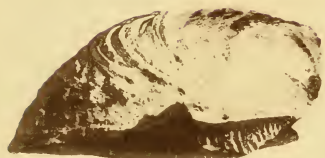


FIG. 3.

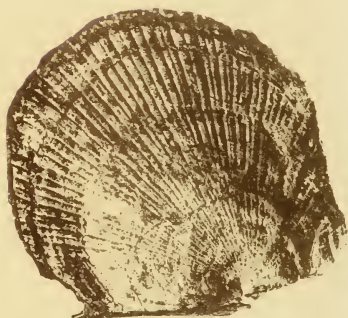


FIG. 5.



FIG. 4.



FIG. 6.

Fig. 1. *Trigonía mesembria*.

Fig. 2. Do. do. upper surface.

Fig. 3. Do. do. anterior end.

Fig. 4. *Aricula barklyi*.

Fig. 5. Do. do. showing ribs.

Fig. 6. Fragment showing ribs.





FIG. 1.



FIG. 3.



FIG. 2.

- Fig. 1. *Belemnites australis*, Phill ventral aspect.  
Fig. 2. Do. do. lateral aspect, showing lateral groove.  
Fig. 3. End view, with alveolar cavity





WEDNESDAY, JULY 25TH, 1883.

Professor W. J. Stephens, M.A., in the chair.

DONATIONS.

“Transactions and Proceedings of the Royal Society of Victoria.” Vol. XIV., 8vo, 1883. From the Society.

“Science,” American illustrated Journal, Vol. I., No. 14, May 11th, 1883. From the Editor.

“Journal of the Royal Microscopical Society of London.” April, 1883. From the Society.

“Bulletin of the American Museum of Natural History,” New York. Vol. I., No. 4, May, 1883; and also the Fourteenth Annual Report of the Museum for the year 1882. From the Museum.

“Bulletin de la Société de Géographie d'Anvers” Tome VII., 7me., Fasc. 1883. From the Society.

“Eleventh Annual Report of the Zoological Society of Philadelphia, for the year 1882.” From the Society.

“Bulletin de la Société Zoologique de France.” Tome VII., 5e Partie. 1882.

Pamphlet on “The Foraminifera of Victoria.” By H. Watts, Esq. From the author.

Pamphlet on the “Proteaceæ of the Victorian Alps.” By James Stirling, Esq. From the author.

A number of Copies of the “Proceedings of the Linnean Society of New South Wales.” From Thomas Robertson, Esq.

Thirteen papers, seven on New Zealand Botany, and six on New Zealand Crustacea. By George M. Thomson, Esq., F.L.S. From the author.

“Jahreshefte des Vereins für vaterlandische Naturkunde in Württemberg.” Volume for 1883.

“Bulletin de la Société Impériale des Naturalistes de Moscou.” Tome LVIII., No. 2, 1 and 2 Livraisons. From the Society.

“Mittheilungen aus der Zoologischen Station zu Neapel.” Vierter (iv.) Band, II Heft, 1883. From the Director.

“Report of the Progress and Condition of the Botanic Garden and Government Plantations, Adelaide, during the year 1882.” From the Director.

“Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien.” Austria. XXXII Band, Jahrgang 1882. From the Society.

“Bulletin of the Museum of Comparative Zoology at Harvard College.” Vol. X., Nos. 5 and 6, 1883, From the Museum.

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PAPERS READ.

MYOLOGY OF CHLAMYDOSAURUS KINGII.

BY CHARLES W. DE VIS, B.A.

[PLATES XIV.-XVI.]

The present study, if it may be so-called, of the muscles of the Frilled Lizard was suggested long ago by an incident in the Queensland bush. On one of the two occasions on which I have seen the lizard adopt its biped mode of locomotion, trotting out briskly on its hind legs, its fore-paws hanging down affectedly and its vertebral line to the very snout stiffened at an angle of 60°, I was much interested to see it halt abruptly, erect its frill, and at the same moment turn its head enquiringly from side to side—then trot on again for twenty yards or so, and repeat its attitude of attention—thus it did, till it reached the tree it was making for, then darting a few feet up its bole it clung there immovable for more hours than my leisure could afford for

observation. The listening attitude assumed by the pedestrian reptile, if the phrase may be excused, was so real, or at least so realistic, that it at once occurred to me that one function of the hood might be that of conducting sound to the tympanum, an office apparently aided by the channels formed by its converging folds, and that if it were so it might be furnished with special muscles. After this point had been investigated it was a facilis descensus to the nether extremities, where nature might be asked if she had made any peculiar muscular provision for erect carriage; and when this question had been put so few of the creatures muscles remained intact, that it seemed well to examine the rest and render an account of the whole myology of a lizard, which is really inferior to few in interest. I do not propose to lengthen the following descriptions with references to the muscles of whatever lizards may have been previously examined, but to form them as tersely as possible. At some future time an opportunity may be taken of comparing the myology of some other of our Australian lacertians, not only with that of the subject of the present observations, but with that of all the extraneous lizards which have been monographed or otherwise noticed.

#### MUSCLES OF THE UNDER SURFACE OF THE HEAD.

*Mylohyoid* (Plate XIV., fig. 1—m. h.)—At its commencement very near the symphysis menti it is thick and attached to the lower edge of the mandible, its fibres passing transversely from each side to a median raphe; as it recedes from the symphysis it becomes gradually thinner, its insertion rises higher on the inner surface of the jaw, and the course of its fibres is more and more oblique till it merges into the

*Platysma myoides* (fig. 1—p. m.) which sends attenuated fibres and slips to the gular region of the hood, and is lost dorsad in the fascia covering the trapezius, but acquires thickness over the sternum and cervix.

*Thyromandibularis* (fig. 1—t. m.)—Two distinct muscles may bear this name, an externus and an internus. The latter rises by two slips from about the middle of the inner surface of the mandible

and is inserted into the middle of the inner side of the thyrohyal. The greatly elongated thyrohyal passes between the two layers of integument constituting the hood, at its middle fold, and so forms a "yard" to which the lower half of the hood is bent. This inner division of the Thyromandibularis being an adductor of the bone, is the chief agent in lowering the hood and bracing its lower moiety to the side of the neck—it is antagonised by the greater part of the outer division which rises fleshy immediately behind the inner one, but nearly on the lower edge of the jaw, the origin of the mylohyoideus being between them. It immediately divides into two superposed fascicles, the deeper one being inserted into the lower surface of the thyrohyal a little behind the insertion of the inner division—the other sub-division is inserted posteriorly to the former one into the outer side of the bone for the rest of its length, and acting thus advantageously is an efficient erector of the lower part of the hood.

*Geniohyoideus* (fig. 1—g. h.)—Partly concealed by the preceding rises as a fleshy cone from the symphysis, and expanding as it recedes, is inserted into the inner side of the base of the thyrohyal.

*Ceratomandibular* (fig. 1—c. m.)—Rises by a double headed origin from the inner side of the mandible below the thyromandibularis—and is inserted into the whole of the outer side of the cerato-hyal to its extremity.

*Glossohyoideus*.—From the mandible, between the symphysis and the insertion of the thyromandibularis—from the median raphe—the outer edge of the under surface of the tongue, the side of the basi-hyal and strongly from the hinder end of the base of the tongue—inserted into the outer side of the proximal portion of the thyrohyal as far backward as the insertion of the outer division of the thyromandibularis—a powerful divaricator of the thyrohyals and consequent erector of the hood.

*Hyobranchialis* (fig. 1, h. b.)—From the hinder edge of the arm of the ceratohyal to the whole of the inner edge of the thyrohyal beneath the glossohyoideus—the deepest of the muscles concerned in the erection of the frill.

## MUSCLES OF THE UPPER SURFACE OF THE HEAD.

*Digastric* (fig. 2-d.)—In two very distinct and subequal bodies. The external from the edge and posterior sloping surface of the postfrontal:—passing the fibro-cartilaginous root of Grey's cartilage of the hood its outer fibres have a strong insertion into the hinder part of the root of the cartilage; it is thence continued to form the posterior portion of its joint insertion into the extremity of the inner surface of the long articular process of the mandible. By virtue of its insertion into the cartilage it becomes the chief erector of the upper half of the hood. The internal body rises from the parietal process, and converging to the external near their joint insertion forms the posterior half of that insertion.

*Attollens chlamydis* (fig. 2—atc.).—A thin triangular muscle rising from the posterior half of the edge of the postfrontal external to the digastric and inserted into the fore part of the lower angle of Grey's cartilage.

*Adductor chlamydis* (fig. 2—a. c.).—A very distinct band rising over the occipital condyle from the ligamentum nuchæ and fascia of the complexus major in apposition to its fellow of the opposite side; running outward and downward within a conspicuous fold of the integument of the hood it reaches Grey's cartilage, and is inserted into it at about the middle of its lower side. Its function seems to be to draw the erect hood downward and inward upon the neck.

*Pterygoideus externus*.—From the sloping posterior external surface, rotular anterior edge and adjacent inner surface of the articular process;—inserted mainly by strong tendon into the entopterygoid process, also into the edge of the entopterygoid as far as its exterior process.

*Pterygoideus internus*.—From the posterointernal surface of the articular process nearly to the coronoid process;—inserted into the edge and surface of the entopterygoid.

*Temporalis* (fig. 2 t.)—From the whole fossa—*i.e.*, from the outer side of the tympanic, columella, and parietal process; inserted into the coronoid process and edge of the surangular element.

The preceding three muscles are but moderately developed.

*Zygomaticus* (fig. 2—z.)—A thin but very distinct muscle rises from the curved posterior edge of the malar, and rests upon the anterior portion of the temporalis. It is inserted by two attachments into the outer and inner sides of the commissure of the lips. Its office being clearly to raise the commissure, I venture to recognise it as a *zygomaticus major*, and very unexpected the recognition is.

#### MUSCLES OF THE NECK AND THROAT.

*Complexus major*.—From the spines of the anterior two dorsal and transverse processes of the posterior cervical vertebræ;—inserted as usual into the supraoccipital and parietal process.

*Complexus minor*.—From the transverse processes of the cervical vertebræ; inserted by two equal divisions separable for some distance from their points of attachment into the parotic ridge and into the occipito-parotic process beneath the insertion of the sternocleidomastoids.

*Rectus capitis posticus major*.—Under the circumstances I was rather surprised that no trace of this muscle was discoverable.

*Spinalis colli*.—Lying between the spines and transverse processes of the cervical vertebræ beneath the *complexus major*; inserted beneath the *complexi* into the supraoccipital and parietal.

*Sterno(cleido)mastoideus* (fig. 1—s. c. m.).—A very narrow ribbon running obliquely from the foremost point of the true sternum to its insertion into the occipito-mastoid process.

*Omohyoid* (fig. 1—o. h.).—A powerful muscle rising from the middle third of the anterior edge of the clavicle; also by a narrow slip from the sternum below (ventrad of) the preceding, and joining the main body at about the middle of its length. Its insertion is into the proximal third of the lower edge of the inner side of the thyrohyal.

*Sternohyoid* (fig. 1—s. h.).—Has a bulky origin from the sternum immediately superposed by the omohyoid, and from the strong fascia investing the pectoralis major. It expands and thins away as it proceeds to the inner side of the thyrohyal beneath the

omohyoid. Its anterior fibres are inserted near the lower edge, its posterior ones gradually ascend towards the upper edge of the bone.

*Rectus capitis anticus major.*—Rises by tendon from the basioccipital process; also from the hinder edge of the lower surface of the bone;—inserted into the upper part of the under surface of the third and fourth ribs, and sides of the bodies of the posterior cervical vertebræ.

*Longus colli.*—From the ventral surfaces of the atlas and axis and posterior cervical vertebræ; inserted into the summit of the first and second ribs, and thence continued to be inserted with the rectus anticus.

*Scalenus.*—Unusually small; rising from the transverse process of the fifth cervical vertebra it is inserted into the fore edge of the first (cervical) rib.

*Cervicalis ascendens.*—An indefinable continuation of the sacrolumbalis. It may be said to be inserted into the three anterior ribs, the three posterior cervical vertebræ and rather strongly into the deep surface of the levator scapulæ near its origin.

#### MUSCLES OF THE SHOULDER—GIRDLE AND FORE LIMB.

*Pectoralis major* (fig. 3—p. m.).—From the last sternal rib, and the middle line of the sternum to the base of the clavicle, but not from the interclavicle; inserted into the summit of the radial tuberosity of the humerus.

*Pectoralis minor.*—Not represented.

*Trapezius.*—Rises by a thin, strong aponeurosis from the eighth rib; anteriorly its aponeurosis becomes continuous with the nuchal fascia. Inserted by a broad tendon into the outer side of the edge of the anterior angle of the scapula.

*Deltoid* (fig. 3—d.).—In two divisions. The first from the base of the suprascapula and summit of the scapula, and from the ligamentous septiment between it and the latissimus dorsi over the subscapularis. The second from the whole posterior edge of the clavicle. The common insertion is into the outer side of the summit of the radial tuberosity of the humerus.

*Epicoracohumeralis*.—From the bifurcation of the epicoracoid from the fenestra, and from the adjacent edge of the coracohumeral;—inserted into the apex of the radial tuberosity between the deltoid and pectoralis major.

*Infraspinatus*.—From the spinous process of the scapula: by a distinct slip from the upper spur of the epicoracoid and from the membrane between them—the combined body also derives origin, but rather scantily, from the subjacent bone nearly to the glenoid cavity. Passing between the two long heads of the triceps and its external humeral origin, and beneath the ligamentous strap connecting the second long head of the triceps with the head of the humerus, it is inserted between the humeral heads of the triceps.

*Triceps* (Plate XIV., fig. 3, and Plate XV., fig. 4—t.)—1st. External long head, from the posterior edge of the base of the scapula (fig. 4—T. 1.)

2nd. Internal long head, on the left side rises from the same spot ventrad of the external: on the right side rises from the articular ligament. This head receives a long slender tendon from the ligamentous arch beneath the subscapularis. (fig 4—T. 2.)

3rd. External humeral, from the whole posterolateral surface of the humerus;—externally communicating with the

4th. Internal humeral, from the internal surface of the humerus as far as the head.

The common insertion is into the patelloid ossicle and summit of the ulna.

*Brachialis anticus* (fig. 3 & 4—b. a.)—From beneath the radial tuberosity and downwards;—at less than two-thirds of the length of the bone it blends indissolubly with the biceps.

*Biceps* (Plate XIV., fig. 3, and Plate XV., fig. 4—b.)—1st. Head rises—by a broad tendon (without any interruption) from the anterior sternal margin of the coracoid.

2nd. Head—rises by a fleshy belly from the lower epicoracoid spur and edge of the fenestra;—at about half its independent course this belly becomes a tendon, and again becomes fleshy before joining the first head. Inserted in common with the *Brachialis anticus* into which it quickly merges.



*Coraco brachialis*.—*C. brevis*.—The short portion rises from the lower two-thirds of the posterior surface of the epicoracoid, and from the internal surface of the head of the humerus ;— it is inserted into the proximal half of the fore edge of the humerus. *C. longus*. The long portion rises from the lower (sternal) edge of the common origin, and is inserted into the inner condyle.

*Levator scapulae*.—From the aponeurosis covering the side of the neck, and from the pleurapophyses of the atlas and three succeeding vertebræ. It expands as it passes backwards to its insertion, which is separable into two parts, a lower or ventral one beneath the upper part of the origin of the sternohyoid, and a dorsal one into the upper interior angle of the suprascapula and the edge of the scapula. The two portions may be separated for some distance ere they join.

*Latissimus dorsi*.—From the fourth, fifth, and sixth dorsal vertebræ, and thence to the last true rib ;—inserted into the short ridge on the posterior external surface of the humerus below the head,

*Costocoracoid*.—A very feeble muscle from the anterior edge of the first sternal rib ;—inserted into the sternocoracoid ligament going from the posterior upper of the sternum to the bottom of the epicoracoidal fork.

*Sternocostalis*.—A thin sheet from the same point of the sternum to the anterior edge of the third sternal rib.

*Serratus*.—1st. From the distal moiety of the fourth and fifth sternal ribs and posterior edge of the third, along which it exchanges fibres with the second portion beneath ; inserted into upper part of the hinder edge of the scapula, extending a little around the upper angle.

2nd. From the lower end of the third vertebral rib beneath the first portion ; inserted into the middle of the hinder margin of the scapula below the first portion,

3rd. Small, from the back of the upper part of the third rib ; inserted into the lower surface of the hinder upper angle of the suprascapula.

4th. Much larger, from the upper part of the second and first rib; inserted into the upper half of the under surface of the suprascapula.

*Subscapularis*.—From the whole deep surface of the scapula, coracoid and epicoracoid; inserted into the ulnar tuberosity of the humerus.

*Coracohumeralis*.—(=External sterno-coracoid of Mivart, P.Z.S. 1867-779). From the whole deep surface of the coracoid and epicoracoid; its fibres converging are inserted strongly into the ulnar tuberosity beneath the insertion of the subscapularis.

*Sternocoracoid*.—From the articulations of all the sternal ribs with the sternum;—meeting its fellow of the opposite side at the posterior end of the sternum, but diverging from it anteriorly to be inserted by a long tendon into the deep surface of the lower (posterior) spur of the epicoracoid, passing beneath the edge of the coracohumeralis on the one side, over it on the other.

*Pronator teres*.—Rises by a moderate tendon from the summit of the olecranon; passing over to the supinator longus it becomes confluent with it.

*Supinator longus* (fig. 4—s. 1.).—Rises by a single head from the outer condyle;—inserted into the radial edge of the lower half of the radius

*Pronator brevis*.—From the fore part of the inner condyle; insertion into the second fourth of the radius.

*Supinator brevis*.—From the hinder part of the inner condyle, insertion into the upper third of the ulna.

*Pronator quadratus*.—From the flexor surface of the lower (distal) half of the ulna into the flexor surface of the radius. At its upper end wedged in between the pronator brevis and supinator brevis.

*Flexor sublimis digitorum*.—Has the normal lacertian origin from the annular ligament; its perforated digitations are inserted each into the base of the first phalanx of the digit.

*Flexor carpi ulnaris* (fig. 4—f. u.)—First head tendinous from the olecranon and soon coalescing with the extensor carpi ulnaris. Second or condylar head from the inner condyle forming a round fusiform belly entirely separable from the first. The common insertion is carneotendinous into the ulnar side of the common tendon of the flexor profundus.

*Flexor profundus digitorum* (fig. 3—f. p. d.)—The two condylar heads of this muscle are separable, but with difficulty. They quickly blend with the ulnar head, and in the large tendon common to them is a sesamoid. The fourth or deep head rises fleshy from the carpus, and is inserted into each tendon. The great tendon runs up within the muscle as a rather stiff tongue, reminding one of the semio ossified tendons of birds.

*Extensor carpi ulnaris*.—Rises tendinous from the outer condyle; soon becoming confluent with the olecranal division of the Flex. c. u. is inserted into the pisiform and fifth metacarpal.

*Extensor carpi radialis* (fig. 4—e. r.)—Tendinous from the outer and hinder part of the outer condyle;—besides its three tendons to the second, third, and fourth metatarsals, it sends a fleshy slip to the fascia over the fifth.

*Extensor ossis metacarpi pollicis*.—From the distal third of the ulna;—inserted into the metacarpal of the pollex.

*Extensor proprius pollicis*.—This is a thin band running on the distal edge of the preceding from the ulna across to the pollex, where it forms a tendon which proceeds along its upper surface to the unguis phalanx.

*Extensor communis*.—Feeble; rising from the carpus, forms a muscular pad hardly resolvable into distinct fascicles except at their insertions into the bases of the digits.

*Adductor minimi digiti*.—Distinct though small;—rising by a long tendon from the metacarpal of the pollex;—inserted fleshy into the distal end and radial side of the metacarpal of the fifth digit.

*Interossei*. 1st, *Flexor brevis*.—Large, fanlike ;—rising from the carpus and going in pairs of fascicles to each side of the three middle digits. 2nd. A similar pair of very feeble insertions into the fifth digit. 3rd. *Opponens pollicis*, a single fascicle from the ulnar side of the index to the ulnar side of the pollex. 4th. *Flexor brevis pollicis*—A fascicle with direct course from the carpus to the ulnar side of the pollex.

*Interossei dorsales*.—From the carpus to each side of each digit save the pollex. The fascicle mentioned by Mr. Mivart as inserted into the metacarpal of the pollex appears to be substituted by the extensor proprius pollicis.

#### MUSCLES OF THE PELVIS AND HIND LIMB.

*Sartor-gracilis* (fig. 5—s. g.)—The broad and thin muscle traversing the inner (ventral) side of the lacertian thigh obliquely and superficially, occupying the place and performing the functions of the sartorius and gracilis has been named both the one and the other. In the present subject at least, it seems to me to be a combination of the two and to deserve the compound name. It rises from the ischium, and the arched ligament connecting the ischium with the spine of the pubis. It has no origin from the ischiatic symphysis. Its tendon is inserted into the ridge on the back of the tibial side of the tibia, at the lower end of the internal lateral ligament where it covers the tendon of the semitendinosus whose insertion is in union with it. The sartorius is represented by the upper and major part of the muscle, the gracilis by the inferior fibres which about the middle of their length separate from the rest, and send a slender tendon to be inserted just below that of the chief division, distinct from it, but communicating with it by a minute belly and delicate tendon.

*Semitendinosus* (fig. 5—s. t.)—From the ligament joining the posterior point of the ilium with the tuberosity of the ischium, in close proximity to the origin of the biceps ;—inserted as the deep part of the sartor—gracilis tendon.

*Biceps* (fig. 6—b. f.)—Rises ventrad and contiguously to the last. Behind the knee it forms two tendons. One passes down the inner edge of the gastrocnemius internus with which it is incorporated, the other passes forwards between the heads of the gastrocnemii, and of the tibia and fibula, and is inserted into the front of the tibia immediately below the head.

*Semimembranosus* (fig. 6—s. m.)—Rises a little apart from and ventrad of the biceps, passes behind the tendon of the femoro caudal, and quickly divides into two portions:—

1st. Its tendon passes beneath the internal lateral ligament to be inserted into the summit of the inner side of the tibia.

2nd. Receives the tendon of the tibial adductor, and with it is inserted into the summit of the outer side of the tibia. Along its anterior edge runs the long tendon of the femoro caudal.

*Adductor tibialis* (Plate XVI., fig. 9—s.)—A compressed muscle wedged in between the rectus and adductor magnus;—it rises from the acetabulo—pubic ligament anterior to the origin of the gracilis—it is inserted with the first division of the semimembranosus.

*Adductor magnus* (fig. 9—a.)—Rises from the ischiopubic ligament immediately below the gracilis. It is inserted into the whole length of the posterior surface of the femur flanked distad by the vastus externus and internus;—the inner (femoral) portion of the distal end is separable as a small flat belly.

*Vastus externus* (Plate xv., fig. 6—v. ex.)—Rather large, rises from the proximal third of the femur, and at the middle blends indissolubly with the cruræus.

*Vastus internus* (fig. 5—v. i.)—Much smaller, from the inner side of the humerus at about its middle, and merging below into the extensor mass.

*Ilioperoneal* (fig. 6—i. p.)—Semitendinous from the middle of the inferior border of the ilium, not overlapping the glutæus medius; inserted by strong tendon into the outer side of the head of the femur between the outer head of the gastrocnemius externus and the peronæus primus.

*Rectus femoris* (fig 5—r. f.)—Tendinous from the brim of the acetabulum, passes beneath the origin of the adductor tibialis at the proximal third of its length, is joined by a long slip rising tendinous from the iliopubic spine below the origin of the glutæus maximus, and is inserted into the patella, in common with the cruræus.

*Glutæus maximus* (fig. 5 & 6—g. mx.)—Rising from a thin strong tendinous fascia attached to the ilio-pubic ligament, it is bound down posteriorly by tendinous fibres to the ilioischiatric ligament arching over the passage of the femoro caudal tendon : and fuses with the cruræus midway on its anterior surface, and lower down on its outer lateral side.

*Glutæus medius* (fig. 5—m. a.)—From the inferior outer border of the ilium passing from under the origin of the maximus ;—inserted into the proximal third of the posterior surface of the femur behind the origin of the cruræus.

*Femoro-caudal* (fig. 9—f. c.)—A strong muscular sheet from the lower side of the proximal fourth of the tail ;—inserted by a broad strong tendon into a low ridge or row of tubercles at the outer base of the trochanter : reflexing and rotating the femur. From the lower side of its tendon near insertion, a long slender tendon, sent down the biceps, runs to the interarticular cartilage beneath the poplitæal space, and is there inserted.

*Pyriiformis* (fig. 7—p. f.)—From the lower surface of the first three transverse processes of caudal vertebræ ; inserted into the iliopubic ligament, and thence into the trochanter immediately external to the tendon of the femorocaudal. A minute belly rising from the ischiatic tubercle, and inserted by tendon into the side of the head of the femur appears to be an accessory slip.

*Pectineus*.—In three divisions. The first a small fusiform belly rising in front of the pubic spine, and going to the lower part of the trochanter ridge superficial to the second, which is a larger fascicle from the pubic spine into the same ridge immediately above it. The third is from the concavity formed by the reflected lip of the pubis, and goes to the same insertion in union with the previous one.

*Obturator externus.*—From the ischium and obturator membrane, in continuity with the last; inserted into the trochanteric fossa higher than the insertion of the pyriformis.

*Obturator internus.*—Possibly represented by the slip referred to the pyriformis with which it may have no real connection.

*Iliacus primus.*—A long flat band from the median raphe on the deep surface of the pubis; it passes over the brim of the pelvis close by the pubic spine receiving fleshy fibres from the brim in its passage and is inserted into the acetabulo-ischiatric ligament.

*Secundus* (fig. 7—i. 2)—A long thin muscle rising also from the median raphe, and passing dorsad of the primus over the pelvic brim.

*Tertius* (fig. 7—i. 3)—Broad and strong from the whole deep surface of the pubis and ischium. It passes over the brim of the pelvis between the two heads of the rectus, and is inserted into the second upper fourth of the femur, becoming also continuous with the origin of the vastus externus. On the left side however, it has no connection with the vastus, but sends fibres to the cruralis from its lower transverse edge.

*Gastrocnemius internus* (fig. 9 & 10—g. i.)—From the whole length of the inner condyle of the femur between the tendons of the sartor—gracilis and inner semimembranosus, and of the biceps. Its outer edge is strengthened by the long tendon of the biceps. It forms the superficial plantar fascia, strengthening the tendons of the gastrocnemius externus.

*Gastrocnemius externus* (fig. 9 & 10—g. e.)—Rises together with the plantaris from the outer femoral condyle above the outer semimembranosus, and the peronæus primus. As it passes over the flexor profundus it communicates fibres to it in one leg but not in the other. In its distal portion, its line of junction with the plantaris is obvious, but the two are still inseparably blended. It is inserted as part of the

*Plantaris* (fig. 10—p. 1.)—Which, rising in union with the preceding, has three insertions, First or fibular division;—its tendon splits into unequal parts, whereof the first receives a tendon from

the tibial lumbricalis, and running along the tibial edge of the lower surface of the third toe is inserted into the base of the penultimate phalanx.

Second or median ;—gives off a perforated tendon which, after receiving the tendon of an accessory rising from the deep surface of the perforans, re-unites, and is inserted into the tibial side of the base of the penultimate phalanx of the first toe.

Third or tibial division. The tendon is perforated, and embracing the perforans is inserted on either side of the base of the penultimate phalanx of the hallux.

*Flexor longus* (fig. 7—f. l. d.)—Fleshy from the outer femoral condyle between the tendinous origins of the glutæus externus and peronæus primus, and fleshy from the middle third of the fibula; its tendon when splitting up on the sole receives the whole of the tibial division of the plantar accessory. It has beneath each tendon a flat fleshy belly which rises immediately after its separation; these bellies are attached fleshy to the base of the proximal phalanx of the second and fourth toes; the flexor tendons go to the last phalanx of each of the five digits. The outer or fibular tendon passes under the edge of the outer (second) division of the lumbricales; receives the equal sized tendon of the outer division of the plantar accessory, and proceeds to the base of the terminal phalanx of the fifth digit.

*Peronæus primus* (fig. 7—p. 1.)—By thin tendon from the outer femoral condyle and a strong carneotendinous origin from the head of the fibula; inserted by a strong round tendon which runs in a synovial sheath in a groove at the back of the outer malleolus, and is inserted into the outer edge of the fifth metatarsal.

*Peronæus secundus* (fig. 7—p. 2.)—From the anterior outer aspect of the fibula nearly throughout; inserted by a strong tendon into the fifth metatarsal proximad of the primus.

*Tibialis anticus* (fig. 7—t. a.)—Fleshy from the lower four-fifths of the tibia; the upper portion is more on the outer, the lower more on the inner aspect of the front of the bone; inserted by a broad thin tendon, given off by its fore edge, into the proximal third of the metatarsal of the hallux.



*Extensor longus* (fig. 7—e. l. d.)—Tendinous from the outer side of the fore aspect of the head of the tibia;—forms a slender muscle dividing its tendon over the base of the middle metatarsal. Each tendon passes between the metatarsals to the plantar surface of the middle one, and runs forward beneath it to an insertion at about three-fourths of its length. In the other foot the tendon *undivided* passes down the peroneal side of the metatarsal.

*Extensor brevis* (fig. 7—e. b. d.)—1st. From the peronæal side of the lower end of the fibula passes obliquely as a broad slip to the dorsum of the hallux.

2nd. Rises inseparably from No. 1;—inserted into the dorsum of the index. In the other foot this rises by tendon from the upper fibular side of the base of the first (hallux) metatarsal.

3rd. By a strong tendon from a depression in the middle of the upper surface of the astragalus;—insertion into the dorsum of the third digit.

4th. From the base of the fourth metatarsal;—inserted into the dorsum.

5th. By a strong tendon from the inner side of the outer tuberosity of the calcaneum;—it passes without adhesion over the dorsum of the fourth metacarpal, and is inserted into the base of the proximal phalanx.

6th. *Extensor proprius quarti digiti*.—Fleshy from the fibular side of the base of the fourth metatarsal;—sends a long tendon to the upper and outer side of its terminal phalanx.

*Extensor accessorius*.—Two fascicles rising together from the outer side of the anterior tuberosity of the calcaneum send a long tendon along the outer side of each of the third and fourth digits to the terminal phalanges.

*Popliteus* (fig. 7—p. v.)—From the tibial side of the head of the fibula; inserted into the posterior side of the upper fourth of the tibia.

*Tibialis posticus* (fig. 7—t. p.)—From the lower two thirds of the hinder surface of the fibula; ends in a carneotendinous expansion investing the ends of the tibia and fibula.

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*Peroneo-tibialis* (fig. 7—ptb.)—A small pronating muscle descending from about the lowest fifth of the fibula to the tibia ; on to the anterior surface of which it is inserted.

*Supinator pedis*.—A delicate band rising beneath the tibialis posticus fleshy from the posterior side of the fibula ; inserted by tendon into the middle of the outer side of the outer malleolus.

*Lumbricales* (fig. 9—l. 1 & 2).—Are merely two small bundles rising from the third and fourth perforating tendons. The smaller is inserted on the inner side of the third tendon. The larger and fibular division sends a slender tendon with the perforans to the tibial side of the base of the penultimate phalanx of the fourth toe.

*Flexor accessorius* (fig. 9—f. a. 1).—In three divisions—

1st. (fig. 9—f. a. 1).—Rises from the os calcis, and is inserted into the flexor longus tendon on its peroneal side before it splits up on the sole.

2nd. (Plate XVI., fig. 9—f. a. 2).—From the inner and concave surface of the fifth metatarsal nearly to its distal end. Beneath it proximad runs the tendon of No. 1, and beside it lies the belly of the flexor minimi digiti ; its insertion is into the tendons of the digits from the second to the fourth.

3rd. (fig. 9—f. a. 3).—By a long round tendon from the external lower angle of the os calcis ; resting on the concave surface of the metatarsal it winds round inwardly and downwards to the inner side of the fifth metatarsal.

*Flexor minimi digiti*.—Rises above the No. 2 preceding, on the tibial aspect of the ridge of the metatarsal, and is inserted by tendon into the tibial side of the base of the first phalanx.

*Abductor hallucis*.—Rises from the cuboid, and is inserted into the first phalanx of the hallux.

*Abductor metatarsi quinti*.—Rises by a short stout semi-tendinous origin from the distal end of the calcaneum, and is inserted fleshy into the distal tuberosity of the deep surface of the fifth metatarsal.

*Transversales plantæ* consist of—

1st. A flat belly from the upper edge of the inner side of the fifth metatarsal under the accessory flexor No. 2. It crosses the sole and is inserted into the outer (fibular) side of the base of the first phalanx of the hallux.

2nd. Rises by tendon, distad of the preceding, and dividing into two flat bellies, is inserted into the second and third toe.

There is no branch of this superficial layer to the fourth toe.

*Interossei*.—These are in three sets, connecting the toes from the hallux to the fourth.

#### MUSCLES OF THE TRUNK AND TAIL.

*Longissimus dorsi*.—Chiefly a continuation of the upper lateral columns of the caudal system. It has also a strong tendinous origin from the posterior process of the ilium. It is inserted into the dorsal spines with frequent alternations of origin and insertion: laterally it is indistinguishably blended with the sacro lumbalis.

*Sacro lumbalis*.—Rises from the anterior part of the crest of the ilium, and is inserted by tendinous interdigitations into the ribs till it merges into the cervicalis ascendens.

*Rectus abdominis*.—From the posterior end of the ischiatic symphysis. Occupying as usual the middle tract of the abdomen, on its lateral edge it blends with the external oblique. It is inserted into the last two ribs, posterior to but distinct from the pectoralis major.

*External oblique*.—Separable into three more or less stratified divisions.

1st. From the third rib ventrad of the origin of the first portion of the serratus, and from the two following ribs; inserted into the rectus.

2nd. From the first three floating ribs, this layer terminates anteriorly in aponeurosis and blends posteriorly with No. 1.

3rd. From the last rib and lumbar fascia; it has a strong insertion into the pubic spine, and by virtue of its lumbar connection into the anterior process of the ilium.

*Internal oblique.*—Lines almost the entire chest; rising from all the vertebral, and inserted into all the sternal ribs by digitations, and into the rectus by continuity.

*Transversalis.*—From a fascia extending from the pelvis to the ribs; from this long origin it runs to be inserted into the rectus and sternum.

*Intercostales externi.*—Run obliquely between all the ribs both vertebral and sternal.

*Intercostales interni.*—Between the sternal ribs only: but on the upper half of the vertebral ribs the deep fibres of the externi are more or less separable as an internal layer

*Retrahentes costarum* from the ventral surface of the vetebræ adjacent to the head of each rib forwards to the fourth. The broad and delicate posterior digitations pass beneath two ribs to be inserted into the third in advance. The first two are more distinct, especially the first which rises at the fourth rib, and is inserted by a rather long tendon into the second.

*Caudalis* (Plate XVI., figs. 12 & 13—f.c.)—Consists of four rows of cone-in-cone muscles, one on each side of the upper and lower surfaces. Posteriorly these columns occupy the spaces between the spines and hæmapophyses and transverse processes. Towards the base of the tail the columns separate from the vetebræ and form an investing layer over the origins of the pyriformis, femorocaudal and compressor cloacæ. The upper lateral column is an extension backwards of the longissimus dorsi. The upper median is a similar extension of the sacrolumbalis, but it has also a special origin by tendon from the spine of the ilium. From this origin a long round fascicle enclosed in a sheath formed of the rest of the muscle beneath runs backward to a point at the eleventh caudal vertebra. The lower median rises in conjunction with the lower lateral from the transverse processes of the first and succeeding caudal vetebræ. Expanding, they join their fellows of the opposite side on the basal median line, overlapping as they descend the origin of the pyriformis. By their separation they form the lower median and the lower lateral columns.

*Compressor cloacæ* (fig. 13—c. c.)—Rises by two heads; one from the transverse processes of the fifth and sixth caudal vertebræ, the other from the processes of the seventh and ninth; they descend side by side over the femoro-caudal and lower lateral caudal column, and are inserted into the side of the cloacal outlet.

*Sphincter cloacæ*.—Composed of transverse fibres on the posterior aspect of the cloaca.

*Transversus peronei* (fig. 13—t. p.)—A strong mass rising from the epischiatric ossicle, inserted into the ileoischiatric ligament contiguous to the insertion of the semimembranosus.

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#### OBSERVATIONS.

The result of the examination, is on the whole somewhat disappointing. The fact ascertained that the mechanism of the frill is served by special though feeble muscles, as well as by a large extension of the functions of some ordinary ones, is nothing surprising to an eye witness of its use. Our knowledge of that use has not been much advanced. The muscles specialised for the purpose of assisting in the elevation and depression of the hood do not of themselves indicate very clearly that the appendage is in a strict sense an auditory conch. But since they certainly do not forbid the idea generated by the presence of the cartilage and by the observed actions of the animal, that the hood may serve to arrest sound and direct it towards the ear, we may, if we can overcome our disinclination to attribute an auricle to a reptile, recognise this as part of its office without prejudice to its supposed use as an engine of terror to assailants. With this conclusion, we must for the present rest content. Still less satisfaction in the way of discovery has been derived from the second division of the enquiry. We may fairly be allowed an expression of surprise on finding that the semierect attitude and plantigrade gait of the creature are not facilitated by any additions or modifications in the hind quarters and limbs. Thus it is, however;—all is strictly lacertine. There is no approach towards the conditions existing in warm blooded bipeds. The so-called glutæi for instance, are still in front of the

thigh;—the whole work of raising the body is thrown disadvantageously upon the long muscles of the back of the thigh. The possibility of raising the body on the legs is rather permitted by circumstances generally favourable than brought about by direct means. It is in the comparative shortness and lightness of the head and anterior part of the trunk: the length without undue weakness of the hind limb: above all, as it appears to me, in the imperfect isolation of the several muscles which enables them to act in certain directions with combined strength that we must find an explanation of the power possessed by this lizard of simulating the gait of a cursorial bird; certain it is that in its muscular system it has no feature relating it to anything higher than its fellow reptiles.

DESCRIPTIONS OF AUSTRALIAN MICRO-LEPIDOPTERA.

BY E. MEYRICK, B.A.

IX. OECOPHORIDAE—(Continued.)

The following additional species of *Eulechria* (besides others) were obtained since my last paper left my hands, and are therefore not included in the analytical table of that genus; but as they are closely related to the concluding species, they may be added here without disturbing the systematic arrangement. The first alone is of somewhat doubtful affinity; the second belongs to the group of *Eul. scopariella*; the remaining four form a single peculiar group, with the forewings more elongate and generally narrower than in any others. except *Eul. perdita*.

108. *Eul. leucophanes*, n. sp.

Media, alis ant. niveis, nitidis, margine costali basim versus angustissime fusco; post. dilute albido-fuscis; thorace griseo.

♂ 17-20 mm., ♀ 24 mm. Head white, faintly ochreous-tinged, face fuscous. Palpi long, in ♀ very long, fuscous, internally and at apex of second joint whitish. Antennae fuscous, towards base whitish. Thorax pale whitish-fuscous. Abdomen ochreous whitish. Legs dark fuscous; posterior tibiæ ochreous-whitish,

tarsi somewhat suffused with whitish. Forewings elongate, rather narrow, costa gently arched, in ♀ more strongly, apex pointed, hind margin extremely oblique, slightly rounded: snow-white, shining; extreme costal edge very narrowly dark fuscous, sometimes towards base only; cilia ochreous-white. Hindwings very pale whitish-fuscous, towards apex rather darker; cilia ochreous-whitish.

Very distinct from any other species of the genus, but apparently most allied to the group of *Eul. scopariella* according to the long palpi, and the form of the wings.

Port Lincoln, South Australia, in November; tolerably common locally on sandhills.

109. *Eul. aërodes*, n. sp.

Media, alis ant. griseis, margine costali angustissime albido, punctis disci tribus serieque postica transversa angulata saturate fuscis; post. griseis.

♂ ♀. 21-22 mm. Head, thorax, abdomen, and legs fuscous-grey. Palpi long, dark fuscous, second joint with basal half and extreme apex whitish. Antennæ dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hind margin extremely obliquely rounded; light fuscous-grey, finely sprinkled with darker; extreme costal edge narrowly ochreous-whitish except at extremities; a dark fuscous dot in disc before middle, a second beyond middle, and a third on fold rather beyond first; a row of dark fuscous dots from costa about  $\frac{2}{3}$  to close before apex, thence sharply bent and continued very near hind margin to anal angle; two or three dark fuscous marginal dots round apex; cilia light fuscous-grey. Hindwings fuscous-grey; cilia grey, with a faint darker line.

Closely allied to *Eul. siccella*, but with the ground colour darker, without coarse blackish irroration, the costal edge sharply whitish, and the hindwings darker; it also resembles somewhat *Eul. paurogramma*, but is immediately separated by the grey head.

Deloraine and Evandale, Tasmania, in November; four specimens.

110. *Eul. tanyscia*, n. sp.

Media, alis ant. saturate fuscis, ♂ disco cano-suffuso, punctis disci quatuor lineaque postica curva nigricantibus; post. saturate fuscis, ♂ subtus flavidis.

♂ ♀. 16-25 mm Head, thorax, and abdomen dark fuscous-grey, slightly mixed with whitish. Palpi rather short, dark fuscous, second joint white towards the base. Antennæ dark fuscous. Legs dark fuscous, apex of tarsal joints white, middle tibiæ with central and apical ochreous-whitish rings, hairs of posterior tibiæ whitish-ochreous. Forewings elongate, costa in ♂ hardly arched, in ♀ moderately, apex rounded, hind margin very obliquely rounded; dark fuscous, in ♀ coarsely irrorated with whitish-grey, in ♂ irrorated with white and more or less conspicuously suffused with white towards disc; a blackish crescentic dot in disc before middle, a small round dot above middle, a crescentic mark beyond middle, and a small spot on fold hardly beyond first dot; a strongly curved dark fuscous transverse line from a cloudy darker spot on costa  $\frac{3}{4}$  to anal angle, where is sometimes another darker spot; cilia with basal half barred alternately with dark fuscous and whitish, terminal half grey. Hindwings dark fuscous, under surface in ♂ dull light yellowish-ochreous, in ♀ dark fuscous; cilia fuscous-grey, with a darker line near base.

The sexes are at first sight very dissimilar; the ♂ resembles in colouring the group of *Eul. adoxella*, but is immediately separated by the nearly strait costa, and the yellowish under surface of the hindwings; the ♀ is more like *Eul. siccella*, but is easily recognisable by the uniform dark colouring.

Both sexes taken plentifully at Mount Gambier, South Australia, at rest on the trunks of *Eucalyptus Gunnii* in November; also met with at Adelaide in October.

111. *Eul. ombrophora*, n. sp.

Minor, alis ant. elongatis, albidis, leviter griseo-irroratis, vitta costali grisea, punctis disci quinque (postremo transverso) lineaque postica curva saepius obsoleta saturate fuscis; post. griseis.



♂ ♀. 10-15 mm. Head and thorax white, mixed with grey. Palpi short, second joint dark fuscous, terminal joint whitish, more or less mixed with dark fuscous. Antennæ grey. Abdomen pale grey, anal tuft of ♂ pale whitish-ochreous. Legs dark fuscous-grey, tarsal joints with obscure ochreous-whitish apical rings; hairs of posterior tibiæ ochreous-whitish. Forewings elongate, narrow, costa in ♂ almost straight, in ♀ gently arched, apex rounded, hindmargin extremely obliquely rounded; whitish, thinly and irregularly irrorated with fuscous-grey; an irregular fuscous-grey streak along costa; a dark fuscous sometimes double dot in disc before middle, two others longitudinally placed above middle, a transverse mark beyond middle, and an elongate dot on fold somewhat beyond first; these are generally rather ill-defined; a strongly curved transverse posterior grey line from an inwardly oblique spot on costa at  $\frac{4}{5}$  to anal angle, often almost obsolete; cilia whitish, irrorated with dark fuscous towards base. Hindwings grey, rather paler towards base; cilia pale whitish-grey, with a faint darker line near base.

This and the next species are very closely allied, but I think distinct; *E. ombrophora* is considerably smaller, the discal dots larger and differently placed, the first dot being lower in the disc, two dots above the middle instead of one, the transverse mark beyond middle not divided into two dots, the posterior line more defined, and the terminal joint of palpi more or less whitish externally.

Quorn, South Australia, in October; rather common.

#### 112. *Eul. sciophanes*, n. sp.

Media, alis ant. elongatis, albidis, leviter griseo-irroratis, vitta costali grisea, punctis disci quatuor, (postremo duplici) saepe obsoletis nigris; post, dilute griseis.

♂ ♀. 17-21 mm. Head and thorax white, slightly mixed with grey. Palpi short, dark fuscous, internally whitish. Antennæ light grey. Abdomen long, pale whitish-ochreous. Legs dark fuscous, apex of tarsal joints obscurely ochreous-whitish, hairs of posterior tibiæ very pale whitish-ochreous. Forewings very

elongate, narrow, costa in ♂ hardly arched, in ♀ more distinctly, apex rounded, hindmargin extremely obliquely rounded; whitish, very finely and scantily sprinkled with fuscous-grey; a fuscous-grey streak along costa; a minute black dot beneath this before middle, a second in middle, two transversely placed in disc beyond middle, and a short fine longitudinal mark on fold beneath first dot, all sometimes obsolete; sometimes indications of a dentate strongly-curved transverse grey line near hind margin; cilia whitish, sprinkled with fuscous-grey towards base. Hind wings light fuscous-grey; cilia fuscous-whitish.

The points of distinction from *Eul. ombrophora* are given above. Quorn, South Australia, in October; tolerably common.

113. *Eul. aceraea*, n. sp.

Media, alis ant. elongatis, canis; post, griseis, ciliis albido-ochreis.

♂. 16-19 mm. Head and thorax clear white, face slightly mixed with grey. Palpi rather short, dark fuscous, internally and at base and apex of second joint white. Antennæ dark fuscous. Abdomen long, pale whitish-ochreous tinged with grey. Legs dark fuscous, posterior pair pale whitish-ochreous above. Forewings elongate, narrow, costa slightly or hardly arched, apex pointed, hind margin excessively oblique; clear white; cilia white. Hindwings grey, paler towards base, under surface whitish-ochreous; cilia pale whitish-ochreous, more ochreous towards base.

Nearly related to the preceding, but very distinct.

Petersburg, South Australia, in October; three specimens amongst thin barren scrub.

16. *ATOMOTRICHA* Meyr.

Antennæ in ♂ moderate, with fine long ciliations (5), six at apex of each joint, basal joint with strong pecten. Palpi rather long, second joint exceeding base of antennæ, densely scaled, somewhat rough beneath, terminal joint shorter than second, slender, recurved. Thorax smooth. Forewings elongate, surface with tufts of raised scales. Hindwings as broad as forewings, elongate-ovate,

hind margin rounded, cilia  $\frac{3}{5}$ . Wings of ♀ abbreviated, incapable of flight. Forewings with vein 7 to apex, 2 from hardly before angle. Hindwings normal.

The characters of this and other genera peculiar to New Zealand are given more fully in a paper in the Transactions of the New Zealand Institute for this year; all the New Zealand species are also there described. This and the following genus are closely allied, but their exact origin is uncertain; their relationship with *Eulechria* is however obvious. The semi-apterous ♀ is remarkable; not improbably a similar character may recur in *Brachysara*, of which that sex is still unknown.

#### 114. *Atom. ommatias*, Meyr.

Media, alis ant. fuscis. saturatori nebulois, signis disci tribus arcuatis lineaque postica transversa obscuris saturatoribus; post. albido-griseis.

Christchurch, New Zealand, in August and September; rather common.

#### 17. BRACHYSARA Meyr.

Antennæ in ♂ moderate, with fine long ciliations (5), eight at apex of each joint, basal joint with strong pecten. Palpi short, second joint not nearly reaching base of antennæ, with short loose rough hairs beneath, somewhat projecting anteriorly, terminal joint short, slender, curved. Thorax smooth. Forewings elongate. Hindwings as broad as forewings, elongate-ovate, hind margin very faintly sinuate, cilia 1. Forewings with vein 7 to apex, 2 from hardly before angle. Hindwings normal.

#### 115. *Brach. sordida*. Butl.

(*Oecophora sordida*, Butl., Proc. Zool. Soc. Lond., 1877, 405.)

Media, alis ant. angustis, dilute fuscis, vitta media nigricante interdum obsoleta, signis disci duobus arcuatis lineaque postica transversa obscuris saturatoribus; post. albidis.

Near Christchurch, New Zealand; formerly taken abundantly

#### 18. LEISTARCHA Meyr.

Head with appressed hairs, sidetufts rather short, appressed. Antennæ in ♂ moderate, strongly ciliated ( $1\frac{1}{2}$ ), basal joint moderate,

without pecten. Palpi long, second joint exceeding base of antennæ, evenly thickened with dense appressed scales, terminal joint as long as second, moderately stout, strongly recurved. Thorax smooth. Forewings elongate, apex acute, hindmargin sinuate, very oblique. Hindwings as broad as forewings, elongate-ovate, hindmargin very faintly sinuate, cilia  $\frac{1}{3}$ . Abdomen stout, very strongly margined. Middle tibiæ thickened with rough hairs; posterior tibiæ clothed with dense rough hairs, posterior tarsi with basal joint excessively elongate, rather stout. Forewings with vein 7 to hindmargin, 2 from hardly before angle. Hindwings normal.

I am now satisfied that this genus is wrongly placed in this neighbourhood, and should be transferred to a position between *Eochroa* and *Zonopetala*. It is closely allied to *Eochroa* in most respects, but in the absence of the basal pecten of the antennæ it approaches *Zonopetala* and the succeeding genera. The persistence of the rosy tinge in the cilia, especially beneath, is an interesting indication of affinity. The singularly elongated basal joint of the posterior tarsi is unique, and I have had no opportunity of observing its object. The habits of the larva are known, and are also peculiar.

116. *Leist. iobola*, n. sp.

Magna, alis ant. fuscis, creberrime albido-conspersis, venis albidis, vittis duabus anticis, tertia postica, quarta dorsi saturate fuscis; post. griseis; ciliis omnibus leviter roseo-suffusis.

♂. 31 mm. Head fuscous-grey, on sides ochreous-whitish. Palpi whitish, somewhat mixed with dark fuscous, with basal half of second joint externally dark fuscous. Antennæ whitish. Thorax fuscous-grey. Abdomen grey, anal tuft ochreous-tinged. Anterior and middle legs dark fuscous, beneath white; posterior legs whitish, tarsi mixed with ochreous-grey. Forewings elongate, costa moderately arched, apex acute, hindmargin markedly sinuate, rather strongly oblique; dark fuscous, very closely strewn with very elongate whitish scales; all veins and extreme costal margin slenderly whitish; a clear dark fuscous streak above cell from base to before middle, thence obscurely continued between veins

to costa before apex ; a dark fuscous-streak beneath cell almost from base to middle ; a sharply defined dark fuscous streak from middle of disc to hindmargin beneath apex ; a slender dark fuscous streak along inner margin from near base to middle of hindmargin, broader on anal angle and attenuated thence, sharply interrupted by veins ; cilia fuscous, becoming white towards tips, suffused with light rosy, especially above apex ; on undersurface rosy tinge much stronger. Hindwings fuscous-grey, rather lighter towards base ; cilia grey, towards apex with tips whitish and base pale rosy.

This fine species is coloured in admirable imitation of the fibrous bark of the *Eucalyptus* on which it lives.

Larva 16-legged, very elongate, cylindrical, slightly tapering towards both ends ; whitish-grey, segmental divisions ochreous-tinged ; dorsal very slender, greyish-fuscous, anteriorly lighter and more greenish ; subdorsal rather broad, rather dark greyish-fuscous ; spiracular slender, irregular, greyish-fuscous ; spiracles grey-whitish, enclosed in a fuscous ring ; spots minute, black ; head very pale reddish-ochreous ; irregularly marked with dark reddish-fuscous spots ; second segment whitish-grey, thinly speckled with dark fuscous ; anal segment speckled with dark fuscous, with subdorsal lines indicated. Feeds on *Eucalyptus amygdalina* (*Myrtaceæ*), concealing itself beneath loose bark, to which it attaches with silk the leaves on which it is feeding.

I found a single larva near Picton, New South Wales, at about 1000 feet, in September, and bred the imago in December.

### 19. OENOCHROA Meyr.

Head with appressed hairs, sidetufts rather small, appressed. Antennæ in ♂ moderate, moderately and evenly ciliated (1), basal joint stout, with strong pecten. Palpi moderately long, second joint exceeding base of antennæ, with appressed scales, strongly dilated beneath towards apex with somewhat rough laterally compressed scales, terminal joint rather shorter than second, slender, recurved. Thorax with a small posterior crest of scales. Forewings elongate, moderate, apex pointed, hindmargin very oblique, slightly rounded. Hindwings rather narrower than forewings,

elongate-ovate, hindmargin slightly rounded, cilia  $\frac{2}{3}$ . Abdomen moderate, strongly margined. Posterior tibiæ clothed with very long dense hairs above. Forewings with vein 7 to apex, 2 from somewhat before angle of cell. Hindwings normal.

Probably a direct development from *Eulechria*, from which it differs by the thoracic crest, and dilation of apex of second joint of the palpi; the ♀ of *Oen. iobaphes* closely approaches the group of *Eul. adoxella*.

I have three species, thus distinguished:—

- 1a. Forewings with a cloudy pale anterior fascia....118. *endochlora*  
 1b. „ without pale fascia.  
 2a. Hindwings clear yellow.....117. *lactella*  
 2b. „ more or less suffused with fuscous...119. *iobaphes*

117. *Oen. lactella*, Walk.

(*Gelechia lactella*, Walk., Brit. Mus. Cat., 648.)

Media, alis ant. saturatius griseis, macula plicæ ante medium punctisque disci quatuor nigris, macula anguli analis lineisque duabus posticis transversis obsolete saturatoribus; post. ochreo-flavis, apice ciliisque griseis.

♂ ♀. 20-23 mm. Head, palpi, antennæ, and thorax dark grey, base of palpi whitish. Abdomen ochreous-yellow. Anterior and middle legs dark grey; posterior legs whitish-yellow. tarsal joints greyish towards base. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very oblique, slightly rounded; rather dark slaty-grey, finely and irregularly irrorated with bluish-whitish points; a very ill-defined small roundish blackish blotch on fold at  $\frac{1}{3}$ ; a faint dark fuscous spot on costa at  $\frac{1}{3}$ ; a blackish dot in disc before middle, two others transversely placed and nearly confluent beyond middle, and a fourth below middle; an irregular ill-defined blackish-grey blotch on anal angle; a very indistinct blackish-grey line from costa at  $\frac{2}{3}$  obliquely outwards, sharply bent in disc and terminating in anal blotch, and another similar line intermediate between this and hindmargin, both sometimes obsolete; cilia grey. Hindwings clear ochreous-yellow, extreme apex dark fuscous-grey; cilia fuscous-grey.

Characterised by the clear yellow hindwings, and blackish spot on fold.

Mr. G. H. Raynor once bred this species from an undescribed larva feeding between joined leaves of a species of *Eucalyptus*.

Brisbane and Sydney, in September and March; not common.

I suspect Walker may have intended to call this species *latella*.

118. *Oen. endochlora*, n. sp.

Minor, alis ant. saturate griseis, fascia antica curva discoque exalbido-suffusis, punctis disci quinque, macula anguli analis, lineisque duabus posticis transversis obsolete saturate griseis; post. albido-flavis griseisve, apice ciliisque griseis.

♂ ♀. 14-16 mm. Head dark grey, margins ochreous whitish. Palpi dark grey, somewhat mixed with ochreous-whitish. Antennæ dark fuscous. Thorax dark fuscous, slightly mixed with ochreous-whitish. Abdomen whitish-ochreous or light yellowish-ochreous. Legs dark fuscous, apex of middle tibiæ and tarsal joints obscurely whitish-ochreous, posterior legs pale yellowish-ochreous above. Forewings elongate, costa moderately arched, apex round-pointed, hind margin very oblique, slightly rounded; dark fuscous-grey or blackish-grey, more or less irrorated with very pale yellowish-grey or whitish-scales; these generally coalesce to form a rather broad strongly outwards-curved transverse fascia from  $\frac{1}{4}$  of costa to  $\frac{1}{4}$  of inner margin, and often a more or less defined discal suffusion, sometimes extending to hindmargin; on this the ground colour appears to form two dots before middle, two beyond middle, a fifth below middle, a spot on anal angle, and two posterior sinuate transverse lines; cilia dark fuscous, becoming whitish-fuscous towards tips. Hindwings varying from whitish-yellow to grey, base lighter, apex dark gray; cilia grey, sometimes yellowish-tinged.

Distinguished by its small size, and the curved anterior fascia. The variability of colour in the hindwings is a remarkable feature, and is entirely irrespective of sex, but seems to be influenced by locality; Quorn specimens have them usually more yellow than those taken at Wirrabara, which are mostly grey.

Mr. F. G. O. Tepper has bred this species from galls on *Eucalyptus oleosa*.

Quorn, Wirrabara, and Androssan, South Australia, in October ; common.

119. *Oen. iobaphes*, n. sp.

Media, alis ant. ♂ saturate griseis, macula costa elongata media albido-conspersa, ♀ griseis, albido-sparsis, serie punctorum quinque antica, tribus disci posticis lineaque transversa nigrantibus ; post. fuscis, ♂ basim versus ochreo suffusis.

19-21 mm. ♂. Head, palpi, antennæ, and thorax dark grey, somewhat sprinkled with bluish-whitish, face suffused with whitish. Abdomen light yellowish-ochreous, somewhat greyish-tinged. Anterior and middle legs dark fuscous ; posterior legs whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, extremely oblique ; dark fuscous-grey, with two or three scattered bluish-whitish scales posteriorly ; an elongate semi-oval costal blotch of thickly-strewn bluish-whitish scales, extending along costa from  $\frac{1}{4}$  to  $\frac{3}{4}$  ; a faint blackish spot on fold at  $\frac{1}{4}$  : cilia fuscous-grey, towards tips paler and ochreous-tinged. Hindwings smoky-ochreous, posteriorly somewhat suffused with fuscous, apex dark fuscous-grey ; cilia grey, base ochreous.

♀. Forewings rather more elongate ; grey, irrorated throughout with whitish ; extreme costal edge white ; a few scattered blackish scales near base ; five black dots forming a slightly inwards-curved row from beneath  $\frac{2}{5}$  of costa to above  $\frac{2}{5}$  of inner margin ; a black dot below middle of disc, and two others transversely placed beyond middle ; a minute whitish spot on costa in middle, and another at  $\frac{3}{4}$ , each followed by a few blackish scales ; from apex of second proceeds a strongly outwards-curved blackish line to inner margin before anal angle : cilia grey, irrorated with whitish. Hindwings fuscous-grey, base somewhat ochreous-tinged ; cilia grey, extreme base ochreous.

The sexes are at first sight very dissimilar, owing to the dark suffusion of the ♂.



Sydney and Murrurundi, New South Wales, in November; three specimens (1 ♂, 2 ♀).

20. *MACHETIS* Meyr.

Head densely scaled, sidetufts large, meeting, projecting somewhat over face. Antennæ in ♂ rather stout, somewhat serrate, with short uneven cilia ( $\frac{1}{2}$ ), basal joint rather stout, in ♀ more elongate, without pecten. Palpi long, second joint exceeding base of antennæ, strongly thickened with dense appressed scales, slightly loose beneath; terminal joint shorter than second, strongly reflexed, slender. Thorax with dense erect crest. Forewings elongate, moderate, apex obtuse, hindmargin obliquely rounded. Hindwings hardly narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{3}{4}$ . Abdomen rather stout, strongly margined. Posterior tibæ clothed with very long hairs. Forewings with vein 7 below apex, 2 from before angle of cell. Hindwings normal.

Apparently most allied to *Oenochroa*, and probably a development of it, but this is by no means certain; it differs from all the neighbouring genera by the termination of vein 7 in the hindmargin; in the short ciliation of the antennæ, and absence of the basal pecten, it resembles *Sphyrrelata*.

120. *Mach. aphrobola*, n. sp.

Media, alis ant. saturate ochreo-fuscis, maculis costæ duabus magnis, dorsi duabus anticis conjunctus, strigulaque anguli analis niveis; post. dilutissime flavidis, apicem versus griseis.

♂ ♀.  $15\frac{1}{2}$ -19. mm. Head snow-white. Palpi white, densely irrorated with dark fuscous except on outer side of terminal joint, and apex of second joint. Antennæ whitish, suffusedly annulated with dark fuscous. Thorax dark fuscous, with a white posterior spot. Abdomen whitish-ochreous. Anterior and middle legs dark fuscous, tarsal joints with whitish apical rings; posterior legs whitish-ochreous. Forewings moderate, costa gently arched, apex round-pointed, hindmargin obliquely rounded; dark ochreous-fuscous, lighter in middle of disc; a large rounded-triangular

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white costal blotch, extending on costa from near base to middle, its apex reaching more than half across wing, along costa mixed with dark fuscous; a semi-oval white blotch on inner margin about basal third, and a smaller irregularly-triangular posteriorly ill-defined white spot on the middle of inner margin, confluent on margin; sometimes three or four irregularly-placed very small dark fuscous spots on disc, partially surrounded with white scales; an irregular somewhat pentagonal white blotch on costa at  $\frac{3}{4}$ , its apex produced as an irregular ill-defined white streak to anal angle; a very small ill-defined white apical spot; cilia dark fuscous, with two white transverse bars towards apex, a larger white spot at anal angle, and three ill-defined whitish bars between these. Hindwings very pale whitish-yellow, towards apex suffused with grey; cilia very pale whitish-yellow, with an indistinct grey line round apex.

A very distinct and conspicuous species.

Sydney and Hobart, from October to December; rather common, usually at rest on fences.

#### 21. PLACOCOSMA Meyr.

Head smooth, sidetufts large, spreading, meeting behind. Antennæ in ♂ moderate, somewhat serrate, rather strongly ciliated ( $1\frac{1}{2}$ ), basal joint rather stout, with strong pecten. Palpi moderate, second joint not reaching base of antennæ, somewhat dilated with dense appressed scales, distinctly rough beneath, terminal joint as long as second, moderate, recurved. Thorax with a dense posterior crest. Forewings elongate, moderate, apex obtusely pointed, hindmargin almost straight or slightly concave. Hindwings hardly narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{3}{4}$ . Abdomen moderate. Posterior tibiæ clothed with long dense hairs above. Forewings with vein 7 to apex, 2 from somewhat before angle. Hindwings normal.

Structurally this genus very closely approaches *Oenochroa*, differing in little but the absence of the rough dilation towards the apex of the second joint of the palpi; they are perhaps collateral developments. Superficially there is little resemblance between them, the species of *Placocosma* being handsomely marked with large white blotches.

- 1a. Thorax dark fuscous.....121. *hephaestea*.  
 1b. „ orange-ochreous.. ..... 122. *anthopetala*.

121. *Plac. hephaestea*, n. sp.

Minor, alis ant. saturate fuscis, macula dorsi antica permagna, altera costæ media parva, strigaeque ante-apicali curva dilutissime flavidis, niveo-marginatis, macula dorsi postica dilute rufa; post. aurantiacis, postice leviter fusco-tinctis.

♂ ♀. 14-15½ mm. Head white, margin of eyes dark fuscous, crown faintly yellowish-tinged. Palpi white, basal half of second joint externally dark fuscous. Antennæ dark fuscous. Thorax dark fuscous, with small white posterior spot. Abdomen orange-ochreous, somewhat suffused above with fuscous. Anterior and middle legs dark fuscous, apex of joints whitish-ochreous; posterior legs ochreous, tarsal joints greyish towards base. Forewings moderate, costa gently arched, apex round, pointed, hindmargin slightly sinuate, oblique; dark fuscous; a large yellowish-white blotch, margined with pure white, extending on inner margin almost from base to middle, its posterior edge slightly convex, its upper edge very near and parallel to costa; a rather small semi-circular white spot, posteriorly yellowish-tinged, on costa slightly beyond middle; an ill-defined pale reddish-fuscous blotch towards anal angle, posteriorly mixed with darker fuscous, and containing two small spots of pale yellowish scales; an ill-defined inwards-curved slender white, posteriorly pale yellowish, streak from costa at  $\frac{5}{8}$  to hind margin below middle; cilia dark fuscous, suffused with blackish, with a large pale yellowish spot on middle of hindmargin, towards base pure white, rather narrower, and bisected by a short dark fuscous line, cilia towards anal angle mixed with reddish-fuscous. Hindwings ochreous-orange, slightly fuscous-tinged towards apex; cilia fuscous grey.

A very distinct and handsome insect.

Sydney, in November and December; four specimens in gardens.

122. *Plac. anthopetala*, n. sp.

Minor, alis ant. saturate fuscis, fascia antica lata recta, macula costæ media, altera apicis, tertia anguli analis riveis; post. griseis.

♂ 14 mm., ♀ 19 mm. Head orange-ochreous, face paler. Palpi whitish-orange, basal half of second joint externally and extreme apex of terminal joint dark fuscous. Antennæ dark fuscous. Thorax ochreous-orange, anterior margin very narrowly, a small lateral spot, and larger posterior spot dark fuscous. Abdomen whitish-ochreous, anal tuft orange-ochreous. Anterior and middle legs dark fuscous, apex of joints ochreous; posterior legs whitish-orange-ochreous, tarsal joints greyish towards base. Forewings moderate, costa moderately arched, apex round-pointed, hindmargin oblique, hardly rounded; dark fuscous, with a slight ochreous tinge in disc posteriorly; a broad straight white or ochreous-white transverse fascia from  $\frac{1}{4}$  of costa to  $\frac{1}{4}$  of inner margin, somewhat contracted on costa; a white semi-oval spot on costa slightly beyond middle, on costal edge whitish-ochreous, reaching half across wing, a white triangular spot on inner margin before anal angle reaching half across wing, its apex a little beyond that of costal spot; a larger irregularly quadrilateral white apical spot, on costal edge whitish-ochreous, leaving a slender dark fuscous streak along hindmarginal edge, its anterior and lower edges parallel to posterior edges of costal and dorsal spots respectively, its lower posterior angle produced into a short tooth; cilia dark fuscous, beneath anal angle and on costa above apical spot whitish-ochreous. Hindwings fuscous-grey; cilia fuscous-grey, above apex whitish-ochreous mixed with grey.

Also not to be confused with any other.

Sydney, in November and December; two specimens amongst dry scrub.

## 22. ALLODOXA, Meyr.

I am now of opinion that this genus ought to be referred to the *Glyphipterygidae*; I do not possess a male of either of the two species belonging to it, and I anticipate that the antennæ will be found not to be ciliated. The genus nearly approaches *Eupselia*, and is discordant in this family from the 11-veined forewings. The removal will make *Atelosticha* the only 11-veined genus of the family, to which it is nevertheless without doubt truly referable. I do not propose therefore to describe the species of *Allodoxa* here, and it may be struck out.

## 23. PETALANTHES Meyr.

Head smooth, sidetufts rather small, appressed. Antennæ moderate, in ♂ with long fine cilia (3-4), basal joint rather elongate, moderate, with thin pecten. Palpi rather long, second joint reaching or somewhat exceeding base of antennæ, densely scaled, somewhat loosely beneath, terminal joint as long as second, slender, recurved. Thorax smooth. Forewings elongate, narrow, apex obtuse, hindmargin very obliquely rounded. Hindwings slightly narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{3}{4}$ , scaled at base. Abdomen moderate. Middle tibiæ with a dense median whorl of projecting hairs; posterior tibiæ with short stiff hair-scales. Forewings with vein 7 to hindmargin. Hindwings normal.

I am unable to satisfy myself as to the affinity of this curious genus, concerning which more information is required. Structurally it presents no peculiarities, and differs little from *Peltophara*, to which it may be allied. It is however, quite exceptional in the curiously spotted hindwings of two of the species, evidently intended for display, though I know very little of their habits. I have not been able to obtain a specimen for dissection, all the species being retired and scarce, and it is possible the neuration may present further characters.

1a. Forewings with a white discal spot.

2a. Hindwings with a white subapical spot.....124. *hexastera*.

2b. „ without subapical spot.....123. *sphærophora*.

1b. „ without white spot.....125. *periclyta*.

123. *Petal. sphærophora*, n. sp.

Parva, alis ant. nigris, macula disci parva nivea; post. nigris, macula ad basim flavido-cana, altera disci nivea.

♂. 10 mm. Head and thorax blackish-fuscous, face with a few whitish scales. Palpi black, irregularly mixed with white. Antennæ, black, annulated beneath with white. Abdomen dark fuscous, mixed with coppery-metallic scales, with a yellowish-white basal band, and a whitish-yellow band midway between this and apex. Anterior tibiæ black irrorated with white, tarsi black

with white rings at apex of joints; middle and posterior legs whitish-yellow, tibiæ with an oblique dark fuscous band, tarsi dark fuscous with whitish-yellow rings at apex of joints. Forewings elongate, narrow, costa gently arched, apex rounded, hindmargin very oblique rounded; blackish-fuscous; a small somewhat oval snow-white spot obliquely placed in disc beyond middle: cilia blackish-fuscous. Hindwings blackish-fuscous; a round white spot, faintly yellowish-tinged, in inner angle, not quite touching margin; a somewhat smaller oval snow-white spot obliquely placed in middle of disc; cilia grey.

Differs from the following by the wholly blackish ground colour, the absence of the subapical spot of the hindwings, and the two broad abdominal bands.

One specimen on a fence at Sydney in October; Mr. G. H. Raynor took another at Blackheath (3500 feet) in November.

124. *Petal. hexastera*, n. sp.

Parva, alis ant. nigricantibus, flavido-strigulatis, basi, fascia antica, maculaque costæ postica nigris, macula disci parva nivea; post. nigris, macula ad basim ochreo-flava, altera disci partim nivea cum hac in costa conjuncta, tertia postica parva nivea.

♀.  $10\frac{1}{2}$ - $11\frac{1}{2}$  mm. Head and thorax dark fuscous, with a few yellow-whitish scales. Palpi black, with a slender white longitudinal line from base to apex on each side, and a third above. Antennæ blackish, with a very fine white longitudinal line above. Abdomen dark fuscous, with a broad whitish-yellow basal band, and four narrow whitish-yellow rings. Anterior legs blackish, irregularly striated with yellowish-white; middle tibiæ blackish, coarsely mixed with yellowish-white, tarsi black with yellowish-white rings at apex of joints; posterior tibiæ whitish-yellow with a dark fuscous apical band, tarsi dark fuscous with basal and apical joints whitish-yellow. Forewings elongate, narrow, costa gently arched, apex rounded, hindmargin very obliquely rounded; blackish-fuscous, with fine clearly marked somewhat irregular transverse yellow-whitish striæ; the absence of these produces a clear blackish narrow patch at base, a narrow

direct transverse fascia at  $\frac{2}{5}$ , and a costal spot at  $\frac{4}{5}$ ; a small oval snow-white spot transversely placed in disc beyond middle; sometimes an ill-defined whitish-yellow spot on costa beyond  $\frac{4}{5}$ ; cilia blackish-grey, mixed with whitish-yellow points, with a broad blackish line. Hindwings blackish-fuscous, a rather large whitish-yellow or light ochreous-yellow spot at base, connected with a yellowish-white posteriorly attenuated costal streak from base to  $\frac{2}{3}$ ; a transverse fascia-like spot in middle, connected above with costal streak, beneath almost touching lower margin, its upper half snow-white, lower half and extreme upper edge light ochreous-yellow; a small irregular-oval snow-white spot towards apex; cilia grey, with a broad basal blackish band.

Specially characterised by the fine pale strigulæ of the forewings, the white subapical spot of the hindwings, and the longitudinally striated palpi. The second of my two specimens sat constantly with the wings half-raised, and the forewings not fully covering the hindwings, but I did not observe this habit in the other individuals of the genus.

One specimen taken at Toowoomba, Queensland (2000 feet), in September, and a second near Hamilton, Victoria, in November; both at rest on trunks of *Eucalyptus*.

125. *Petal. periclyta*, n. sp.

Parva, alis ant. saturate purpureo-fuscis, cupreo-nitentibus, fascia prope basim, macula costæ post medium parva alteraque dorsi obscuris dilute ochreis; post. saturate flavis, postice anguste, apicem versus latius nigro-marginatis.

♂. 11 mm. Head and thorax black, thinly strewn with fine whitish-yellow hair-scales, lower part of face and sides of collar whitish-yellow. Palpi black, second joint coarsely mixed with white, terminal joint with an irregular white longitudinal line on each side. Antennæ black, annulated with white. Abdomen dark fuscous, violet-shining, beneath whitish-yellow. Anterior tibiæ black irrorated with white, middle tibiæ black with white median and apical bands, posterior tibiæ whitish-yellow, all tarsi

black with white rings at apex of joints. Forewings elongate, narrow, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; dark purple-fuscous, with blue and green reflections, with a transverse patch of raised scales in disc at  $\frac{1}{3}$ ; an ill-defined whitish-ochreous transverse fascia close to base; two or three scattered whitish-ochreous scales in disc below middle; a small ochreous-whitish spot on costa at  $\frac{2}{3}$ , and a similar less-defined spot on inner margin somewhat before it; an ochreous-whitish dot on costa before apex: cilia dark purple-fuscous. Hindwings deep yellow, apex broadly dark fuscous, with a very narrow dark fuscous border along lower margin; cilia dark grey, with a broad dark fuscous basal line.

A curious species, although the colouring of the hindwings is here of a normal type. The raised scales of the forewings seem natural, but I am not sure that they are really so.

Sydney, in October; one specimen at rest on a fence.

#### 24. LINOSTICHA Meyr.

Head loosely haired, sidetufts large, loosely spreading. Antennæ in ♂ moderate, with long fine cilia (4) on basal half, shorter towards apex, basal joint rather stout, with strong pecten. Palpi moderately long, second joint reaching or somewhat exceeding base of antennæ, with appressed scales, somewhat loose beneath, terminal joint as long as second, slender, recurved. Thorax smooth. Forewings elongate, moderate, apex pointed, hindmargin very oblique. Hindwings somewhat narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{2}{3}$ . Abdomen moderate. Posterior tibiæ clothed with fine moderate hairs above. Forewings with vein 7 to apex, 2 almost from angle of cell. Hindwings normal.

Closely allied to *Eulechria*, of which it is doubtless a development, differing essentially only by the long fine ciliations of the antennæ.

- 1a. Forewings grey..... 126. *scythropha*.  
 1b. „ white..... 127. *canephora*.



126. *Lin. scythropa*, n. sp.

Minor, alis ant. dilutius griseis, sericeis, puncto disci nigro ; post. griseis.

♂ ♀.  $13\frac{1}{2}$ - $15\frac{1}{2}$  mm. Head, palpi, antennæ, thorax, and abdomen rather light glossy grey, inner side of palpi and apex of abdomen whitish, terminal joint of palpi anteriorly dark fuscous. Anterior and middle legs rather dark grey, posterior legs ochreous-whitish. Forewings moderate, costa gently arched, apex acute, hindmargin straight, very oblique uniform light glossy grey ; a blackish dot in disc beyond middle, generally distinct, sometimes nearly obsolete ; cilia glossy whitish-grey. Hindwings fuscous-grey. darker towards apex ; cilia grey-whitish, with an indistinct grey line near base.

An inconspicuous species, somewhat resembling *Eulechria achalinella*.

Common round Sydney amongst dry scrub in November ; also met with at Blackheath (3500 feet) in January.

127. *Lin. canephora*, n. sp.

Minor, alis ant. niveis, partim griseo-sparsis, triangulo dorsi ad basim, macula dorsi postica elongata magna lineaque postica angulata saturate griseis, punctis disci tribus nigricantibus ; post. albido-griseis.

♂ ♀. 17-18 mm. Head, palpi, antennæ, thorax, abdomen, and legs white ; thorax with a suffused fuscous-grey spot on each side of back ; anterior legs dark fuscous above, apex of joints white. Forewings elongate, costa gently arched, slightly sinuate in middle, apex round-pointed, hindmargin very obliquely rounded ; white ; costal edge dark fuscous at base ; a slender fuscous-grey suffusion beneath costa from  $\frac{1}{4}$  to beyond middle ; a suffused dark-grey oblique triangular blotch on inner margin towards base, reaching half across wing, mixed with blackish above and posteriorly ; a large grey oblong blotch extending on inner margin from  $\frac{1}{3}$  to anal angle, anteriorly mixed with blackish and connected with a small blackish spot in disc before middle, posteriorly more or less suffused and ill-defined ; two cloudy dark fuscous dots transversely placed

in disc beyond middle, connected with costa beyond middle by a few grey scales; a cloudy dark fuscous-grey outwards-angulated transverse line from costa at  $\frac{3}{4}$  to hindmargin above anal angle; beyond this some scattered grey scales; a row of cloudy almost confluent dark fuscous dots along hindmargin and apical fourth of costa: cilia white, with a few grey spots. Hindwings pale whitish-grey, under surface white; cilia white.

Very distinct and easily recognisable.

One specimen taken at Launceston, Tasmania, at the end of January; a second near Mount Gambier, South Australia, in November.

#### 25. PHRICONYMA Meyr.

Head loosely haired, sidetufts moderately large, loosely spreading. Antennæ in ♂ moderate, moderately and evenly ciliated (1), basal joint moderate, with strong pecten. Palpi moderate, second joint hardly reaching base of antennæ, beneath dilated with roughly projecting laterally compressed scales on apical half, terminal joint shorter than second, moderate, recurved. Thorax smooth. Forewings elongate, moderate, apex obtusely pointed, hindmargin very oblique. Hindwings somewhat narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{4}{5}$ . Abdomen elongate. Posterior tibiæ clothed with long hairs above. Forewings with vein 7 to apex, 2 with 3 from angle of cell, upper fork of 1 obsolete. Hindwings with veins 3 and 4 short-stalked.

Also near *Eulechria*, differing in the peculiarities of neuration, and the projecting scales of the second joint of palpi; also certainly related to *Locheutis*. It is probably a direct offshoot of *Eulechria*.

#### 128. *Phric. lucifuga*, n. sp.

Minor, alis ant. griseis, leviter nigro-sparsis, punctis disci tribus nigris; post. griseis; capite cano.

♂ ♀. 15 $\frac{1}{2}$ -18 mm. Head white, mixed with grey on crown. Palpi dark grey, terminal joint and apex of second mixed with white. Antennæ dark fuscous. Thorax fuscous-grey, sometimes irrorated with blackish. Abdomen whitish-grey. Anterior and middle legs dark grey; posterior tibiæ grey-whitish, tarsi grey with

whitish rings at apex of joints. Forewings elongate, narrow. costa slightly arched, apex round-pointed, hindmargin very obliquely rounded; dull grey, thinly irrorated with blackish; a small black dot in disc before middle, another obliquely somewhat before it on fold, and a third larger and more conspicuous in disc beyond middle; cilia light grey, irrorated with blackish. Hindwings grey; cilia light grey.

An obscure species, liable to be overlooked.

Blackheath, New South Wales (3500 feet), in January and March; tolerably common.

#### 25\*. LOCHEUTIS n. g.

Head with appressed scales, sidetufts rather small loosely appressed. Antennæ in ♂ moderate, somewhat serrate, with whorls of long cilia ( $2\frac{1}{2}$ -4), basal joint moderate, without pecten. Palpi moderately long, second joint somewhat exceeding base of antennæ, thickened with dense appressed scales, somewhat rough beneath, terminal joint shorter than second, moderate, recurved. Thorax smooth. Forewings elongate, apex rounded, hindmargin very obliquely rounded. Hindwings slightly narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{3}{4}$  to 1. Abdomen moderate. Posterior tibiæ clothed with rather short dense hairs above. Forewings with vein 7 to apex, 2 from before apex of cell. Hindwings normal.

This genus is not included in the analytical tabulation, as I have only recently obtained the species on which it is founded. It is allied to *Eulechria*, differing in the long ciliations of the antennæ, and the absence of the basal pecten. In the tabulation it should be referred to the same head as *Linosticha* and *Macronemata*, but distinguished from both by the absence of the pecten. It may be regarded as partially intermediate between *Phloeopola* and *Eulechria*; I consider it to be probably an offshoot from a genus (perhaps extinct) which should connect these two. Further material is required to decide the affinities of these small allied genera. This genus is as yet exclusively Tasmanian.

- 1a. Forewings with a whitish-yellow anterior fascia..131. *ancyrota*.  
 1b. „ without pale fascia.  
 2a. Forewings with a suffused dark fascia enclosing  
     a pale discal spot.....130. *desmophora*.  
 2b. „ not fasciated.....129. *philochoa*.

129. *Loch philochoa*, n. sp.

Minor, alis ant. griseis, albido-ochreo conspersis, macula costæ ad basin parva, punctis costæ duobus, disci tribus, lineaque postica transversa sæpius obsoleta nigricantibus; post. griseis.

♂. 12 $\frac{1}{2}$ -15 mm. Head whitish-ochreous. Palpi dark-fuscous, apex of second joint whitish-ochreous. Antennæ dark-fuscous. Thorax grey, mixed with whitish-ochreous towards shoulders. Abdomen pale ochreous-grey. Legs dark fuscous, posterior tibiæ and apex of all tarsal joints obscurely ochreous-whitish. Forewings elongate, costa slightly arched, somewhat bent near base, apex round-pointed, hindmargin very obliquely rounded; grey, irrorated with whitish-ochreous; an oblong black spot along costa at base; costal edge blackish from base to middle, a small blackish spot on costa at  $\frac{1}{3}$ , another somewhat beyond middle, and a third a little before apex; a black dot in disc before middle, a second hardly beyond middle, and a third obliquely before first on fold; a very obscure dark fuscous transverse line from ante-apical costal spot to anal angle, sharply indented inwards beneath costa, often obsolete: cilia grey, mixed with whitish-ochreous towards base. Hindwings fuscous-grey, apex somewhat darker; cilia light fuscous-grey.

Readily distinguished from *L. desmophora* by the lighter and more uniform grey colouring, the sharply-defined basal spot, the distinctness of the other dots, and the absence of any darker transverse shade.

Abundant round Deloraine Tasmania, in November, especially along the roadsides, but I observed it nowhere else; the ♂ is active and readily disturbed by day, but I failed to obtain the other sex.

130. *Loch. desmophora*, n. sp.

Minor, alis ant. fuscis, albido nigroque conspersis, macula costæ parva, punctis disci duobus anticis, fascia nebulosa punctum albidum includente, lineaque postica transversa obscura nigrescentibus; post. saturate griseis.

♂. 12-15 mm. Head and thorax whitish-grey, mixed with dark fuscous. Palpi dark fuscous, mixed with whitish-grey, apex of second joint whitish. Antennæ dark fuscous. Abdomen light grey. Legs dark fuscous, apex of all joints, central band of middle tibiæ, and hairs of posterior tibiæ ochreous-white. Forewings elongate, costa slightly arched, somewhat bent near base, apex round-pointed, hindmargin very obliquely rounded; fuscous, densely irrorated with ochreous-whitish and with scattered black scales; base of costa and inner-margin blackish-fuscous; a small blackish-fuscous spot on costa before  $\frac{1}{3}$ , a blackish dot in disc before middle, and another obliquely before it on fold, all three sometimes confluent; a triangular blackish-fuscous spot on costa somewhat beyond middle, connected with inner margin before anal angle by a cloudy dark fuscous shade, containing a white or whitish dot in disc, margined above by a blackish dot; a cloudy blackish-fuscous transverse line from costa a little before apex to anal angle, dilated on costa and sharply indented beneath it, often obscure; cilia fuscous-grey mixed with ochreous-whitish, tips ochreous-whitish. Hindwings dark fuscous-grey; cilia light fuscous-grey, tips pale.

Closely allied to the preceding, but differing in the fuscous colouring, more suffused markings, the transverse darker shade beyond middle and included whitish dot, and darker hindwings.

Mount Wellington, Tasmania, at about 1000 feet; seven specimens.

131. *Loch. ancyrota*, n. sp.

Minor, alis ant. purpureo-griseis, nigro-conspersis, puncto dorsi antico, altero costæ postico, fascia antica oblique interrupta, strigaeque dorsi postica deflexa albido-flavis; post. saturate griseis.

♂ ♀. 11-14 mm. Head and thorax dark fuscous, slightly mixed with whitish, face white. Palpi whitish-yellow, terminal joint

and extreme base and apex of second joint black. Antennæ dark fuscous, in ♀ annulated with whitish-yellow. Abdomen dark fuscous. Legs dark fuscous, central ring of anterior and middle tibiæ and apex of all joints yellowish-white, hairs of posterior tibiæ whitish. Forewings moderate, costa gently arched, somewhat bent near base, apex rounded, hindmargin very obliquely rounded; purplish-grey, very finely irrorated with black, most densely on costa and hindmargin; a very small whitish-yellow spot on inner margin at  $\frac{1}{4}$ ; a straight narrow whitish-yellow fascia from  $\frac{1}{4}$  of costa to middle of inner margin, interrupted on fold; a narrow whitish-yellow streak from lower extremity of this to disc beyond and below middle, its posterior extremity connected with anal angle by some irregular whitish-yellow scales; a very small whitish-yellow spot on costa at  $\frac{3}{4}$ ; cilia purplish-grey, mixed with black towards base, with a darker line. Hindwings and cilia dark grey.

Unlike any other species in marking.

Deloraine, Tasmania; nine specimens beaten from *Leptospermum scoparium* in swamp in November.

## 26. IOPTERA Meyr.

Head with appressed scales, sidetufts large, loosely spreading, meeting above. Antennæ in ♂ stout, serrate, with extremely long and fine dense cilia (7), basal joint stout, short, with strong pecten. Palpi rather short, second joint not nearly reaching base of antennæ, with appressed scales, beneath dilated to form a short angular projection at apex, somewhat rough beneath; terminal joint as long as second, slender, oblique. Thorax smooth. Forewings elongate, narrow, apex obtusely pointed, hindmargin straight, very oblique. Hindwings as broad as forewings, elongate, parallel-sided, hindmargin slightly rounded, cilia  $\frac{3}{4}$ . Abdomen elongate, somewhat flattened. Legs very elongate, posterior tibiæ clothed with rather long hairs above. Forewings with vein 7 to apex, 2 from angle of cell. Hindwings normal.

Probably a development from *Linosticha*, with exaggerated characteristics; the antennal ciliations reach their maximum in this genus.

132. *Iopt. aristogona*, n. sp.

Media, alis ant. fuscis, albido-conspersis, maculis sub costa quinque parvis, strigulis disci longitudinalibus plerisque, signoque disci postico transverso cum dorso connexo nigrescentibus; post. dilute griseis.

♂. 22 mm. Head white mixed with grey, crown dark grey. Palpi fuscous-grey, terminal joint and extreme apex of second mixed with white, second joint internally suffused with white. Antennæ ochreous-whitish. Thorax fuscous-grey mixed with white. Abdomen ochreous-whitish. Anterior and middle legs dark fuscous-grey, posterior legs ochreous-whitish. Forewings very elongate, narrow, costa very slightly arched, somewhat sinuate beyond middle, apex round-pointed, hindmargin very oblique, slightly rounded; rather light brownish-grey, thickly and irregularly strewn with white, more scantily along costa and inner margin; four small ill-defined blackish spots below costa between middle and apex; a short cloudy blackish oblique streak beneath costa about  $\frac{1}{4}$ , and three others more clearly defined beneath the first three subcostal spots; inner margin broadly and irregularly irrorated with blackish; two or three ill-defined longitudinal streaks of blackish scales in disc; a transverse blackish mark in disc at  $\frac{3}{5}$ , emitting two slightly diverging cloudy blackish lines directly to inner margin; a small cloudy blackish oval spot in disc beyond this; cilia grey-whitish, with a broad cloudy fuscous-grey median line. Hindwings pale fuscous-grey; cilia whitish, with a broad suffused light grey median shade.

A distinct and rather elegant species.

Sydney, in April; one fine specimen at rest on a fence.

## 27. MACRONEMATA Meyr.

Head smooth, sidetufts rather small, loosely spreading behind. Antennæ in ♂ moderate, somewhat serrate, strongly ciliated (3), basal joint rather stout, with strong pecten. Palpi moderate, second joint not reaching base of antennæ, densely scaled, somewhat loosely beneath, terminal joint rather shorter than second,

moderate, recurved Thorax smooth. Forewings elongate, moderate, apex obtusely pointed, hindmargin very obliquely rounded. Hindwings rather narrower than forewings, elongate-ovate, hindmargin rounded, cilia 1. Abdomen dilated, distinctly flattened. Posterior tibiæ clothed with dense moderate hairs above. Forewings with vein 7 to apex, 2 from near angle of cell. Hindwings normal.

Closely allied to *Linosticha*, of which it is probably an off-shoot; it differs from *Linosticha* principally by the second joint of palpi not reaching base of antennæ, the terminal joint rather shorter than second (so that the whole palpi are considerably shorter), and the somewhat flattened abdomen. The species are small and very inconspicuous.

- 1a. Forewings nearly unicolorous fuscous.....133. *lopelictes*.  
 1b. „ pale greyish-ochreous, with black dots 134. *elaphia*.

133. *Macr. lopelictes*, n. sp.

Parva, alis ant. saturatius fuscis; post. saturatius fuscis.

♂ ♀. 10-11 mm. Head, palpi, antennæ, thorax, and abdomen fuscous, somewhat mixed with paler. Legs fuscous, posterior tibiæ whitish-ochreous, and tarsi with ochreous-whitish rings at apex of joints. Forewings moderate, costa moderately arched, apex pointed, hindmargin very oblique, slightly rounded; fuscous or dark fuscous, finely irrorated with paler; cilia fuscous. Hindwings dark fuscous; cilia fuscous, with an indistinct darker line near base.

A very obscure-looking insect.

Toowoomba, Queensland; three specimens in September.

134. *Macr. elaphia*, n. sp.

Parva, alis ant. dilute griseis, albido-ochreo conspersis, leviter nigro-sparsis, puncto disci postica majore nigro; post. dilute griseis.

♂. 10½-11½ mm. Head, palpi, and thorax whitish-ochreous, second joint of palpi externally suffused with dark fuscous. Antennæ dark fuscous. Abdomen pale grey. Legs dark fuscous, posterior tibiæ ochreous-grey-whitish, apex of all tarsal joints ochreous-whitish. Forewings elongate, costa moderately arched.



apex round-pointed, hindmargin extremely obliquely rounded: light grey, densely irrorated and costa suffused with pale whitish-ochreous; base of costa black; some scattered black scales, especially towards apex, and sometimes seeming to form a dot in disc before middle, and another obliquely before it on fold; a larger blackish dot in disc beyond middle: cilia pale grey, irrorated with pale whitish-ochreous. Hindwings light grey; cilia whitish-grey, with a faint darker line.

Near the preceding, but cannot be confused with it.

Hobart and Deloraine, Tasmania, in November and December; common but local.

## 28. PHLEOPOLA Meyr.

Head with loosely appressed scales, sidetufts large, loosely spreading. Antennæ in ♂ moderately stout, somewhat serrate, moderately ciliated ( $\frac{2}{3}$ -2), basal joint rather elongate, moderate, without pecten. Palpi long or rather long, second joint reaching or exceeding base of antennæ, dilated with dense appressed scales, slightly rough beneath, terminal joint as long as second or somewhat shorter, moderate or stout, strongly recurved. Thorax with dense posterior crest. Forewings elongate, moderate, apex bluntly rounded, hindmargin oblique. Hindwings as broad as forewings or somewhat narrower, elongate ovate, hindmargin rounded, cilia  $\frac{1}{2}$  to  $\frac{2}{3}$ . Abdomen moderate, strongly margined. Middle tibiæ with a median whorl of projecting hairs, and roughly short-haired beneath; posterior tibiæ clothed with long dense hairs above. Forewings with vein 7 to apex, 2 from angle of cell. Hindwings normal.

This genus appears to form the nearest representative of the transitional stage between the two main groups of the family, that of *Oecophora* on the one hand, and that of *Eulechria* and *Philobota* on the other. It is therefore of considerable importance. The apex of the forewings is in most of the species peculiarly rounded, so that it is difficult to determine where the exact apical point is, and the termination of vein 7 appears therefore in some cases to fluctuate between the costa and hindmargin. It is then easy to

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understand how, when such a form of wing had prevailed for some moderate period, when again species with more pointed (but on the whole somewhat broader) wings were produced, the termination of vein 7 was found to have slipped round from the costa to the hindmargin, and thus another type was established, of which the hindmarginal termination was the most persistent character. It should be observed that there are strictly only these two types, the apical termination being properly regarded as a special case of the hindmarginal. *Phlæopota* may be considered as a development from *Oecophora* itself (but not immediate, a connecting link being required), and as closely approaching the parent form of *Eulechria*; it differs from both by the strong thoracic crest, and the absence of the antennal pecten, both of which characters, however, recur in several of the allied genera. The genus should be of very considerable antiquity. There is one New Zealand species; the Australian species are principally southern, and especially Tasmanian. There is considerable reason to suppose that the larvæ feed in bark or dead wood, as with many species of *Oecophora*.

I have at present twelve species, of which the following is a tabulation:—

- 1a. Hindwings with a darker central lunule...135. *dinocosma*.
- 1b. „ without darker lunule.
- 2a. Hindwings whitish-yellow, at least towards  
base.....141. *confusella*.
- 2b. „ fuscous or grey.
- 3a. Forewings snow-white.....142. *synchyta*.
- 3b. „ more or less greyish or ochreous-  
tinged.
- 4a. With a large clear blackish dorsal triangle...146. *melanodelta*.
- 4b. Without defined dorsal spot.
- 5a. Forewings strongly dilated posteriorly.
- 6a. Costal spots suffusedly darker.
- 7a. With a blackish streak from costa along fold..137. *semocausta*.
- 7b. Without streak on fold.
- 8a. Antennæ dark fuscous.....136. *asbolæa*.
- 8b. „ annulated with whitish-ochreous...138. *helica*.

- 6b. Antennæ tolerably well-defined blackish.  
 7a. Forewings short .....140. *turbatella*.  
 7b. „ elongate.....139. *psephophora*.  
 5b. „ not or slightly dilated.  
 6a. Ground colour grey-whitish.....145. *lithoglypta*.  
 6b. „ whitish-ochreous,  
 7a. Palpi mostly whitish-ochreous.....144. *exarcha*.  
 7b. „ wholly dark-fuscous.....143. *banarusa*.

135. *Phloe, dinocosma*, Meyr.

Media, alis ant. fuscis, ochreo-nebulosis, costa partim, dorsis basi, maculis disci tribus strigulaque media nigrantibus; post. albido-griseis, lunula media saturatiore.

Immediately distinguished from all others by the distinct darker lunule of the hindwings, a very rare characteristic in the family; the discal markings are much as in *Phloe. semocausta*.

Wellington, New Zealand; one specimen in January.

136. *Phloe. asbolaea*, n. sp.

Media, alis ant. fuscis, apice saturatiore, margine costali punctisque disci tribus longitudinaliter positis atque albido-ochreo disjunctis, quarta etiam plicae nigrescentibus; post. saturate griseis.

♂. 23 mm. Head and thorax whitish-ochreous suffused with dark fuscous. Palpi whitish-ochreous, strongly mixed with dark fuscous, terminal joint, and basal half and subapical ring of second joint dark fuscous. Antennæ dark fuscous. Abdomen grey. Legs dark fuscous, central ring of middle tibiæ and apex of all joints slenderly whitish, hairs of posterior tibiæ grey-whitish. Forewings elongate, posteriorly moderately dilated, costa gently arched, apex rounded, hindmargin obliquely rounded whitish-ochreous, almost wholly suffused with pale fuscous, and mixed with fuscous and dark fuscous; costal edge blackish-fuscous; some cloudy irregular dark fuscous spots towards base; a small round blackish-fuscous spot in disc before middle, a second in middle, and a third beyond middle, lying in a straight line, and separated by clear whitish-ochreous-spots; a fourth on fold obliquely before first; a cloudy

fuscous suffusion towards apex, its inner edge indicating the usual transverse indented line : cilia whitish-ochreous, suffusedly mixed with light fuscous, base suffused with dark-fuscous. Hindwings dark grey ; cilia grey.

In the general dark suffusion this species resembles some forms of *Phloe. banausa*, which latter is always recognisable by the thickened terminal joint of the palpi, it differs however from all in the arrangement of the discal dots, and their separation by whitish-ochreous dots.

Deloraine, Tasmania ; one good specimen in November.

137. *Phloe. semocausta*, n. sp.

Media, alis ant. albido-ochreis, fusco-mixtis, striga e costæ basi perobliqua, punctis disci tribus strigulaque media, serie etiam marginis postici nigrescentibus, maculis costæ duabus serieque punctorum postica flexuosa nebulosis fuscis ; post. griseis.

♂. 20-24 mm. Head whitish-ochreous. Palpi whitish-ochreous, with terminal joints towards base, and a subapical ring and basal half of second joint dark fuscous. Antennæ fuscous, ciliations 2. Thorax whitish-ochreous, anterior margin suffused with dark fuscous. Abdomen ochreous-whitish, mixed with grey. Legs dark fuscous, central ring of middle tibiæ, hairs of posterior tibiæ, and apex of all joints whitish-ochreous. Forewings rather elongate, broadly dilated posteriorly, costa moderately arched, apex rounded, hindmargin straight or very slightly sinuate, oblique ; pale whitish-ochreous, irrorated with grey and dark fuscous scales ; a thick blackish suffused streak from base of costa along fold to  $\frac{1}{3}$  ; a blackish dot on base of inner margin ; a cloudy fuscous suffusion along basal half of costa, darker posteriorly ; a cloudy fuscous oblong spot on costa somewhat beyond middle ; a cloudy blackish-fuscous dot in disc at  $\frac{1}{3}$  above and beyond apex of basal streak, and a short blackish fuscous transverse mark in disc beyond middle ; between these is a short longitudinal blackish-fuscous line, beneath posterior extremity of which is a blackish-fuscous dot ; a transverse outwards-curved line of cloudy dark fuscous nearly confluent dots from  $\frac{4}{5}$  of costa to before anal angle,

sharply indented inwards above middle; a hindmarginal row of well-defined dark fuscous dots; cilia pale whitish-ochreous, towards base very obscurely spotted with fuscous, and with a fuscous-grey median line. Hindwings grey, base lighter; cilia whitish-ochreous, with a broad suffused grey line.

Distinguished from all by the suffused dark fuscous streak from base of costa along fold; it has also the forewings more broadly dilated, and the ciliations of the antennæ longer, than in any other species; the transverse form of the posterior discal dot, the short longitudinal streak in disc between the dots, and the well-defined series of dots on the hindmargin, are also reliable characteristics.

Deloraine, Tasmania; five specimens taken in November, flying after dusk on the river-bank.

138. *Phloe. helica*, n. sp.

Media, alis ant. ochreo-albidis, ochreo-fusco nigroque irroratis, maculis costæ tribus obscuris fuscis, strigula dorsi antica maculaque costæ postica pallidis, punctis disci quinque nigris; post. griseis.

♂. 23 mm. Head whitish-ochreous, crown suffused with fuscous. Palpi ochreous-whitish, basal half and a subapical ring of second joint, and basal third of terminal joint dark fuscous. Antennæ whitish-ochreous, annulated with dark fuscous. Thorax dark fuscous, mixed with ochreous-whitish. Abdomen ochreous-whitish. Legs dark fuscous, central ring of middle tibiæ and apex of all joints whitish-ochreous, hairs of posterior tibiæ grey-whitish. Forewings elongate, posteriorly considerably dilated, costa moderately arched, apex obtuse, hindmargin straight, oblique; ochreous-whitish, densely irrorated with ochreous-brown and blackish scales; a very ill-defined cloudy dark fuscous triangular spot on costa at  $\frac{1}{3}$ , another somewhat beyond middle, and a third, larger and with the apex black, on costa before apex; between the second and third the costal space is clear ochreous-whitish; an oblique whitish mark on inner margin at  $\frac{1}{4}$ , surrounded by a darker suffusion; a sharply-defined partially pale-margined black dot in disc at  $\frac{1}{3}$ , a second in middle, and a third considerably larger beyond middle; a fourth on fold directly beneath first, and a fifth,

less defined, between fourth and second ; hindmarginal space paler, through absence of blackish irroration ; cilia ochreous-whitish, mixed with blackish, forming obscure transverse bars. Hindwings grey ; cilia ochreous-whitish suffused with grey.

Superficially most like *Phloe. asbolaea*, but with the dark suffusion incomplete, the discal dots not connected by pale spots yet more clearly defined, the forewings more strongly dilated, and with the apex less rounded and hindmargin straight, and the antennæ annulated with whitish-ochreous.

Deloraine, Tasmania ; one fine specimen November.

139 *Phloe. psephophora*, n. sp.

Media, alis ant. albido-ochreis, griseo-suffusis, costa pallida, strigula costæ ad basim obliqua, altera ante medium reversa, puncto costæ medio, aliis disci quatuor, lineaque postica transversa flexuosa nigris ; post. griseis.

♂. 16-21 mm. Head pale yellowish-ochreous. Palpi pale yellowish-ochreous, basal  $\frac{2}{3}$  and a subapical ring of second joint, and more or less of terminal joint externally black. Antennæ fuscous or dark fuscous. Thorax dark fuscous, with a large whitish-ochreous spot on each side. Abdomen grey. Legs dark fuscous, apex of joints and hairs of posterior tibiæ grey-whitish. Forewings elongate, posteriorly moderately dilated, costa gently arched, apex rounded, hindmargin rather strongly oblique, rounded ; whitish-ochreous, suffused with light grey ; costal edge usually clear whitish-ochreous ; a short narrow very oblique black streak from base of costa above fold ; a short slender inwardly oblique black streak from costa at  $\frac{1}{3}$ , almost reaching apex of basal streak ; a small elongate blackish spot on costa somewhat beyond middle ; a small blackish spot at base of inner margin, generally separated from costal streak by a small clear whitish-ochreous spot ; a black dot on inner margin near base ; a black dot in disc before middle, a second beyond middle, a third on fold very obliquely before first, and fourth in disc below middle ; immediately beneath the second is a clear ochreous-whitish dot ; a strongly outwards-curved wavy blackish-fuscous transverse line from costa at  $\frac{4}{5}$  to inner margin

before anal angle, sharply indented inwards above middle; a slender fuscous streak from apex along upper half of hindmargin; cilia whitish-ochreous, suffused with light grey, obscurely barred with dark fuscous towards base on upper half of hindmargin and above apex. Hindwings grey; cilia pale grey.

Easily recognised by the general neatness and clearness of all markings, the two converging anterior strigulæ from the costa, the arrangement of the discal dots, and the more yellowish head.

Common at Deloraine, and up to 1200 feet on Mount Wellington, Tasmania, from November to January.

140. *Phloe. turbatella*, Walk.

(*Cryptolechia turbatella*, Walk., Brit. Mus. Cat., 765.)

Media, alis ant. dilute griseo-ochreis, fusco-nebulosis, maculis costæ duabus, tertia dorsi antica, punctis ad basim plerisque, disci tribus, lineaque postica flexuosa nigrescentibus; post. griseis.

♂ ♀. 17-19 mm. Head whitish-ochreous, crown suffused with dark fuscous. Palpi whitish-ochreous mixed with dark fuscous, basal half and subapical ring of second joint dark fuscous. Antennæ pale greyish-ochreous, obscurely ringed with dark fuscous, ciliations in ♂ whorled. Thorax blackish-fuscous, slightly mixed with pale ochreous, with suffused whitish-ochreous lateral and posterior spots. Abdomen whitish-ochreous. Legs dark fuscous, central ring of tibiæ, apex of all joints, and hairs of posterior tibiæ, whitish-ochreous. Forewings moderate, posteriorly distinctly dilated, costa moderately arched, apex rounded, hindmargin obliquely rounded; pale dull whitish-grey-ochreous, irregularly irrorated with blackish-fuscous; four or five small irregular variable blackish spots towards base; a narrow suffused often indistinct dark fuscous fascia from  $\frac{1}{4}$  of costa to  $\frac{1}{3}$  of inner margin, including a small blackish spot on costa, another in disc, and a third rather larger on fold; a small suffused blackish spot on costa slightly beyond middle; a small black spot in disc beyond middle, and a smaller less distinct spot oblique beneath and before it, sometimes partially confluent; these are sometimes connected with second costal spot by a fuscous shade; an indistinct fuscous

suffusion above anal angle; a transverse row of suffused partially confluent blackish-fuscous spots from costa at  $\frac{4}{5}$  to before anal angle; outwards-curved, dilated on costa, sharply indented inwards above middle: a hindmarginal row of very suffused dark fuscous spots: cilia pale whitish-ochreous, basal half obscurely barred with dark fuscous. Hindwings fuscous-grey, paler towards base; cilia grey-whitish, with an indistinct grey line.

Proportionately shorter-winged than any other species; well characterised also by the conspicuous blackish costal spots, (larger and coarser than in *Phloe. psephophora*), and the tendency of the discal dots to form with these transverse fasciæ.

Brisbane, Sydney and Melbourne, from September to December; tolerably common, principally at light. Walker's type is said to be from Tasmania, which is not unlikely.

141. *Phloe. confusella*, Walk.

(*Oecophora confusella*, Walk., Brit. Mus. Cat., 682.)

Major, alis ant. ochreo-albidis, fusco-sparsis, fascia antica lata perobliqua, altera post medium abbreviata cum tertia ex apice conjuncta, macula costæ parva antica punctisque disci duobus saturate fuscis; post. albido-flavis, apicem versus griseo-suffusis.

♂ ♀., 18-27 mm. Head dark fuscous, face whitish-ochreous. Palpi whitish-ochreous, basal half and subapical ring of second joint dark fuscous, terminal joint dark fuscous except extreme base and apex. Antennæ dark fuscous. Thorax dark fuscous, with small lateral and posterior ochreous-whitish spots. Abdomen whitish-yellow. Legs dark fuscous, central ring of tibiæ, apex of all joints, and hairs of posterior tibiæ whitish yellowish. Forewings moderate, costa gently arched, apex rounded, hindmargin obliquely rounded; ochreous-white, coarsely irrorated with dark fuscous; a rather broad irregular-edged dark fuscous fascia from costa almost at base to  $\frac{1}{3}$  of inner margin, considerably dilated beneath; a small oblique cloudy dark fuscous spot on costa at  $\frac{1}{3}$ ; a large blackish dot in disc before middle, and another below middle; a moderately broad irregular dark fuscous fascia, attenuated beneath costa, from costa beyond middle almost to anal angle;



a broad inwardly oblique dark fuscous blotch from costa before apex, confluent with extremity of central fascia, emitting from middle of posterior edge a partially interrupted dark fuscous line very near hindmargin to inner margin before anal angle; a hind-marginal row of ill-defined dark fuscous dots: cilia ochreous-whitish, mixed with grey, with a suffused grey line, basal half obscurely barred with dark fuscous. Hindwings whitish-yellowish, towards apex more or less broadly suffused with grey; cilia whitish, more yellowish towards base, with an indistinct grey line, and sometimes a second before tips.

Very distinct by the pale yellowish hindwings, and broad oblique anterior fascia.

Sydney and Melbourne, in December and January; locally common at rest on the trunks of *Eucalyptus*, especially in the Sydney parks.

142. *Phloe. synchyta*, n. sp.

Media, alis ant. niveis, costæ basi lineaque prope basim obliqua nigrescentibus, disco usque ad dorsum fusco-suffuso, macula costæ post medium parva alteraque postica angulum analem versus producta saturate fuscis; post. griseis.

♂ ♀. 16½-19 mm. Head snow-white. Palpi white, base and a slender subapical ring of second joint dark fuscous, terminal joint dark fuscous except towards base. Antennæ whitish, obscurely ringed with fuscous. Thorax dark fuscous, with a small white spot on each side, and a larger one behind. Abdomen ochreous-whitish. Anterior and middle legs dark fuscous, central ring of tibiæ and apex of all joints whitish; posterior legs ochreous-whitish. Forewings rather elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; snow-white, thinly and irregularly strewn with dark fuscous scales; a very small dark fuscous spot at base of costa; a sharply-defined slender dark fuscous streak from inner margin almost at base to costa at  $\frac{1}{4}$ , somewhat inwards-curved, with a blunt tooth projecting towards basal spot, and interrupted immediately below costa; a small irregular dark fuscous spot on costa slightly beyond middle; an irregular variable cloudy fuscous suffusion in middle of disc,

extending to inner margin, containing one or two darker spots, and leaving a small white spot in disc beyond middle; a broad inwardly oblique ill-defined dark fuscous blotch from costa before apex, sometimes confluent beneath with discal suffusion, lighter and more suffused towards disc; two or three small dark fuscous spots near lower part of hindmargin: cilia white, towards tips mixed with grey, on basal half barred with dark fuscous. Hindwings rather light fuscous-grey; cilia grey-whitish.

Conspicuously distinct from all by the clear white ground colour, and the dark inwards-curved transverse streak from near base of inner margin.

Sydney, in January; three specimens at rest on tree trunks.

143. *Phloe. banausa*, n. sp.

Media, alis ant. dilute ochreis, saturate fusco-nebulosis, maculis costæ duabus, tertia postica magna lineam transversam emittente, quarta dorsi, antica punctisque disci tribus nigrescentibus, puncto disci ochreo-albido; post. albido-griseis; palporum articulo apicali incrassato.

♂ ♀. 18-22 mm. Head whitish-ochreous, with a dark fuscous spot above each eye. Palpi wholly dark fuscous, terminal joint considerably thickened. Antennæ fuscous. Thorax dark fuscous, slightly mixed with pale ochreous, with whitish-ochreous lateral and posterior spots. Abdomen whitish-ochreous. Legs dark fuscous, central ring of tibiæ, apex of all joints, and hairs of posterior tibiæ whitish-ochreous. Forewings elongate, moderate, slightly dilated, costa moderately arched, apex rounded, hindmargin obliquely rounded; whitish-ochreous, coarsely irrorated with dark fuscous, and irregularly suffused with light fuscous in disc and towards base; several small irregular dark fuscous spots at base; a suffused irregular dark fuscous spot on costa at  $\frac{1}{3}$ , another slightly beyond middle, and a third, larger and more suffused, on inner margin before middle; a small round dark fuscous spot in disc at  $\frac{1}{3}$ , and a second on fold rather before it, more or less confluent with dorsal blotch; a third similar spot beneath costa about middle, and a fourth in disc beyond middle, more or less absorbed

in discal suffusion; beneath the fourth is a small clear whitish-ochreous dot; a broad inwardly oblique dark fuscous blotch from costa before apex, preceded by a clear whitish-ochreous spot on costa, and emitting a suffused dark fuscous attenuated streak to before anal angle; the narrow hindmarginal space beyond this is clear whitish-ochreous; a row of small triangular dark fuscous spots along hindmargin: cilia whitish-ochreous, posteriorly suffused with grey, basal half obscurely barred with dark fuscous. Hindwings whitish-grey, apex somewhat darker; cilia whitish-grey, base pale.

Var. *a*. Head suffused above with dark fuscous; markings of forewings almost wholly lost in general dark fuscous suffusion. Hindwings grey.

Var. *b*. Similar to var. *a*, but with the whitish discal dot well-defined.

Although variable in respect of the dark fuscous suffusion, always immediately recognisable by the palpi, which are wholly dark fuscous, with the terminal joint peculiarly thickened.

Common; the typical form taken at Sydney and Blackheath (3,500 feet) in New South Wales, and Melbourne and Fernshaw in Victoria; var. *a*. at Deloraine, Tasmania (two specimens); var. *b*. at Adelaide (four specimens); from September to November.

144. *Phloe. ewarcha*, n. sp.

Major, alis ant. albido-ochreis, ochreo-fusco suffusis, nigro-irroratis, strigula costæ ad basim obliqua, maculis costæ duabus, punctis disci quatuor (quarto majusculo), lineaque postica nebulosa nigrescentibus; post. griseis, basin versus dilutioribus.

♂. 27 mm. Head whitish-ochreous. Palpi whitish-ochreous, externally sprinkled with dark fuscous, basal  $\frac{2}{3}$  of second joint and a median band of terminal joint dark fuscous. Antennæ greyish-ochreous. Thorax whitish-ochreous, mixed with brownish, anterior margin and a mark on each side of back blackish-fuscous. Abdomen whitish-grey. Legs dark fuscous, central ring of tibiæ and apex of all joints whitish-ochreous, hairs of posterior tibiæ ochreous-whitish. Forewings rather elongate, moderate, costa gently

arched, apex rounded, hindmargin obliquely rounded; whitish-ochreous, irregularly suffused with ochreous-brown, and irrorated with blackish: a short very oblique black mark from base of costa; a cloudy blackish spot on costa at  $\frac{1}{3}$ , and another somewhat beyond middle; a very small black spot in disc at  $\frac{1}{3}$ , a second directly beneath it on fold, a third in disc a little beyond first, and a fourth, larger and roundish, in disc beyond middle, in a line with first and third; a cloudy blackish outwards-curved transverse line from  $\frac{3}{4}$  of costa to before anal angle, sharply indented inwards above middle, the indentation filled up with blackish: cilia pale whitish-ochreous, with a faint fuscous line before tips, basal half obscurely barred with fuscous. Hindwings fuscous-grey, considerably paler towards base; cilia ochreous-whitish, with two cloudy grey lines.

Distinguished amongst the species with forewings not dilated, by the large size, ochreous-brown suffusion, and blackish oblique mark at base of costa.

Mount Gambier, South Australia, in November; one fine specimen on a trunk of *Eucalyptus Gunnii*.

145. *Phloe. lithoglypta*, n. sp.

Media, alis ant. griseo albidis, lineis duabus anticis transversis flexuosis, fasciisque duabus posticis latis saturate ochreo-fuscis, punctis disci tribus maculaque parva fasciæ primæ media nigrescentibus; post. fuscis.

♀. 17 mm. Head whitish. Palpi dark fuscous, apex of second joint and a band above middle suffusedly whitish. Antennæ dark fuscous. Thorax dark ochreous-fuscous, lateral margins whitish. Abdomen whitish-ochreous. Anterior and middle legs dark fuscous, central ring of tibiæ and apex of all joints whitish-ochreous; posterior legs whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; grey-whitish, with a few scattered dark fuscous scales; extreme costal edge ochreous-tinged; a small dark fuscous spot on inner margin at base; an ill-defined irregular somewhat outwards-curved dark fuscous streak from base of costa

to inner margin at  $\frac{1}{4}$ ; a similar partially interrupted streak from  $\frac{1}{4}$  of costa to  $\frac{1}{3}$  of inner margin, more reddish-ochreous in disc; a dark fuscous dot in disc before middle, a second below and obliquely beyond first, and a third directly beyond second; a moderately broad irregular-edged ochreous-brown fascia from costa beyond middle to inner margin before anal angle, and a broad triangular ochreous-brown patch on apical fourth of costa, extending to anal angle, and almost confluent with the transverse fascia and with hindmargin, both marked with short dark streaks on veins; a small round dark fuscous spot in middle of fascia; a hind marginal row of elongate cloudy ochreous-fuscous spots; cilia grey-whitish, with a broad cloudy ochreous-grey median line. Hindwings fuscous; cilia whitish-ochreous, with an indistinct fuscous line.

A distinct species, easily known by the grey-whitish ground-colour, and ochreous-brown anterior lines and posterior fasciæ.

Sydney, in November; one fine specimen on the trunk of *Eucalyptus* sp.

146. *Phloe. melanodelta*, n. sp.

Minor, alis ant. ochreo-fuscis, maculis costæ tribus saturatoribus, triangulo dorsi antico magno maculaque disci parva nigrescentibus; post. griseis, basim versus dilutioribus.

♂. 13-17 mm. Head pale whitish-ochreous, on crown mixed with dark fuscous. Palpi pale whitish-ochreous, mixed with dark fuscous, basal half and a subapical ring of second joint, and terminal joint except base and apex dark fuscous. Antennæ greyish-ochreous or fuscous, ciliations  $\frac{2}{3}$ . Thorax whitish-ochreous, mixed anteriorly with dark fuscous and reddish-ochreous. Abdomen ochreous-whitish. Anterior and middle legs dark fuscous, central ring of tibiæ and apex of all joints ochreous-whitish; posterior legs grey-whitish. Forewings moderate, costa moderately arched, apex rounded, hindmargin obliquely rounded; fuscous, irrorated with ochreous-whitish and dark fuscous; base indistinctly spotted with blackish-fuscous; a small suffused blackish-fuscous spot on costa at  $\frac{1}{3}$ , and a second beyond middle; a dark fuscous irregularly triangular sharply defined blotch on inner margin before middle, more blackish towards apex, reaching more than half

across wing ; a small round blackish-fuscous spot on disc beyond middle ; a dark fuscous inwardly oblique spot on costa before apex, preceded by a clearer whitish ochreous space, and emitting an indistinct interrupted curved line to anal angle ; a row of small suffused dark fuscous spots on hindmargin : cilia pale whitish-ochreous, irrorated with fuscous, basal half more ochreous and obscurely barred with dark fuscous. Hindwings fuscous-grey, paler towards base ; cilia grey-whitish, with an indistinct darker line.

The smallest species of the genus, and with the antennæ more shortly ciliated than any other ; differing from all by the sharply defined dark fuscous triangular dorsal spot.

Brisbane in September, and Sydney in December ; four specimens, mostly on the trunks of *Banksia*. I have found, but not succeeded in breeding, a larva feeding on the bark of *Banksia*, in a loose web among the crevices, which I expected to produce this species.

#### 29. SPHYRELATA Meyr.

Head with loosely appressed scales, sidetufts moderately large, loosely appressed. Antennæ in ♂ stout, strongly serrate, minutely ciliated ( $\frac{1}{4}$ ), basal joint moderate, without pecten, or with two or three fugitive scales. Palpi moderate, second joint not exceeding base of antennæ, dilated with dense appressed scales, thickest in middle, somewhat rough beneath, terminal joint shorter than second, moderate, recurved. Thorax with dense posterior crest. Forewings elongate, moderate, apex obtusely pointed, hindmargin obliquely rounded. Hindwings rather narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{3}{4}$  to 1. Abdomen rather dilated, somewhat flattened. Middle tibiæ with median whorl of projecting hairs ; posterior tibiæ clothed with long fine hairs above. Forewings with vein 7 to apex, 2 from or slightly before angle of cell. Hindwings normal.

This genus closely approaches *Phlæopola*, from which it is distinguished mainly by the antennæ of the ♂, which are stouter, more strongly serrate, and very shortly ciliated. I regard it as an offshoot of *Phlæopola*. It is uncertain whether the first species

ought not to be referred to a distinct genus, since it seems to possess a more developed antennal pecten.

- 1a. Groundcolour white.....149. *melanoleuca*.  
 1b. „ „ whitish-ochreous.  
 2a. Hindwings whitish-ochreous or yellow  
     towards base .....148. *indecorella*.  
 2b. Hindwings wholly grey .....147. *ochrophæa*.

147. *Sphyr. (?) ochrophæa*, n. sp.

Minor, alis ant. ochreo-fuscis, disco leviter roseo-suffuso, basi costaque saturatoribus, punctis disci tribus saturate fuscis; post. dilute griseis.

♂ ♀. 15-18 mm. Head whitish-ochreous, crown ochreous. Palpi whitish-ochreous, terminal joint and base of second suffused with dark fuscous. Antennæ dark fuscous. Thorax whitish-ochreous, anteriorly more ochreous with a few dark fuscous scales, anterior edge dark fuscous. Abdomen whitish-ochreous. Anterior and middle legs dark fuscous, central ring of middle tibiæ and apex of all joints whitish-ochreous; posterior legs whitish-ochreous, base of tarsal joints dark fuscous. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin very obliquely rounded; whitish-ochreous, suffused with light fuscous and towards disc with rosy-ochreous, and densely irrorated with dark fuscous; the dark fuscous suffusion is stronger towards base, along costa, and at apex; a dark fuscous dot in disc before middle, a second beyond middle, sometimes connected with first by a clear ochreous streak, and a third on fold slightly beyond first: cilia whitish-ochreous, mixed with dark fuscous, basal third barred with rosy-ochreous and dark fuscous. Hindwings light grey; cilia grey-whitish.

Somewhat peculiar in structure; there are distinct traces of an antennal pecten, which may perhaps be developed in fresh specimens; the hairs of the head (at least in ♂) are very dense and somewhat loosely dilated; the thoracic crest appears slightly developed. With further material it may be necessary to form a fresh genus for this species.

Brisbane and Sydney, from September to December ; five specimens.

148. *Sphyr. indecorella*, Walk.

(*Cryptolechia indecorella*, Walk., Brit. Mus. Cat., 764 ; *Oecophora amotella*, ib. 1034.)

Minor, alis ant. albido-ochreis, fascia latissima antica, altera post medium modica, maculaque costæ antepicali lineam transversam emittente saturate fuscis, punctis disci quatuor nigris ; post. ♂ flavis, ♀ albido-ochreis, dimidio apicali fusco.

♂ ♀. 15-17 mm. Head and palpi whitish-ochreous, basal third of second joint and more or less of terminal joint suffused with dark fuscous. Antennæ light ochreous, base dark fuscous. Thorax whitish-ochreous, anterior half dark fuscous. Abdomen whitish-ochreous. Legs dark fuscous, central ring of middle tibiæ, hairs of posterior tibiæ, and apex of all joints whitish-ochreous. Forewings elongate, costa moderately arched, apex rounded, hindmargin very obliquely rounded ; pale whitish-ochreous ; a very broad oblique anterior dark fuscous fascia, inner edge very near base, outer edge from  $\frac{2}{3}$  of costa to middle of inner margin, irregularly concave ; a moderate irregular-edged straight dark fuscous fascia from beyond middle of costa to anal angle ; a blackish dot in disc on margin of first fascia, another on inner margin of second, a third, minute, between these, and a fourth on fold on margin of first fascia ; a dark fuscous subtriangular blotch on costa before apex, emitting a curved dark fuscous line to anal angle ; some small cloudy confluent dark fuscous spots on hindmargin : cilia pale whitish-ochreous, towards base obscurely barred with dark fuscous, above costal blotch and on anal angle wholly dark fuscous. Hindwings in ♂ ochreous-yellow, in ♀ whitish-ochreous, apical half and a hindmarginal border suffused with fuscous-grey ; cilia fuscous-grey.

A very distinctly characterised species.

Sydney and Mittagong (2000 feet), New South Wales, in February and March ; three specimens.



149. *Sphyr. melanaleuca*, n. sp.

Minor, alis ant. niveis, macula basali magna, altera costæ media, tertia dorsi postica suffusa cum hac conjuncta, quarta apicis nigris; post. dilute griseis.

♂. 13-14 mm. Head, antennæ, and thorax blackish-fuscous, face whitish. Palpi white, basal half and subapical ring of second joint, and terminal joint more or less wholly blackish-fuscous. Abdomen whitish-grey. Legs dark fuscous, central ring of middle tibiæ and apex of all joints ochreous-white, hairs of posterior tibiæ grey-whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; white, in disc partially yellowish-tinged; basal third wholly blackish-fuscous, outer edge slightly concave; a large irregular blackish-fuscous blotch on middle of costa, reaching half across wing; a dark fuscous suffused blotch on inner margin, extending almost from middle to anal angle, above partially confluent with costal blotch; a minute blackish dot in disc above fold before this; a subquadrate blackish-fuscous apical blotch, and hindmarginal edge blackish-fuscous: cilia ochreous-white, towards tips greyish tinged, towards base mixed with blackish-fuscous, above apical blotch wholly blackish-fuscous. Hindwings light grey, apex somewhat darker; cilia whitish-grey, with a suffused darker line.

Also a very distinct species.

Sydney, in October; four specimens at light.

30. *HIEROPOLA* Meyr.

Head smooth, sidetufts moderately large, loosely appressed, projecting somewhat between antennæ. Antennæ in ♂ slender, serrate, moderately ciliated (1), basal joint stout, without pecten. Palpi long, second joint very long, exceeding base of antennæ by half its length, obliquely ascending, thickened with appressed scales, somewhat roughened beneath towards apex, terminal joint less than half second, slender, erect. Thorax smooth. Forewings elongate, apex almost acute, hindmargin very obliquely round. Hindwings narrow than forewings, elongate ovate, hindmargin

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rounded, cilia 1. Abdomen moderate. Posterior tibiæ smoothly scaled, with a few hairs above. Forewings with vein 7 to apex, 2 from considerably before angle of cell. Hindwings normal.

This genus is at present rather isolated. In the structure of the palpi, and the yellow and rosy colouring it recalls *Hypercallia*, which differs in venation. Until some connecting forms are discovered, it cannot be determined whether the genus should be placed here, or, as is very possible, referred to the neighbourhood of *Hoplitica*.

150. *Hier. jucundella*, Walk.

(*Tisobarica jucundella*, Walk., Brit. Mus. Cat. 813.)

Minor, alis ant. dilute flavis, macula basali, fasciis tribus obliquis, quarta etiam marginis postici roseis, interdum griseo irroratis; post. ochreo-albidis.

♂ ♀. 13-14 mm. Head snow-white, side tufts yellowish-tinged, round antennæ rosy. Palpi snow-white, a subapical ring of second joint yellowish-tinged, a broad median band of terminal joint dark fuscous. Antennæ white, annulated with dark fuscous, basal joint yellowish-tinged. Thorax pale yellow, anterior margin white, with an irregular rosy spot on each side of back, and sometimes another behind. Abdomen ochreous-whitish. Legs white, anterior tibiæ with two faint ochreous bands. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; light yellow; markings light carmine-rosey, often irrorated partially or completely with bluish-grey, and more or less completely margined with dark fuscous; an irregular elongate spot from base very near inner-margin to  $\frac{1}{4}$ ; a narrow irregular slightly outwards-curved fascia from costa near base to inner margin before middle, dilated abruptly on inner margin, connected in middle with extremity of basal spot; a similar broader fascia from before middle of costa to  $\frac{3}{4}$  of inner margin, connected below middle by bar with dorsal extremity of first fascia, attenuated below this, posterior edge with two projecting teeth; a narrow irregular fascia from beyond middle of costa to anal angle, dilated towards costa, anterior edge with a sharp projecting tooth in middle; a hindmarginal fascia, rather broad on costa and

gradually attenuated to anal angle : cilia pale yellow, with a deep yellow median line, on anal angle and above hindmarginal fascia pale rosy-grey. Hindwings ochreous-whitish, more ochreous posteriorly ; cilia ochreous-whitish.

A beautiful insect, rather variable.

Brisbane, Newcastle, and Sydney, from September to November ; local, but rather common ; near Sydney frequenting *Eugenia*, at Brisbane *Eucalyptus*,

### 31. PILOPREPES Meyr.

Head loosely haired, sidetufts large, spreading. Antennæ in ♂ moderate, moderately and evenly ciliated ( $1\frac{1}{2}$ ), basal joint stout, with strong pecten. Palpi moderate, second joint not reaching base of antennæ, densely scaled, somewhat roughened beneath towards apex, terminal joint rather shorter than second, moderate, curved. Thorax with a small posterior crest. Forewings elongate, moderate, apex rounded, hindmargin oblique ; surface with tufts of raised scales. Hindwings narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{2}{3}$ . Abdomen moderate. Anterior tibiæ and basal joint of tarsi very strongly dilated with long dense hairs ; middle tibiæ densely clothed with hairs ; posterior tibiæ clothed with long fine hairs above. Forewings with vein 7 to apex, 2 from before angle of cell. Hindwings normal.

Closely allied to *Trachypepla*, from which it differs in the strongly dilated anterior tibiæ ; it is doubtless a late development of *Trachypepla*. The first species does not perhaps belong to this genus ; the ♂ is unknown, and the tips of the wings are imperfect ; so that the neuration cannot be absolutely determined, yet it seems to belong to this neighbourhood ; the dilated tarsi and tibiæ are, however, not conclusive, as they occur in other and remote genera.

1a. Hindwings dark grey..... 152. *cenulella*.

1b. „ whitish-yellow..... 151. *iriodes*.

151. *Pilopr.* (?) *iriodes*, n. sp.

Media, alis ant. niveis, dimidio antico roseo-suffuso, fasciis duabus anticis obliquis saturate flavis, postice rufo-marginatis, macula disci postica glauca flavo-cincta, margine postico flavo ; post. dilute albido-flavis.

♀. 18 mm. Head glossy ochreous-whitish, sidetufts deep golden-ochreous. Palpi white, externally ochreous-tinged. Antennæ whitish-ochreous. Thorax pearly-white, mixed with ochreous and light rosy (partly defaced). Abdomen and legs ochreous-whitish; anterior tibiæ deep ochreous above. Forewings moderate, costa moderately arched, hindmargin obliquely rounded; pearly white; anterior half suffused with light carmine rosy; an irregular deep orange-yellow fascia from base of costa to inner margin before middle, and a second somewhat broader from before middle of costa to beyond middle of inner margin, both attenuated and partially obsolete on inner margin, and posteriorly margined with reddish-fuscous, connected on fold by a spot of orange-yellow and reddish-fuscous partially raised scales; a very pale greyish-blue oval spot towards hindmargin in middle, surrounded by a broad ring of irregularly scattered orange-yellow scales, which touches central fascia and apex; hindmargin narrowly orange-yellow: cilia white, slightly mixed with yellow, with an orange-yellow line round apex. Hindwings pale whitish-yellow, base paler; cilia pale whitish-yellow.

A singular and very delicately coloured insect.

Sydney, in November; one specimen, not in very good condition.

152. *Pilopr. emulella*, Walk.

(*Oecophora emulella*, Walk., Brit. Mus. Cat., 697.)

Minor, alis ant. saturate flavo-ochraceis, fascia antica lata, macula disci postica transversa magna, altera anguli analis parva, strigulaque ante apicem obliqua niveis; post. saturate griseis.

♂ ♀. 15-16½ mm. Face snow-white, sidetufts ochreous-orange mixed with white. Palpi white, partially suffused with ochreous-orange, and with scattered dark fuscous scales. Antennæ whitish, obscurely ringed with fuscous. Thorax white, posteriorly irregularly spotted with reddish-ochreous, anterior margin broadly reddish-ochreous. Abdomen pale ochreous, mixed with grey. Anterior legs brownish-ochreous suffused with dark fuscous. second tarsal joint and apical half of first snow-white; middle tibiæ ochreous, with two oblique dark fuscous bands, apex white, tarsi

dark fuscous, with white rings at apex of joints; posterior legs whitish-ochreous; all femora pearly white beneath. Forewings moderate, costa moderately arched, apex rounded, hindmargin obliquely rounded; deep ochreous-orange, more brownish-tinged towards middle, paler posteriorly; a raised tuft very near base; a broad snow-white fascia from  $\frac{1}{4}$  of costa to  $\frac{1}{3}$  of inner margin, rather narrower on costa, its edges irregularly waved; its outer edge with three raised tufts, followed by suffused blackish spots; a small blackish spot on fold beyond middle; posterior half of costa with ill-defined oblique whitish strigulae; a moderately large irregularly ovate transverse snow-white spot in disc beyond middle, extending from near costa  $\frac{2}{3}$  across wing; beyond middle of posterior margin of this a raised tuft mixed with black; a smaller sub triangular snow-white spot on anal angle; an irregular snow-white spot running from costa before apex to middle of hindmargin; a slender irregular white line along upper half of hindmargin: cilia whitish-orange, with a darker median line. Hindwings dark fuscous-grey, base paler; cilia pale ochreous, towards anal angle greyish-tinged.

Very conspicuous and easily recognised.

Brisbane and Duaringa, Queensland, in September; six specimens, from *Eucalyptus*.

### 32. TRACHYPEPLA Meyr.

Head loosely haired, sidetufts moderate or rather large, loosely spreading. Antennae in ♂ moderate, somewhat serrate, moderately and evenly ciliated ( $1-1\frac{1}{2}$ ), rarely with fascicles of cilia, basal joint moderate, with strong pecten. Palpi moderate or rather short, second joint not exceeding base of antennae, densely scaled, somewhat rough beneath, terminal joint shorter than second, moderate, recurved. Thorax smooth or with a distinct crest. Forewings elongate, apex round-pointed, hindmargin very obliquely rounded; surface with tufts of raised scales. Hindwings narrower than forewings, elongate-ovate, hindmargin slightly rounded, cilia  $\frac{3}{4}$  to 1. Abdomen moderate, strongly margined. Posterior tibiae clothed with fine moderate hairs above. Forewings with vein 7 to apex, 2 from angle of cell. Hindwings normal.

Allied to *Eulechria*, from which it differs by the tufts of scales on the forewings. The genus is characteristic of New Zealand, and considerably developed there, but there is one Australian species. The Australian genus *Piloprepes* is certainly closely allied to it, and so (less intimately) is the European *Anchinia*. I believe that we have here one of the older types of the family, now approaching extinction. Its true affinity cannot be certainly demonstrated at present, but I am disposed to think that it may be regarded as originating from a genus intermediate between *Oecophora* and *Phlaeopola*, and as collateral with but older than *Phlaeopola*. There can therefore be no direct connection between *Trachypepla* and *Eulechria*.

- 1a. Head dark fuscous.
- 2a. Forewings with clear white markings.
- 3a. Basal half white .....153. *leucoplanetis*.
- 3b. „ third „ .....154. *euryleucota*.
- 3c. „ fifth „ .....155. *conspicuellæ*.
- 2b. „ without white markings .....161. *anastrella*.
- 1b. „ light greyish or ochreous.
- 2a. Hindwings dark fuscous.. .....162. *lichenodes*.
- 2b. „ grey.
- 3a. Anterior line represented by two tufts.....163. *melanoptila*.
- 3b. „ „ well-defined.
- 4a. Anterior line very obtusely angulated .....157. *nyctopis*.
- 4b. „ „ rectangularly „ .....156. *spartodeta*.
- 4c. „ „ acutely „ .....159. *protochlora*.
- 2c. „ grey-whitish .....160. *aspidephora*.
- 1c. „ white.....158. *galaxias*.

153. *Trach. leucoplanetis*, Meyr.

Parva, alis ant. dimidio anteriori niveo, posteriori fusco, costæ basi nigricante, macula costæ anteapicali cum linea transversa conjuncta nivea; post. griseis.

Hamilton and the Otira River, New Zealand, in January; two specimens.

154. *Trach. euryleucota*, Meyr.

Minor, alis ant. saturate fuscis, macula magna basali alteraque parva costæ anteapicali lineam transversam emittente canis, costæ basi nigra; post. saturate griseis.

New Zealand, from Auckland to Dunedin, in January; tolerably common.

155. *Trach. conspicuella*, Walk.

(*Gelechia conspicuella*, Walk., Brit. Mus. Cat. 651.)

Minor, alis ant. fuscis, macula ad basim transversa angustiori, alteraque parva costæ anteapicali nebulosa lineam transversam emittente canis; post. griseis.

Wellington and Christchurch, New Zealand, in December and January; common.

156. *Trach. spartodeta*, Meyr.

Minor, alis ant. dilute griseo-ochreis, linea antica transversa, rectangulata, altera postica sinuata, maculaque costæ media elongata saturate fuscis, macula disci parva ferruginea; post. dilute griseis.

Wellington, New Zealand, in January; one specimen.

157. *Trach. nyctopis*, Meyr.

Minor, alis ant. griseis, striga antica transversa leviter flexuosa nigra, interdum fascia lata pallidiore, macula costæ media elongata lineaque postica transversa sinuata saturate fuscis; post. griseis.

Christchurch and Dunedin, New Zealand, in January and February; common.

158. *Trach. galaxias*, Meyr.

Minor, alis ant. canis, griseo-sparsis, postice interdum griseo-suffusis, fascia ad basim lata postice fere retangulata nigroque marginata, costæ triangulo medio, lineaque postica transversa sinuata saturate griseis; post. griseis.

From Hamilton to the Bealey River, New Zealand, in January; three specimens.

159. *Trach. protochlora*, Meyr.

Minor, alis ant. albidis, virescenti-suffusis, fascia ad basim, costæ triangulo medio, maculaque apicis griseis, linea antica transversa acute angulata nigra; post. griseis.

Palmerston and the Otira River, New Zealand, from January to March; three specimens.

160. *Trach. aspidephora*, Meyr.

Minor, alis ant. albidis, leviter ochreo-suffusis, macula costæ postica magna subtriangulari alteraque apicis parva saturate griseis, nigro-mixtis; post. griseo-albidis.

Christchurch and Dunedin, New Zealand, in December and January; tolerably common.

161. *Trach. anastrella*, Meyr.

Minor, alis ant. fuscis, saturatiori-suffusis, linea antica transversa, fere rectangulata, nigra, altera postica sinuata costæque triangulo saturate fuscis; post. saturate fuscis.

From Christchurch to Invercargill, New Zealand, in December, January and March; tolerably common.

162. *Trach. lichenodes*, Meyr.

Minor, alis ant. saturate purpureo-fuscis, partim flavido-sparsis, maculis disci tribus parvis nigris, macula dorsi ad basim albida, altera dorsi postica fasciaque marginis postici flavidis; post. saturate fuscis.

On the Bealey River, New Zealand, in January; one specimen.

163. *Trach. melanoptila*, n. sp.

Minor, alis ant. griseis, punctis disci duobus anticis, linea postica transversa recta, altera marginem posticum versus curva nigris; post. griseis.

♂ ♀. 14-18. mm. Head and thorax light fuscous-grey, mixed with grey-whitish. Palpi grey, second joint sometimes more whitish, with a dark fuscous subapical ring. Antennæ fuscous. Abdomen light ochreous-grey. Anterior and middle legs dark fuscous, apex of joints very obscurely whitish; posterior legs grey-writish. Forewings elongate, rather narrow, costa moderately



arched, apex round-pointed, hindmargin almost straight, extremely oblique; light fuscous-grey, with scattered grey-whitish scales, and sometimes a few black scales; a raised blackish tuft in disc before middle, and a second obliquely beyond it on fold, sometimes connected with margins by a few raised black scales; an irregular line of raised black scales from  $\frac{3}{5}$  of costa to anal angle, more strongly marked in disc; a few black scales forming a curved transverse line towards hindmargin: cilia ochreous-whitish, suffused with light fuscous-grey. Hindwings fuscous-grey; cilia ochreous-whitish, suffused with light fuscous-grey.

Not closely approaching any other, but with marked general affinity, and quite typical.

Sydney, in November and December; five specimens from *Kunzea capitata*.

32\*. MISOLECTA n. g.

Head loosely haired, sidetufts moderate, spreading. Antennæ in ♂ moderate, moderately and evenly ciliated (1), basal joint moderate, with strong pecten. Palpi moderate, second joint reaching base of antennæ, with appressed scales, rather loose beneath, terminal joint shorter than second, moderate, curved. Thorax with an erect crest. Forewings elongate, apex rounded, hindmargin obliquely rounded. Hindwings slightly narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{4}{5}$ . Abdomen moderate. Posterior tibiæ clothed with long hairs above. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

The single species of this genus has only recently come into my hands; the genus is therefore not included in the analytical table, but will fall under the same head with *Epipyrga*, from which it may be immediately distinguished by the antennal pecten. It is very closely allied to *Nephogenes*, from which it differs only by the crested thorax.

164. *Mes. psacasta*, n. sp.

Media, alis ant. griseis, albido-sparsis, macula costæ ad basim parva, altera antica, triangulo postico depresso, maculaque anguli analis parva saturate griseis, punctis disci quinque nigris; post. griseis.

♂ ♀. 17.20 mm. Head ochreous-whitish, crown slightly greyish-tinged. Palpi ochreous-white, second joint externally fuscous-grey except at apex. Antennæ grey. Thorax light grey, with a small blackish spot on shoulder. Abdomen ochreous-whitish. Anterior legs dark fuscous; middle legs grey; posterior legs ochreous whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin obliquely rounded; light grey, densely irrorated with whitish; a small transverse blackish-grey spot on base of costa, reaching fold; a small blackish-grey spot on costa at  $\frac{1}{4}$ ; a very flattened triangular blackish-grey patch on costa from before middle to  $\frac{3}{4}$ , reaching  $\frac{1}{4}$  across wing; a blackish dot in disc at  $\frac{1}{3}$ , a second directly beneath it on fold, a third above middle of disc, a fourth and fifth transversely placed and confluent in disc beyond middle, and a sixth rather below and before these: between the first two and towards inner margin are some scattered blackish scales; a small blackish-grey spot above anal angle; a small blackish-grey spot on costa before apex, emitting an outwards-curved interrupted line to anal angle: cilia whitish, posteriorly slightly suffused with greyish, with a blackish-grey median line. Hindwings grey; cilia grey-whitish, with a grey line.

Has a strong general resemblance to the species of *Nephogenes*.

Port Lincoln, South Australia, in November; tolerably common, but at that season most of the specimens worn; probably October is its usual month.

### 33. NEPHOGENES Meyr.

Head loosely haired, sidetufts moderate, spreading, loosely projecting between antennæ. Antennæ in ♂ moderate, moderately and evenly ciliated ( $1-1\frac{1}{2}$ ), basal joint with strong pecten. Palpi moderate, second joint not reaching base of antennæ, densely scaled, rather loosely beneath, terminal joint shorter than second, curved. Thorax smooth. Forewings elongate, moderate or rather narrow, apex more or less rounded, hindmargin oblique. Hindwings hardly narrower than forewings, elongate-ovate, hindmargin

rounded, cilia  $\frac{1}{2}$  to  $\frac{4}{5}$ . Abdomen moderate. Posterior tibiae clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from angle of cell. Hindwings normal.

Closely allied to *Philobota*, from which it differs by the second joint of palpi not reaching base of antennæ. From *Eulechria*, with some species of which there is a strong superficial resemblance, it is separated by the hindmarginal termination of vein 7 of the forewings. It approaches *Coesyra* very closely in structure; the loose hairs of the head, and anteriorly projecting sidetufts seem to form the best distinction, but it must be admitted that the point is an unsatisfactory one. I consider the genus to be a development from *Eulechria* (the termination of vein 7 is only just below the apex), and to be itself the origin of the two large and collateral genera *Philobota* and *Coesyra*; it is therefore an important link. The species are very dull-coloured and extremely similar in general appearance, but usually very constant, and common where they occur.

- 1a. Hindwings whitish-ochreous.  
 2a. Apex of hindwings dark fuscous.....170. *protorthra*.  
 2b. „ „ hardly darker .....171. *philopsamma*.  
 1b. „ dark fuscous; species small.  
 2a. Forewings with six discal dots.....172. *athalea*.  
 2b. „ three „ .....173. *microschema*.  
 1c. „ grey.  
 2a. Forewings very elongate and narrow.....174. *apora*.  
 2b. „ not narrow.  
 3a. With a dark costal triangle.  
 4a. Edge of basal patch or fascia outwardly oblique.  
 5a. With a basal patch .....168. *orescoa*.  
 5b. „ fascia near base .....169. *ædatella*.  
 4b. „ „ „ inwardly oblique.  
 5a. Head clear whitish-ochreous.....167. *mathematica*.  
 5b. „ light greyish..... ..166. *ennephela*.  
 3b. Without costal triangle.....165. *egeleida*.

165. *Neph. egelida*, n. sp.

Media, alis ant. griseis, leviter nigro-sparsis, punctis disci quinque lineaque postica transverse angulata perobscuris nigris; post. albido-griseis.

♂. 18-20 mm. Head and thorax light grey. Palpi dark fuscous, base of terminal joint, and base and apex of second joint whitish. Antennæ grey-whitish. Abdomen ochreous-whitish. Anterior and middle legs dark-fuscous, apex of joints whitish; posterior legs ochreous-whitish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; light uniform grey, with a few scattered fine black scales; a very obscure blackish dot in disc before middle, a second on fold somewhat beyond first, a third above middle, a fourth and fifth transversely placed beyond middle; a faint interrupted blackish-grey transverse line from costa at  $\frac{2}{3}$  obliquely outwards to before apex, thence sharply angulated and continued to anal angle: cilia pale whitish-grey. Hindwings whitish-grey; cilia whitish.

A distinct species, easily known by its light uniform grey colouring, the obsolescence of the markings, and the peculiar form of the posterior line.

Sydney, in August; one of the earliest spring insects; three specimens.

166. *Neph. ennephela*, n. sp.

Major, alis ant. griseis, albido-mixtis, nigro-sparsis, mucula ad basim superius dilatata, costæque triangulo medio fuscis, punctis disci sex lineaque postica transversa flexuosa nigrescentibus; post. albido-griseis; capite griseo.

♂. 21-27 mm. Head whitish mixed with fuscous. Palpi whitish mixed with dark fuscous, second joint externally dark fuscous except at apex. Antennæ light grey. Thorax fuscous-grey mixed with whitish, with a small suffused dark fuscous spot on shoulder. Abdomen grey-whitish, anal tuft ochreous-whitish. Anterior and middle legs dark fuscous, apex of joints whitish; posterior legs dull-ochreous whitish. Forewings elongate, posteriorly somewhat dilated, costa moderately arched, apex rounded,

hindmargin very obliquely rounded ; light fuscous-grey, irregularly mixed with whitish, and with scattered blackish scales ; a fuscous basal patch, its outer edge inwardly oblique, from  $\frac{1}{4}$  of costa to  $\frac{1}{5}$  of inner margin ; a triangular fuscous patch on costa somewhat before middle, reaching  $\frac{1}{3}$  across wing ; a blackish dot in disc at  $\frac{1}{3}$ , a second on fold slightly beyond first, a third on apex of costal triangle, and three others transversely placed and generally united into a crescentic mark in disc beyond middle ; an irregular interrupted blackish-grey transverse line from  $\frac{3}{4}$  of costa to before anal angle, indented inwards beneath costa, angulated in disc, and somewhat bent above anal angle ; a row of dark fuscous dots on hindmargin : cilia whitish, with two interrupted fuscous-grey lines. Hindwings pale grey or whitish-grey, rather darker posteriorly ; cilia whitish-grey, with a darker line.

The largest species of the genus, and the only one in which the forewings are at all dilated ; differs from all but the next species in the form of the basal patch, which is broadest above ; from *N. mathematica* it is separated by the much cloudier appearance and lighter markings, and by the greyish head.

Blackheath (3,500 feet), New South Wales, in October ; common.

167. *Neph. mathematica*, n. sp.

Media, alis ant. griseis, cano-mixtis, nigro-sparsis, macula ad basim superius dilatata, costæ triangulo medio, punctis disci quinque lineaque postica transversa flexuosa nigris ; post. albidogriseis ; capite albidochreoo.

♂. 16-20 mm, Head clear whitish-ochreous. Palpi white, slightly mixed with fuscous, second joint externally dark fuscous except at apex. Antennæ pale grey. Thorax white, somewhat mixed with grey, with a suffused dark fuscous spot on shoulder. Abdomen whitish-ochreous. Anterior and middle legs dark fuscous, apex of joints obscurely whitish ; posterior legs ochreous-whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin very obliquely rounded ; light fuscous-grey, mixed with whitish, and partially suffused with white round

dark markings, irregularly irrorated with blackish, especially towards disc; a narrow inwardly oblique slightly outwards-curved blackish fascia from costa at  $\frac{1}{4}$  to inner margin at  $\frac{1}{5}$ , before which the basal space is suffused with dark grey; a blackish triangular spot on costa somewhat before middle, sharply defined anteriorly, nearly reaching middle of wing; a black dot in disc at  $\frac{1}{3}$ , a second obliquely rather beyond it on fold, and three others transversely placed and usually united into a crescentic mark in disc beyond middle; a somewhat interrupted blackish-grey transverse line from costa at  $\frac{3}{4}$  to before anal angle, sinuate beneath costa, angulated outwards in disc, and again sinuate above inner margin; a row of dark fuscous dots in hindmargin: cilia whitish, with two grey interrupted lines. Hindwings grey-whitish, posterior half suffused with grey; cilia whitish, greyer round apex, with a suffused grey line.

Very closely allied to the preceding, but smaller, with the head clear whitish-ochreous, the markings of the forewings blackish and sharply defined by the adjacent white suffusion; the forewings do not appear at all dilated.

Sydney, in September; found rather commonly on a fence during a high wind.

168. *Neph. orescoa*, n. sp.

Media, alis ant. griseis, albido-irroratis, macula ad basim obliqua, triangulo costæ medio, punctis disci quinque, lineaque postica flexuosa nigris; post. dilute griseis, apice saturatori.

♂ ♀.  $16\frac{1}{2}$ -19 mm. Head whitish mixed with grey. Palpi whitish, terminal joint towards apex, and second joint externally except at apex dark fuscous. Antennæ grey-whitish. Thorax whitish, mixed with grey, with a dark fuscous spot on shoulder. Abdomen ochreous-whitish. Anterior and middle legs dark fuscous, central ring of middle tibiæ and apex of joints obscurely ochreous-whitish; posterior legs ochreous-whitish. Forewings elongate, costa gently arched, apex rounded, hindmargin very obliquely rounded; fuscous-grey, very finely irrorated with whitish; a narrow blackish basal patch; its outer edge outwardly oblique, from  $\frac{1}{7}$  of costa to  $\frac{1}{5}$  of inner margin; a suffused triangular

blackish patch on middle of costa, reaching  $\frac{1}{3}$  across wing; a black dot in disc at  $\frac{1}{3}$ , a second slightly beyond it on fold, a third and fourth transversely placed and sometimes confluent in disc beyond middle, and a fifth before and slightly below fourth; a small blackish spot on costa at  $\frac{3}{4}$ , emitting an outwards-curved obscure dark grey line to before anal angle; a row of dark fuscous dots on hindmargin; cilia grey, extreme tips white. Hindwings whitish-grey, apex rather dark grey; cilia whitish-grey, darker round apex.

Easily distinguished from the two preceding species by the different form of the basal patch; it is also a smaller and neater insect; smaller than *N. foedatella*, with the wings more elongate, the basal patch entire, and without the additional anterior discal dot.

Sydney, Mount Keira near Wollongong, and Blackheath (3,500 feet), New South Wales, in September and October; common.

The ♀ in this and other species of the genus is commonly much more obscure than the ♂, and usually best distinguished by the form of wing.

169. *Neph. foedatella*, Walk.

(*Cryptolechia foedatella*, Walk., Brit. Mus. Cat., 763.)

Media, alis ant. griseis, ♂ cano-suffusis, fascia prope basim angusta obliqua, costæ triangulo medio lineaque postica transversa flexuosa saturate fuscis, punctis disci septem nigris; post. griseis, basim versus dilutioribus.

♂ ♀. 20-24 mm. Head ochreous-whitish or whitish-grey. Palpi white, more or less suffused with dark fuscous, except base and apex of second joint. Antennæ whitish, annulated with fuscous. Thorax white mixed with grey, anterior margin fuscous-grey. Abdomen whitish-ochreous, sometimes greyish-tinged. Anterior and middle legs dark fuscous, apex of joints whitish; posterior legs ochreous-whitish. Forewings elongate, moderate, costæ moderately arched, apex rounded, hindmargin nearly straight, oblique; light fuscous-grey, in ♂ more or less strongly suffused with white; a dark fuscous oblique slightly outwards-curved

narrow fascia near base, from  $\frac{1}{8}$  of costa to  $\frac{1}{5}$  of inner margin, sometimes obsolete beneath fold; a dark fuscous triangular spot on costa towards middle, anteriorly suffused, reaching  $\frac{1}{3}$  across wing; a blackish (sometimes double) dot in disc before middle, a second rather beyond it on fold, a third, elongate, above and beyond second, a fourth on apex of costal triangle, and three others transversely placed in disc beyond middle, and generally united into a crescentic mark; a small cloudy dark fuscous spot on costa at  $\frac{3}{4}$ , emitting an outwards-curved fuscous-grey line to before anal angle, its extremities often joined by an inwards-curved fuscous shade; sometimes a row of fuscous hindmarginal dots: cilia ochreous-whitish, with an interrupted fuscous-grey line. Hindwings fuscous-grey, towards base rather paler and slightly ochreous-tinged; cilia ochreous-whitish, with a faint grey basal line.

Rather variable, but specially characterised by the outwardly oblique dark fascia near base, and the additional discal dot beyond and between the first two. In form of wing the species recalls *Eulechria adoxella*.

Brisbane, Rosewood, and Toowoomba, Queensland, in September; round Sydney in November and January; tolerably common. The northern specimens are the most distinctly marked.

170. *Neph. protorthra*, n. sp.

Media, alis ant. saturate fuscis, albido-irroratis, macula ad basim obliqua, costæ triangulo medio, lineaque postica flexuosa saturatioribus, punctis disci sex nigris; post. albido-ochreis, apice saturate fusco-suffuso.

♂ ♀. 16-21 mm. Head, palpi, and thorax dark fuscous, somewhat mixed with whitish-ochreous. Antennæ dark fuscous. Abdomen whitish-ochreous suffused with dark fuscous. Legs dark fuscous, central ring of middle tibiæ and apex of all joints ochreous-whitish, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin nearly straight, oblique; dark fuscous, irrorated with white or ochreous-whitish, except towards hindmargin; a blackish-fuscous basal patch, its outer edge oblique, from  $\frac{1}{7}$  of costa to  $\frac{1}{4}$  of inner margin;



a triangular blackish fuscous patch towards middle of costa, anteriorly suffused, reaching  $\frac{1}{3}$  across wing; a black dot in disc before middle, a second slightly beyond it on fold, a third on apex of costal triangle, and three others transversely placed and generally united into a crescentic mark in disc beyond middle; an obscure darker transverse outwards-curved line, from a small spot on costa at  $\frac{3}{4}$  to before anal angle: cilia whitish-ochreous suffused with grey, with a dark grey interrupted line. Hindwings dull whitish-ochreous, slightly-fuscous tinged, apex and hindmarginal edge suffused with dark fuscous; cilia fuscous grey, tips paler.

Conspicuously distinguished by the peculiar hindwings, which are alike in both sexes; these pale hindwings are specially characteristic of the Tasmanian mountain fauna.

Mount Wellington, Tasmania, from 1000 to 1500 feet; common, early in December.

171. *Neph. philopsamma*, n. sp.

Minor, alis ant. dilute fuscis, cano-mixtis, basi, costæ dimidio antico, macula postica lineaque transversa flexuosa saturatoribus, punctis disci tribus nigris; post. albido-ochreis.

♂ ♀. 15 mm. Head whitish-yellow. Palpi dark fuscous, terminal joint and apex of second whitish. Antennæ dark fuscous. Thorax whitish, anteriorly mixed with dark fuscous. Abdomen whitish-ochreous. Legs dark fuscous, central ring of middle tibiæ, apex of all joints, and hairs of posterior tibiæ whitish-ochreous. Forewings elongate, costa moderately arched, apex rounded, hindmargin obliquely rounded; ochreous-grey, mixed with white; base, a costal streak from base to before middle, a spot on costa beyond middle, and an inwardly oblique spot at  $\frac{4}{5}$  suffusedly darker; a black dot on fold at  $\frac{1}{3}$ , and two others transversely placed in disc beyond middle; an outwardly-curved line of blackish scales from posterior costal spot to before anal angle: cilia white, beneath anal angle ochreous-tinged, with an interrupted fuscous-line. Hindwings whitish-ochreous, slightly fuscous-tinged; cilia whitish-ochreous, with a fuscous line near base

An inconspicuous but easily recognised species.

Wallaroo, South Australia, on coast sandhills at the beginning of November ; two specimens.

172. *Neph. æthalea*, n. sp.

Minor, alis ant. saturate fuscis, disco cano-suffuso, punctis disci sex lineaque postica transversa flexuosa nigrescentibus ; post. saturate fuscis.

♂.  $12\frac{1}{2}$ -15 mm. Head, palpi, antennæ, thorax, abdomen, and legs dark fuscous, slightly mixed with whitish ; hairs of posterior tibiæ whitish-ochreous. Forewings elongate, costa slightly arched, apex rounded, hindmargin nearly straight, oblique ; dark fuscous ; disc more or less strongly suffused with white, obliquely extended to costa at  $\frac{2}{3}$  ; sometimes some white scales towards hindmargin ; a black dot in disc before middle, a second hardly beyond it on fold, a third above middle, a fourth above and beyond second, and two or three others transversely placed and confluent beyond middle ; an indistinct darker outwards-curved line from  $\frac{3}{4}$  of costa to anal angle ; cilia grey, with an interrupted dark fuscous line. Hindwings dark fuscous ; cilia fuscous-grey.

Differing from all but *N. microschemata* by the dark fuscous hindwings and smaller size ; from *N. microschemata* it is easily distinguished by the discal dots, which are arranged as in *N. fedatella*. It has considerable superficial resemblance with the larger *Eulechria tanyscia*.

Mount Lofty range and Mount Gambier, South Australia, in October and November ; four specimens.

173. *Neph. microschemata*, n. sp.

Minor, alis ant. saturate fuscis, partim albedo-sparsis, punctis disci tribus lineaque postica transversa flexuosa nigrescentibus ; post. saturatius fuscis.

♂.  $11\frac{1}{2}$ -14 mm. Head, palpi, antennæ, thorax, abdomen, and legs dark fuscous ; palpi internally ochreous-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very oblique, hardly rounded ; dull fuscous, irrorated with dark

fuscous and ochreous-whitish ; base and costa suffusedly darker ; an obscure blackish dot in disc before middle, a second directly beneath it on fold, and a third in disc beyond middle ; an obscure darker spot above anal angle ; an obscurely indicated darker transverse outwards-curved line very near hindmargin indented, inwards beneath costa : cilia grey, with a darker basal line, tips whitish. Hindwings rather dark fuscous ; cilia grey, with a darker line.

Very obscure-looking, but perfectly distinct ; the smallest of the genus.

Mount Wellington, Tasmania, 1000-1200 feet, at the beginning of December ; rather common.

174. *Neph. apora*, n. sp.

Media, alis ant. angustis, griseis, albido-mixtis, costæ triangulo depresso medio saturatori, puncto ad basim, aliis disci septem, lineaque postica transversa flexuosa nigrescentibus ; post. griseis.

♂. 17-22 mm. Head, palpi, and thorax white, irregularly mixed with fuscous. Antennæ grey-whitish. Abdomen elongate, ochreous-whitish. Anterior and middle legs dark fuscous mixed with whitish ; posterior legs whitish. Forewings elongate, narrow, costa slightly arched, apex round-pointed, hindmargin extremely obliquely rounded ; white, fine and irregularly irrorated with fuscous ; a small blackish spot very near base beneath costa ; a very indistinct grey flattened-triangular blotch on costa towards middle, a black dot in disc at  $\frac{1}{3}$ , a second, rather elongate, on fold beyond first, a third above middle, a fourth and fifth transversely placed beyond middle, a sixth below and before fifth, and a seventh before sixth ; a strongly outwards-curved blackish-grey line from costa at  $\frac{4}{5}$  to before anal angle, sharply indented beneath costa ; cilia whitish, with a blackish-grey median line, and a faint grey line before tips. Hindwings grey, darker posteriorly ; cilia grey-whitish, with a grey line.

Distinguished from all by the peculiarly elongate and narrow forewings, with extremely oblique hindmargin.

Coomooboolaroo, near Duaringa, Queensland ; several specimens sent by Mr. G. Barnard.

## 34. ANTIDICA, Meyr.

Head loosely haired, sidetufts small, spreading. Antennæ in ♂ rather thick, somewhat serrate, biciliated with rather long tufts of hairs (2); basal joint stout, with moderate pecten. Palpi rather long, second joint exceeding base of antennæ, densely scaled, somewhat loosely beneath, terminal joint shorter than second, moderate, recurved. Thorax smooth. Forewings elongate, apex obtusely pointed, hindmargin very oblique. Hindwings almost as broad as forewings, elongate-ovate, hindmargin slightly rounded, cilia  $\frac{2}{3}$ . Abdomen elongate, broad, somewhat flattened. Posterior tibiæ clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from angle of cell. Hindwings normal.

Closely allied to *Philobota*, of which it is perhaps an earlier form, differing in the increased development of the antennal ciliations, and the peculiar stout and elongate abdomen.

1a. Forewings ochreous-white.....175. *eriomorpha*.

1b. „ ochreous-grey.....176. *barysoma*.

175. *Ant. eriomorpha*, n. sp.

Média, alis ant. ochreo-albis, vitta angusta supra medium, interdum etiam dorso fuscis; post. saturate fuscis.

♂. 17-21 mm. Head and thorax white, suffused with fuscous except on sides. Palpi white, more or less wholly suffused with dark fuscous. Antennæ whitish. Abdomen ochreous-whitish. Legs dark fuscous, hairs of posterior tibiæ ochreous-whitish. Forewings elongate, rather narrow, costa gently arched, apex pointed, hindmargin extremely obliquely rounded; ochreous-white; costal edge slenderly blackish towards base; a straight narrow longitudinal fuscous streak from base above middle to apex of costa, posteriorly somewhat paler and tending to be trifurcate at extremity; inner margin sometimes narrowly fuscous: cilia ochreous-white. Hindwings dark-fuscous; cilia whitish, towards base suffused with fuscous-grey.

In markings recalling typical species of *Philobota*.

Round Melbourne and at Mount Macedon, Victoria, in November; rather common.

176. *Ant. barysoma*, n. sp.

Minor, alis ant. griseis, ochreo albidoque mixtis, punctis disci plerisque circulatim dispositis sæpius obsoletis nigris; post. saturate fuscis.

♂. 15-16 mm. Head, palpi, antennæ, thorax, abdomen and legs greyish-fuscous; hairs of posterior tibiæ paler. Forewings elongate, posteriorly somewhat contracted, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; fuscous-grey, mixed with ochreous and grey-whitish scales; six or seven small black dots arranged in an irregular oval in disc, often partially obsolete: cilia whitish-ochreous. Hindwings dark fuscous; cilia whitish-ochreous, with a dark fuscous line near base.

The unusual form of the forewings gives this species a rather singular facies.

Common at Deloraine, Tasmania, in November, amongst rushes (*Juncus*) in swampy places, flying rather actively and apparently naturally by day; also taken by Mr. G. H. Raynor, near Melbourne.

## SOME REMARKS ON THE ACTION OF TANNIN ON INFUSORIA.

BY HARRY GILLIATT, ESQ.

In the April number of the "Royal Microscopical Society's Journal," appeared a paper by Mr. Waddington\* on the action of Tannin on the Cilia of the Infusoria, which must have aroused considerable interest in the minds of those Microscopists who pay special attention to this group.

Mr. Waddington says:—

"In trying the effect of various Chemicals on Infusoria—principally *Paramæcium Aurelia*, I was led to use a solution of tannin, or tannic acid; and I was surprised to find that the immediate action of this chemical was to render the cilia visible without any manipulation of the light.

\* "The action of Tannin on the Cilia of Infusoria, with remarks on the use of solution of Sulphurous Oxide in Alcohol"; by Henry J. Waddington. read 14th March 1883. "Journal Royal Microscopical Society," April, 1883.

“It may have been noticed, that when these Infusoria have been killed by ordinary means, such as heating the water in which they are contained, the cilia are very difficult to observe, probably owing to their great transparency, so that no correct idea, has, I think, been obtained of their size or quantity.

“On placing however, a drop of water containing *Paramœcia* on a slip side by side with a minute quantity of a solution of tannin and making a junction of the two, it will be seen that the instant the *Paramœcia* approach the mixed fluids, their motion is arrested, of course in a greater or less degree according to the strength of the tannin. They are generally rendered perfectly quiescent, and the cilia begin to appear and continue to develop until the body of the animalcule appears surrounded by them. The symmetry of the cilia depends much upon the strength of the solution. \* \* \*

“To bring out the best appearance of the cilia over the whole of the surface of the *Paramœcium* the parabola is required; the animal then appears as if it were supported on the slip by its cilia.

“If the tannin solution is strong, the *Paramœcium* is almost instantly rendered motionless, and the cilia appear to be entirely removed, remaining in a more or less confused state at the extremity.

“I have shown this action to several Microscopists, and so contrary is the remarkable development of the cilia to received ideas, that on nearly every occasion I have been met with the remark that they were not cilia but fungoid growths. This however, is entirely disproved by the fact that they are developed as it were instantaneously.”

Mr. Waddington believes that the action of the tannic acid on the cilia is analogous to its action on gelatine, rendering them leathery.

Struck with the remarkable appearance shown in Mr. Waddington's illustrations, I made a number of experiments with glycerole of tannin as described by Mr. Waddington. On exposing *P. Aurelia* to the action of the tannin, I found the effect quite as startling as described; the animalcules, as the acid began to affect

them, darted about with great rapidity, endeavouring to conceal themselves beneath any vegetable matter on the slip, their motions gradually growing slower; then they revolved slowly two or three times. A sudden contraction of the body followed, and, in a few seconds, the appearance shown in Mr. Waddington's illustrations.

The regularity of the fine transparent acicular fringe that now surrounded the animalcule, or whether it was completely thrown off, appeared to depend, as described by Mr. Waddington, on the strength of the solution. In those cases when the appendages were separated from the body it was not unusual to find a few spiral shaped, although after careful comparison the majority were rod-like.

After examination of numerous specimens treated with the acid, it seemed difficult to reconcile cilia of such length—in some cases exceeding the width of the body—with the action apparent in the ciliary movements of the living animalcule. But while observing an example under oblique illumination, I was struck with the appearance of fine lines across it, and was thus reminded of the rod-like bodies or trichocysts so fully developed beneath the cuticle of *P. Aurelia*. Referring to Saville Kent's "Manual of the Infusoria," his remarks upon these bodies introduced a new feature. I will quote as briefly as possible what Mr. Kent says:—

"These structures—trichocysts—exist in their most characteristic form, in the very cosmopolitan species, *Paramœcium Aurelia*, taking the form of minute and exceedingly slender rod-like bodies, or fibrillæ \* \* \* distributed in an even layer immediately beneath the cuticle. \* \* \* Under certain conditions, including the use of artificial stimuli, such as weak acetic acid, these trichocysts become suddenly elongated, and their distal ends piercing the overlying cuticle stand out like fine, stiff, hair-like setæ beyond the cilia, around the entire circumference of the animalcule, frequently becoming entirely separated from the thin base of attachment." P. 80.

Stein describes also the treatment of the trichocysts with acetic acid. "Infusionthierchen," p. 61.

Mr. Kent adds that the names of Ehrenberg and Oscar Schmidt, are usually associated with the earliest discovery of these special structures; but he has traced their discovery to Sir John Ellis, whose account of them appears in the "Philosophical Transactions." Vol. 59, 1769.

Ellis says:—"By applying a small stalk of the Horseshoe Geranium, *G. Zonale* Linn., fresh broken, to a drop of water in which these animalcules are swimming, we shall find that they become torpid, instantly contracting themselves into an oblong oval shape, with their fins extended like so many bristles all round their bodies." P. 81.

Mr. Kent further describes the investigations of Professor Allman on *Bursaria (panophrys) leucas*, which appeared in the "Journal of Microscopical Science" for the year 1855, as follows:—

"Under external irritation, such as the drying away of the surrounding water, the application of acetic acid, or forcible compression, they become similarly and suddenly transformed into fine, long, hair-like, filaments, or setæ, which projected from the whole periphery." P. 82.

It may, I think, be fairly concluded, that the effects observed by Mr. Waddington in his experiments, must be attributed to the action of tannic acid on the trichocysts of *Paramecium Aurelia* and not, as he considers, to its action on the Cilia.

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NOTES AND EXHIBITS.

Mr. Haswell exhibited a series of anatomical and Zoological preparations.

Mr. Deane exhibited a small collection of rocks, chiefly igneous, from the railway between Gunnedah and Narrabri.

Mr. Pedley exhibited a specimen of what is called Copper Grass at Cobar, and is regarded as a sure indication of that metal, growing only, it is said, upon the outcrop of a lode. Mr. Haviland suggested that it might be a species of *Xerotes*.



Mr. Macleay exhibited a living specimen of *Trachydosaurus asper*, brought by the Honorable P. G. King, M.L.C., from the Narran country.

With respect to this Lizard, Professor Stephens read the following account written by Dampier, in 1699 (Voyages, vol. iii. p. 122, Ed. 1703):—"A sort of Guanos are also found at Shark's Bay of the same shape and size with other guanos (described vol. i., p. 57). but differing from them in three remarkable particulars. For these had a larger and uglier head, and had no tail; and at the rump, instead of the tail there, they had a stump of a tail, which appeared like another head, but not really such, being without mouth or eyes. Yet this creature seemed by this means to have a head at each end. And which may be reckoned a fourth difference the legs also seemed, all four of them, to be fore-legs, being all alike in shape and length, and seeming by the joints and bending to be made as if they were to go indifferently either head or tail foremost. They were speckled black and yellow, like toads, and had scales or knobs on their backs like those of crocodiles, plated on to the skin, or stuck into it as part of the skin. They are very slow in motion, and when a man comes nigh them they will stand still and hiss not endeavouring to get away. Their livers are also spotted black and yellow, and the body when opened hath a very unsavoury smell. I did never see such ugly creatures anywhere but here" (at Shark's Bay). "The guanos I have observed to be very good meat, and I have often eaten of them with pleasure. But though I have eaten of snakes, crocodiles and alligators and many creatures that look frightfully enough, and there are but few that I should have been afraid to eat of if pressed by hunger, yet my stomach would scarce have served to venture upon these New Holland guanos, both the looks and the smell of them being so offensive." The description of the lizard is accurate and picturesque, and the old buccaneer's estimate of its flesh is much the same as that of the Murrumbidgee aborigines, who look with extreme contempt upon those natives of the dry plains, who for want of better food are obliged to "patter kurraggaly."



Mr. Macleay also exhibited a specimen of *Strophura spinigera*, Gray, a small lizard found in the pine scrubs of the interior, and reputed to be venomous. When irritated it ejects from pores in the tail, an acrid fluid, which, immediately on exposure to the air, becomes viscid.

MR. Brazier, for MR. J. F. Bailey, of Victoria, exhibited a specimen of *Bulimus acutus*, Muller, taken July 22, in a garden at Collingwood. This species has been introduced from France.

Mr. Fletcher exhibited specimens of a parasitic worm, *Filaria macropi majoris*, or *F. Websteri* according to Cobbold, which is often to be met with inclosed in cysts about the distal end of the thigh bone, sometimes extending some way down the shank bone. Out of thirteen specimens, three males and one female shewed these parasites. They are referred to in Vol. II, page 293 of Dr. Bennett's Wanderings in N.S.W. So far they do not seem to have been met with in any species of kangaroo but *M. Major*.

Professor Stephens exhibited a block of tertiary limestone, picked up at Belmont, Lake Macquarie, but in all probability brought from the Southern Coast of Victoria or South Australia. It was composed almost entirely of shells and fragments of shells, some of which were but imperfectly mineralized. Bryozoa of two or three kinds were also distinguishable.

Also a piece of sandstone, composed directly from the debris of a granite rock, found in the same place, but evidently not in its original locality.

Also a chert flake, resembling exactly a Palæolithic implement, but probably not a century old. From Coal Point, Lake Macquarie.

Also some specimens of silicious sinter, obtained by H. R. Labatt, Esq., from the gorge of the Cataract River, a few miles beyond Appin. There was a large quantity of this mineral encrusting the rocks at a considerable height above the river bed. It is evidently the deposit from the waters of a hot spring charged with silicious matter, and derived probably from the great mass of basalt which lies about the head of this river. There is also, however, a very long and occasionally wide dyke of the same

rock crossing the Coal Cliff Road and that to Bulli, at about eight and a half miles from Appin, and appearing at the other side of the Cataract River in a large patch on the Mount Keira Road, and this may have been the real origin of the deposit here illustrated. Most of the specimens consist of pure, dense, fibrous, hydrated silica, but one much more open and cellular than the rest contains also a good deal of carbonate of lime.

Also specimens of the conglomerate and pebbles forming the hills in the Narran District, known as the Murillas. They are rounded masses of no great elevation rising out of the wide levels between the Darling and Bokhara Rivers, which are recognised as tertiary, and appear to rest upon the Cretaceous or Jurassic beds which form the country on the right bank of the latter river. It is evident that they are wrecks of an older formation (possibly Daintree's desert sandstone), and it seems probable that they represent in reality an upper member of the Cretaceous system. But no information has been obtained as to the beds which directly underlie them. The conglomerate is composed of pebbles of milky quartz, imbedded in a mass of rounded pellets and grains of rock crystal, firmly compacted by a siliceous cement into a hard, coarse-grained quartzite. This, however, is more soluble than the materials which it holds together, so that under atmospheric wear and tear it is forced to release them once more, covering the ground with sheets of white pebbles, which at a little distance may be mistaken for snow. The specimens were brought to Sydney by the Hon. P. G. King, M.L.C.

WEDNESDAY, AUGUST 29TH, 1883.

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The President, C. S. Wilkinson, Esq., F.G.S., Government  
Geologist, in the chair.

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MEMBER ELECTED.

Monsieur F. Ratte, Ingénieur des Arts et Manufactures,  
Officier d'Académie.

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DONATIONS.

“Report of the Trustees of the Public Library, Museums, and  
National Gallery of Victoria, for the year 1882.” From the  
Public Library.

“Melbourne University Calendar, for the Academic years  
1882-3.” From the Senate.

“Archivos do Museu Nacional do Rio de Janeiro.” Volumes  
IV. and V., for the years 1879-80. From the Museum.

“Bulletin de la Société Linnéenne de la Charente-Inférieure.”  
Vol. II., No. 17, 1882. From the Society.

“Synopsis of the Queensland Flora, containing both the  
Phænogamous and Cryptogamous Plants.” By F. M. Bailey,  
F.L.S., 1882. From the Author.

“Classified Index of the Indigenous and Naturalised Plants of  
Queensland, 1883.” By F. M. Bailey, F.L.S. From the Author.

“Descriptions of some new species of Squilla from South  
Australia.” By Prof. Ralph Tate, A.L.S., etc. From the Author.

“Journal of Conchology.” Vol. IV., No. 1, January, 1883.  
From the Conchological Society of Great Britain and Ireland.

“The Coal resources of Queensland.” By the Rev. J. E. Tenison-Woods, F.G.S., etc. From the Author.

The following works were presented to the Library by Mr. John Brazier, C.M.Z.S. :—

“International Scientists Directory,” compiled by Samuel E. Cassino. Boston, U.S.A., 1883.

“Handbook of New Zealand,” compiled for the Sydney International Exhibition, 1879, by Dr. James Hector, F.R.S.

“A Brief Account of the Natives of Western Australia to illustrate the Collection of Weapons, &c., sent to the Exhibition at Sydney, 1879.”

Eight Papers on the Rise and Progress of the Queensland Industries, 1879.

Official Statistics of Tasmania, 1879, with map.

“Molluscorum Fossilium species novæ et emendatæ in tellure tertiaria, Dalmatiæ, Croatia, et Slavoniæ inventæ.” Auct. S. Brusina.

Nine Papers from Mr. Brazier on the Mollusca of Australia and adjacent localities.

“Feuille des Jeunes Naturalistes,” Paris, No. 153. Juillet, 1883. From the Editor.

“Science,” Vol. I., Nos. 2 to 24 inclusive : 16th February to the 20th July, 1883. From the Editor.

“Journal of the Royal Microscopical Society of London.” June, 1883. From the Society,

“Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien.” A set, complete from 1853 to 1881, with the exception of the volumes for 1854, 1856, 1860, 1861, 1862, 1864 and 1865 ; with separate publications for the missing years.

## ON A FOSSIL CALVARIA.

BY CHARLES W. DE VIS, B.A.

## PLATE 17.

A model of the upper surface of a brain, produced from the interior of a fossil brain-pan, has already been under the inspection of the Society. To obtain a just conception of the animal represented by it, it appears necessary that the mould itself should be brought into view. I therefore allow myself the pleasure of submitting to consideration a cast of the entire fossil, and of offering some remarks upon it for the purpose of eliciting opinion. The portion of skull which time has left to us consists of the parietal and the upper part of the occipital bones. On its superior surface the sagittal suture is almost effaced—it is indicated merely by a slight groove anteriorly. Posteriorly there is a shallow depression between the particles immediately in front of the superoccipital and from the radiated arrangement of the cell-walls standing out in low relief from the surface of the bone I am inclined to think that there is here an interparietal ossified from a single centre. The parietals are flattened anteriorly and gradually become very moderately convex posteriorly. The cristæ are far removed from the sagittal suture, and are scarcely appreciable—mere lineæ temporalis from which the temporal surfaces slope at a slightly increased angle. The occipital surface makes with that of the parietals an open angle of  $120^\circ$ . The lambdoidal suture is entirely effaced, but no superior occipital crest is developed. A strong and prominent longitudinal spine indicates the necessity that existed for a powerful ligamentum nuchæ. On each side of its upper half a large and deep impression roughened by plate-like bony processes attests the volume of the complexi. The longitudinal spine is crossed by a faint inferior ridge, and beneath the crucial spine so formed there is an ample smooth area on either side for the insertion of the deep muscles of the neck. The confluence of the constituent bones of the calvaria renders it a solid mass of great density and thickness. Measuring

but four inches in length, and three in breadth, the average thickness of the parietals is nearly three-quarters of an inch, the least thickness of the occipital one quarter—the bevel of the coronal suture is not less than thirteen lines in depth. The sutural edges are strongly serrated by more or less tortuous plate-like processes continuous from edge to edge.

The brain-cavity gives us the form of the upper third (there or thereabouts) of the brain anteriorly, increasing to its upper half posteriorly. In the cast taken from it the fore edge of the brain is a straight line broken by the indentations between the anterior convolutions. The anterior angles are rounded, behind them the sides of the anterior lobes of the hemispheres bulge out, but, the posterior lobes contracting, the posterior angles are brought square or nearly so with the anterior. The posterior divaricating edges of the hemispheres form with one another an angle of  $110^\circ$ , and those of the cerebellum being parallel with them respectively, the outline of the cerebellum with its investments is apparently rhomboidal. The dura mater is dense over the cerebellum, but over the cerebrum much thinner, allowing the convolutions beneath it to be seen pretty distinctly. The upper surface of the membrane was highly vascular—the inner table of the skull is throughout channelled with minute branching sulci, which on a gutta-percha impression are seen to communicate with the lateral sinuses and other trunks. A rudimentary tentorium is developed on one side only—on the other there is merely a broad shallow groove. The longitudinal sinus and upper limb of the falx are lodged in a deep median sulcus. The convolutions of the brain are symmetrical and consist mainly of three pairs arranged in two lines, diverging from before backward to the Sylvian fissure which is but faintly marked. The vermiform process is of moderate size—its summit attains nearly the level of the cerebrum; the lateral lobes are about equal to it in breadth. The cerebellum in its fore and aft dimension is to the cerebrum, as seen in the cast of the brain cavity, as five to seven, but the posterior angles of the latter come well back upon the cerebellum and permit no lateral fissure nor depression between them to be seen.

I apprehend that the form and structure of the calvaria taken in conjunction with the subquadrate and unsegmented outline of the brain, forbid the supposition that it was of marsupial origin. A cross crestless and posteriorly sloping skull cap like this could scarcely have belonged to a carnivorous placental. The type of brain presented by it does not accord with that of any terrestrial herbivore known to the writer, who is therefore compelled to refer it to some aquatic mammal. On comparing the fossil with the corresponding part of the skull of the Dugong, the external resemblance between the two is sufficiently obvious. The chief, almost the only difference, is the still greater reduction of the parietal crest, and the oblique instead of nearly perpendicular descent of the bone exterior to the crest. In other words the temporal fossa was shallower, the muscles working the jaws feebler in the extinct than in the recent animal. On reverting to the inner side of the fossil the rectangular shape of the hemispheres of the brain favors, so far as it goes, the suggestion that it has Sirenian affinities. But the objections to that view are not without weight. They consist in the apparent absence of the fairly marked division of the cerebrum into fore and hind lobes seen in both the living and extinct forms of the group—in the number and symmetry of the convolutions in the presence of a rudimentary tentorium, and above all in the greater proportionate extent to which the cerebellum is uncovered. It is true that the *naked* cerebellum of the Manatee figured by Dr. Murie (Trans. Zool. Soc., vol. VIII., pl. 25, appears to be as much exposed as that of the fossil, but in a figure of the cast of the brain-case of the same animal given by Professor Owen (Journ. Geol. Soc.), and in a similar cast of Halicore now before the writer, the proportion of the cerebellum to the cerebrum, is, or seems to be much less than in the extinct form under notice. Remembering however, that the brains of the two surviving genera of Sirenians show that considerable modifications may be consistent with the general type of brain, it may not be too rash to surmise that a brain of inferior development and a smoothness of skull indicative of feebler masticating power, may have been the coadaptation of the softer vegetation,



and less perilous conditions of life enjoyed by a Sirenian tenant of fresh waters. Leaving this question, however, to the discoveries of my fellow-students, I opine that the present relic is the first indication we have had of the existence of the animal. And in expectation of that increased knowledge of its structure which will doubtless be the fruit of further research, I propose to give it recognition under the name of *Chronozoon Australe*. The fossil was procured from the Chinchilla (Darling Downs) drift, in which it was of course associated with crocodiles, turtles, ceratodus, &c., together with land animals.

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REMARKS ON A SKULL OF AN AUSTRALIAN ABORIGINAL FROM  
THE LACHLAN DISTRICT.

BY BARON N. DE MIKLOUHO-MACLAY.

PLATE 18.

The cranium, which, through the kindness of Mr. C. S. Wilkinson, I have had for inspection, is not complete (the right temporal bone, the greater part of the sphenoid and the ethmoid bone are absent), but in a fair state of preservation, which circumstance makes me suppose that the owner of the same died not long ago, and that the skull has not remained long in the ground.

This cranium of a probably male Australian aboriginal, of very likely over forty years of age (the *sutura sagittalis* not very distinct), is remarkable not only on account of a very pronounced dolichocephalism (breadth-index 66.8), but also for the peculiar formation of the occipital bone. The superior curved lines with the external occipital protuberance of the above-named bone form a very prominent occipital curved *crest*, larger than in any of the skulls I have ever seen before. None of the skulls of Australian aborigines in the Australian and Macleay Museums present such a prominence of the superior curved lines. The hindmost point of this skull is the occipital protuberance, and not the convex part of the upper portion of the occipital bone, (the so-called occipital point), as is the case in most human skulls.

A few measures will, I believe, not appear quite useless.

Length from the ophrion to the occip. point, above the occip. protuberance, 187 mm.

Length from the ophrion to the occip. protub., 192 mm.

Interparietal breadth, 125 mm.

Frontal breadth (between the temporal crests of the frontal bone), 102 mm.

Thickness of the bone between the external and internal occipital protuberance, 21 mm.

Breadth index, 66.8.

Height index, 73.2.

#### EXPLANATION OF PLATE 18.

Fig. 1.—Occipital bone of an Australian aboriginal from the Lachlan district, from behind and a little below, showing the prominent *curved crest*, and the not very pronounced inferior curved lines. (Nat. size.)

Fig. 2.—The same bone from the side showing the occipital protuberance, the curved crest, and three ossa triquetra in the lambdoidal suture.

Fig. 3.—Diagrammatic median section of the same bone made with the help of band of lead (lame de plomb of Dr. Marcé.)

c. c.—Curved crest. m. p.—Mastoid process.

c. l.—Inferior curved lines. p.—Parietal bone.

p.—Occipital protuberance. o.—Occipital bone.

f. m.—Foramen magnum. f.—Temporal bone.

o. f.—Ossa triquetra.

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#### NOTES AND EXHIBITS.

Professor Stephens exhibited a living example and photographs of the remarkable New Zealand *Hatteria* (*Sphenodon*, or *Rhynchosaurus*) *punctata*, brought to Sydney by W. Knight, Esq., from Karewa Island, Bay of Islands, 6 miles from Tauranga. Here this lizard lives in association with the Mutton birds, whatever these may be, in great numbers. Whether this association is based upon pure friendship may be doubtful. The affinities of

this animal are, according to Huxley, with the Triassic *Hyperodapedon*, which it resembles in many points, as for example the singular action of the lower jaw with its single row of teeth, cutting between two rows in the upper, one row being in the maxillary, the other in the palatine bones, or rather, both being carried on a plate in which both bones are fused. The amphicælian character of the *centra* is also an important point as connecting this with lower or archaic forms.

Owen describes the osteology of this creature, under the name *Rhynchosaurus*, in Vol. 1, Anat. Vert., p. 57, 154, &c., reckoning it as a New Zealand Gecko. Gunther has also described it under the name of *Hatteria*, Phil. Trans., 1869.

Mention is made of it in the earliest notices of New Zealand; and it appears to have been rather an object of dislike or superstitious fear among the Maories. The pigs however, as aliens, feel neither dislike nor fear, and are said to be rapidly exterminating this interesting relic, so that on the mainland it is becoming very scarce.

Prof. Stephens also exhibited two specimens of *Pennatulidæ* from Burrard's Inlet, Victoria, British Columbia. These were brought to Sydney by Captain Barnes, of the "Pacific Slope," who had obtained them from the natives. They are said to bear their polypiferous heads just at the surface of the water. One of the specimens was  $7\frac{1}{2}$ , the other 5 feet in length; but as they consisted of little more than the slender and cylindrical rachis, curiously like a dry osier twig peeled ready for the basket-maker, it is not possible to identify them with any described form. This exhibit was due to the kindness of A. A. Smith, Esq.

Mr. H. Rawes Whittell exhibited some specimens of *Tacsonia Exonensis*, showing the manner in which the honey is extracted by the Spine-billed Honey-eater—*Acanthorhynchus tenuirostris* Lath. He stated that W. S. Campbell, Esq., of Gladesville, to whose kindness he was indebted for this exhibit, informed him that he had often seen this bird engaged in the operation of extracting the honey. He had also frequently seen it devouring

large numbers of the common white ant. The flower is a hybrid raised in England, and first imported to this colony by Mr. Campbell.

Mr. J. G. Griffin, C.E., exhibited two samples of gravel used as ballast on the Deniliquin and Moama Railway. No. 1 was taken from the bed of the Edwards River, and consisted chiefly of fine subangular drift, while No. 2 obtained from a pit 12 miles south from Deniliquin, and at a depth of from 12 to 30 feet, contained in addition to fine drift some waterworn pebbles of quartz,  $1\frac{1}{2}$  inches in diameter. Professor Stephens considered that the occurrence of such coarse pebbles in the finer drift might be accidental, and that they may have been dropped from the roots of the trees which were swept over this country during floods. Mr. Macleay thought that this country had gradually risen, and referred to the great deposits of coarse gravel on the Murrumbidgee and elsewhere as evidence of the powerful transporting currents in past ages. Mr. Wilkinson said these extensive deposits probably corresponded in geologic age with those of the glacial period of the northern hemisphere. At that time there must have been a much heavier rainfall in the southern hemisphere than we have at the present day, and the material derived from the valleys then eroded in the higher lands spread over the low-lying country and formed the plains. Some of the pebbles resembled those found in the Devonian conglomerate beds of the Hanging Rock, between Urana and Wagga. Mr. Whittell remarked that similar drifts had been met with in some wells sunk in the level country to the west of the Darling River.

The President exhibited some specimens of fossil insects found in the tin-bearing tertiary deep leads near Vegetable Creek, New England. This is the second discovery of fossil insects in Australia, and the specimens show the impressions of larvæ and pupæ of *Ephemera* or "May fly."

A fossil coral (*Cyathophyllum* sp.), from the carboniferous rocks, near Jervis Bay, was exhibited on behalf of the Hon. Jas. Norton.

WEDNESDAY, 26<sup>TH</sup> SEPTEMBER, 1883.

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Dr. James C. Cox, F.L.S., &c., in the chair.

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Mr. W. H. Caldwell, Fellow of Caius College, Cambridge, was introduced as a visitor.

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MEMBERS ELECTED.

Arthur W. Stephens, Esq., of Sydney, and the Reverend Mr. Manning, of Waterloo, were duly elected Members of the Society.

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DONATIONS.

From R. Etheridge, Esq., F.R.S.,

Six Treatises on Fossils by Joachim Barrande; Twenty-four Pamphlets on Palæontological subjects, by R. Etheridge, Jun., and three papers on Geology by R. Etheridge, F.R.S.

“Sydney University Calendar. 1883-4. From the Senate.

“Art of Scientific Discovery.” By G. Gore, LL.D., F.R.S., 1878. From H. Rawes Whittell, Esq.

“System of Mineralogy.” By Professors Dana and Brush, 1868. From H. Rawes Whittell, Esq.

“Bulletin de la Société Royale de Géographie d’Anvers. Tome VIII. Fasc. 1 and 2. From the Society.

“Bulletin de la Société Impériale des Naturalistes de Moscow. Tome LVII. No. 4 for 1882. From the Society.

“Proceedings of the Zoological Society of London.” Part 4. for 1882, and Part 1, for 1883. Also a “List of Fellows, &c., 1883. From the Society.

“Journal of Conchology.” Vol. IV., Nos. 2 and 3, April and July, 1883. From the Conchological Society of Great Britain and Ireland.

“Science.” Vol. II., Nos. 25 to 28, July 27th to August 17th 1883. From the Editor.

“Feuille des Jeunes Naturalistes.” No. 154. Août, 1883. From the Editor.

“Memoires de la Société Royale des Sciences de Liège,” 2<sup>e</sup> Serie, Tome X., 1883. From the Society.

“Proceedings of the Academy of Natural Sciences at Philadelphia.” Part 1, for 1883. From the Society.

“Botany of the Antarctic Voyage of H. M. discovery ships, Erebus and Terror, in the years 1839-1843.” By Dr. Joseph Hooker, F.R.S., &c. Parts 1 and 2, and two Volumes of Plates., 4to. From the Hon. P. G. King, M.L.C.

“Don’s Gardener’s Dictionary.” Four volumes 4to., 1831 to 1838. From the Hon. P. G. King, M.L.C.

The following works from the Hon. William Macleay, F.L.S. :—

“Cyclopædia of Anatomy and Physiology.” Edited by Robert B Todd, M.D. Four volumes. 1836 to 1852.

“Wood’s Illustrated Natural History.” 1874.

“Cuvier’s Animal Kingdom.” Illustrated by Lanseer.

“System of Mineralogy.” By Professor Dana, 1875.

“Manual of Mineralogy and Lithology.” By Professor Dana, 1882.

“Physical Geography of the Sea, and its Meteorology. By Captain Maury. 1879.

“Introduction to Conchology.” By Dr. George Johnston. 1850.

“Elements of Zoology.” Wilson. 1873.

Darwin’s Works. Six volumes. 1875 to 1881.

“The Crayfish.” By Professor Huxley. 1880.

PAPERS READ.

ON A VERY DOLICHOCEPHALIC SKULL OF AN AUSTRALIAN  
ABORIGINAL.

BY N. DE MIKLOUHO-MACLAY.

PLATE 19.

Although the index of breadth or the cephalic index of the skull does not appear to modern anthropologists of so great an importance for the classification of human races, as in the time of Retzius, it remains still a very important character in Craniology.

A skull which has been lately acquired by the Australian Museum, is a most interesting specimen as regards its very low cephalic index, which is, I dare say, a lower index than that of any crania ever described before. This skull, or more correctly the cranium, (the bones of the face are broken off, and the lower jaw is wanting), was, before the Museum purchased it, in possession of Mr. Hume, a "Phrenologist," residing and lecturing at present in Sydney. Finding the skull of great interest on account of its form, I went myself to see Mr. Hume to ascertain the origin of the same. Mr. Hume told me that he had had the skull in his collection for about twenty years, and had picked it up himself in the bush somewhere, he does not remember exactly, between Toowoomba and Dalby, in 1863 or '64. According to the Statistical Reports of the Colony of Queensland, the first importations of South Sea Islanders (chiefly Melanesians), took place in 1867, so that it is nearly certain that the skull belonged to a native of Queensland.

This cranium is remarkable for its extreme length. The Ophrio-occipital length is 202 mm., the Glabello-occipital length 204 mm., by a breadth of 119 mm. So that the cephalic index, calculated on the ophrio-occipital length is 58.9 (the same index calculated by the Glabello-occipital length is 58.3.)

I must especially remark, that the skull is a normal one, *i.e.*, does not present even the slightest indications of being deformed.

It is a very fair specimen of the so-called type of *Roof-shaped* skulls.

The index of height of the skull (from the Basion\* to the Bregma† 131 mm.), on account of the great length of the same, falls below the average index of height of the Australian race, which is (according to the ninth edition of Quain's Anatomy (Vol. I., p. 82), 71.—In our case it is 64.8.

In reference to my statement, that the present skull is the most dolichocephalic than has been hitherto described, I will offer a few remarks. As far back as 1867, Prof. Huxley in a paper "on two widely contrasted forms of the human cranium," (Journal of Anatomy and Physiology, Vol. 1, 1867, p. 60), records a very low breadth index of a skull of unknown origin. In a paper read by me before the Koninglijke Natuurkundige Vereeniging of Batavia, in 1874, and published in the *Natuurkundig Tijdschrift* of the same year (Vol. xxxiv., p. 345), under the title, "*Ueber Brachycephalie bei den Papuas von New Guinea.*" ‡ I mention a skull of a native (Papuan) from the Island Namatote, near the Coast of Papua-Koviay, which breadth-index was calculated being 62.0.

Prof. W. H. Flower in a paper, "*On the Cranial Characters of the Natives of the Fiji Islands*" (Journal of the Anthropological Institute, November 1880), gives some very low cephalic indices of some skulls of the Kai-Colos, or Mountaineers of the interior of Vi ti Levu; the lowest of these indices was 62.9, calculated on the Ophrio-occipital length, and 61.9 on the Glabello-occipital length.

The index of the skull before me is 58.9, and is therefore the narrowest skull ever measured.\*

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\* *Basion*—Middle of the anterior margin of the foramen magnum.

† *Bregma*—Point of junction of the coronal and sagittal sutures.

‡ This paper was the result of a great number of measurements, the careful examination and comparison of which, led me to the conclusion, that the *cephalic index* of skulls of Natives of New Guinea varies from 62 to 84.3.



Some additional measures of the cranium.

Sagittal length of the frontal bone, from the transverse suture of the union with the nasal bone to the coronal suture...	135 mm.
Sagittal length of the parietal bone, or more correctly, length of the obliterated sagittal suture .....	146 mm.
Sagittal length of the occipital bone from the lambdoid suture to the posterior margin of the foramen magnum <i>about</i> (because this margin is defective).....	122 mm.
Total horizontal circumference.....	538 mm.
Minimum frontal diameter.....	88 mm.
Maximum frontal diameter above the Pterion.....	102 mm.
Maximum parietal breadth.....	119 mm.
Diameter between the ridges of the mastoid process.....	122 mm.

*Explanation of Plate 19.*

Fig. 1.—Side view of a skull of an Australian aboriginal from Queensland (B. 1., of the Craniological Collection of the Australian Museum in Sydney), represented *one-half* of nat. size.

The nasal bone, the lower part of the sup. maxillary bone, the Zygoma and the inferior Maxilla are wanting. The bones of the face of the other side are completely broken off.

o. p.—Ophryon or supraorbital point. g.—Glabella.

p. t.—Pterion.

b. g.—Bregma (point of junction of the sagittal and lambdoid sutures.)

b. s.—Basion (middle of the anterior margin of the foramen-magnum.

p. m.—Mastoid process.

o.—Occipital point (the point of the occiput in the mesial plane most removed from the Ophryon.)

t.—Inion (external occipital protuberance)

z.—Zygoma broken off above the glenoid fossa.

c. l.—Sup. curved line.

Fig. 2.—View of the same skull *from above*. One-half nat. size. The sagittal suture is completely obliterated.

Fig. 3.—View of the same skull *from behind* (one-half nat. size.), to show the well pronounced *roof shaped* form of the cranium.

## ON A FOSSIL HUMERUS.

BY CHARLES W. DE VIS, B.A.

A humerus which seems to deserve attention from students of our drift fauna has lately been received by the Queensland Museum from the Darling Downs. In size it is about one-third less than the arm bone of a *Diprotodon*, and at a passing glance is a reduced copy of that bone. A little scrutiny, however, and differences are seen to exist, which in the aggregate amount to at least specific variation, and no sooner do we acknowledge that degree of distinctiveness, than we are prompted to ask whether we can accept it as a specific one only—in other words whether we may fairly conclude from it that there existed in company with the great *Diprotodon*, a comparatively small and not very closely similar species of the genus. The obvious objection to this is that we have no confirmatory evidence, more especially not a solitary tooth, whereby to justify the assumption—and considering the multitude of jaws of *Diprotodon* and its associations occurring in the drift, the total absence of the teeth of this assumed species is a fair though negative ground for putting aside the idea of its existence. But if we do, there is nothing known to which the humerus in question can be attributed. In size indeed, it corresponds to the probable dimensions of the bone in *Nototherium Mitchelli*, but to that animal a humerus of quite a different kind has been already appropriated. Is it possible that exception may reasonably be taken to that appropriation? The suggestion is ventured, and the considerations which have led to it are offered with the utmost deference.

The genus *Nototherium*, was established by Professor Owen in 1844, for the reception of the animal represented by certain molar teeth, with which we are now familiar—teeth with closed fangs, and therefore of limited growth—teeth which “suggested at first sight that the fossils might belong to some smaller species of *Diprotodon*.” (*Foss. Mam.* p. 249.) When, subsequently, the skull of *Nototherium* came into his hands, Professor Owen was led to recognize in it certain marks of affinity with the *Wombats*,

and in determining that relationship, he seems to have allowed even more weight to the cranial that he had previously conceded to the dental characters of the animal which he had then regarded as less nearly allied to *Phascolomys* than *Diprotodon* appeared to be.

It is almost needless to say, that from the Nototherian type of dentition, that of the Wombats, recent and extinct, differs to a degree which in placental mammals would be considered extreme. In *Phascolomys* the teeth have, as all are aware, persistent pulps, and therefore continuous growth. Professor Owen carefully points this out to us at p. 286, where, after correlating *Nototherium* with *Macropus* and *Diprotodon* with *Phascolomys* by virtue of the front upper incisor, he goes on to say—"But in the number and disposition of the upper incisors as in the bilophodont molars of limited growth, both the larger extinct genera retain the poephagous character as contradistinguished from the rhizophagous modification shown by the Wombats among the existing marsupial herbivores." and further, speaking of the lower incisors, says that in the adult *Nototherium*, "this tooth is far from having the proportions and depth of implantation which make it resemble in *Diprotodon* the lower pair of scalpriform teeth of the Wombat." These quotations are necessary to show Professor Owen's opinion of the affinities of the several genera as determined by the teeth. We are clearly taught that in their molars neither genus of the huge grazers is allied to the Wombats, and that in the incisors *Diprotodon* indeed resembles "approximates" *Phascolomys*, but that *Nototherium* does not even this—in brief that the old dentition of the latter differs widely from that of the Wombat, more widely than does that of *Diprotodon*. Now bearing in mind that our safest conceptions of the structure of an extinct mammal are based upon its dentition, bearing also in mind that *Diprotodon* was according to its dentition a browsing beast of mighty bulk, and that we know nothing of it contradictory of the general analogy of limb structure in other such beasts, namely, that their long bones are little more than pedestals of support, we are prepared to admit without hesitation, the justness of Professor Owen's ascription to it of the

thigh bone figured in plate XXXIV. of the "Fossil Mammals." Further, as it is but reasonable to infer that the fore limb of the animal would be characterised by the like massive simplicity we are perfectly ready to concur with the illustrious author of the Fossil Mammals in attributing to Diprotodon the humerus given in plate XXXI., it is in fact, just such a bone as we should have looked for. From that recognition we should obtain a just conception of the general form of the arm-bone of Nototherium, assuming only that it was rather more unlike that of the Wombats than the one delineated. If on comparing Diprotodon and Phascalomys, we are most willing to admit that the very unlike teeth of the Wombat are attended by a very unlike humerus, a bone formed by or for powerful action in different directions, squat, angular, twisted and covered with ridges and asperities, as wont is with fossorial arm-bones we are the less disposed to look in that direction for the humerus of Nototherium. It is therefore with perplexity that we look upon the bone figured in plate XXXVII., as the Nototherian humerus—a perplexity increased by the absence of any reasons declaring for the determination. Nototherium, Owen, as established on the teeth, and Nototherium, Owen, as represented by the humerus, are or appear to be two animals—it would be highly interesting to know why we should believe in their identity. The subject of plate XXXVII., is pronouncedly phascolumine. Prof. Owen directs our special attention to the phascolumyan characters which may in truth be said to be exaggerated in it. If the bone be really the humerus of Nototherium, that animal could scarcely have been a remove from the genus Phascalomys, and it was to all appearance a burrower, whilst its relative the Diprotodon, said to be the nearer to Phascalomys by dentition, was in the structure and office of its fore limb a mere marcher. It is surely improbable that so great a difference should exist between the arm-bones of two animals so closely allied in dental characters as to have been nearly placed at first sight in the same genus without direct or at least good constructive proof to the contrary, we cannot allow a much greater latitude of differentiation to the limb bone than we find in the teeth. On the other hand, we

cannot well refuse to a bone presenting an about equal phase of differentiation a preferential claim on our recognition. Such a bone is the one of which I now submit a cast. The general likeness it bears to the Diprotodon arm-bone becomes apparent when it is laid beside a cast of the latter humerus. It only remains to invite attention to its characteristic features, premising that its adult condition is evidenced by the state of the epiphyses.

The ratios of the length and breadth of the bone under review to the length of the lower molar series of the *Nototherium Mitchelli* are nearly the same as the proportions between the like elements of comparison in its most gigantic relative; the proportion of the length to the breadth is exactly the same in the bones of both animals. The head of the *Nototherian* bone is of the same general form as in *Diprotodon*, and rises but slightly above the level of the outer tuberosity, in the latter respect differing from the fossil figured in plate (*Foss. Mam.*), which however, appears to be somewhat imperfect, but agreeing almost precisely with the original of the accompanying cast. The other tuberosity is in both animals well developed, and surmounted by a low fore-and-aft ridge. The rough ridge representing the inner tuberosity is in *Nototherium* on a lower transverse parallel than in *Diprotodon*—in the latter the depression between it and the head is on the plane of the outer tuberosity, whereas in the former the highest (most proximal) point of the depression is fully an inch below the tuberosity. The bicipital groove is shallower in *Nototherium* than in *Diprotodon*. On the fore side of the shaft the broad ridge falling from the outer tuberosity is much fuller at its origin in the smaller bone, in the larger it curves gently and regularly as it descends, maintains a nearly level summit from near the tuberosity to the beginning of the middle fifth of the shaft, then subsiding very gradually disappears midway between the lateral edges of the shaft in *Nototherium*, commencing at once on the level of the tuberosity it goes straight and full to scarcely the upper third of the shaft, increases for a space in height, then curving suddenly outwards ends abruptly nearer (comparatively) to the head and to the outer edge. The external tubercle has the same situation in both bones,

*i. e.*, in the middle of the outer edge, but by no means the same form, in *Diprotodon*, it is a compressed widely expanded ridge, in *Nototherium* a bilobed tuberosity. The rough surface on the upper part of the back of the shaft described and figured as a well-defined oval in *Diprotodon* is in *Nototherium* very rugose, but shapeless and indefinite in extent. The lateral expansion of the distal end of the shaft has a gradual increment in *Diprotodon*, a comparatively sudden one in *Nototherium*. The inner condylar ridge is, as might be expected imperforate in the smaller, as it is in the larger animal—otherwise also they are much alike in this region. In the ectocondylar ridge on the other hand, they differ markedly. In *Nototherium* it commences much nearer the external ridge, and is suddenly flattened out into an almost wing-like expansion; it is also much less angular. The condyles in *Nototherium* are relatively less in fore-and-aft thickness, and are set on much more obliquely to the long axis of the bone. In form they differ but little from those of *Diprotodon*, but the trochlear constriction between them is much greater. The olecranal fossa is more limited in extent and of greater depth.

It will be seen that the characters of the bone under examination bring it well within the range of family resemblance, and at the same time keep it aloof from a strictly generic likeness to the humerus of *Diprotodon*. It may be acknowledged that these are conditions which can only be fulfilled by a humerus of *Nototherium*. Should this judgment appear sound, the theory which has gained popular headway that *Nototherium* was an animal midway between a Kangaroo and Wombat, will be so far unsupported. Deprived of its phascolomine arm-bone, it will appear that, inasmuch as it was a marsupial and a herbivorous one, it had certain minor points of resemblance to its extant relatives, but that these are in themselves quite insufficient to prove that its relatives are anything nearer than cousins germane.

NOTICES OF SOME UNDESCRIBED SPECIES OF COLEOPTERA IN THE  
BRISBANE MUSEUM.

BY WILLIAM MACLEAY, F.L.S., &amp;c.

Mr. De Vis the Curator of the Brisbane Museum, sent me lately some hundreds of species of Coleoptera, (which he had picked out of the Museum collection), without name, and in most instances without any indication of locality or even country. He sent them in the hope that I might be able, by reference to my very large collection in that branch of Natural History, to furnish him with the names of some of them at least. 'This, I am glad to say, I shall be enabled to do, to a very considerable extent, but it is a work that demands time, and it will probably be weeks before I shall have got entirely through the collection. I find, so far as I have gone, that there are a number of species new to me, and these or such of them as I can confidently pronounce from my previous acquaintance with the groups to which they belong to be undescribed, I shall from time to time name and describe. I may mention that in most cases each species is represented by a single specimen only, so that the identification of the genus by dissection becomes impossible, without destroying or injuring the insect; these cases I have been compelled to pass by altogether.

## Fam. CARABIDÆ.

## PAMBORUS VIRIDI-AUREUS.

Of the general form and sculpture of *P. alternans*, but much smaller, proportionately shorter, and more brilliant in colouration.

The head is black, the palpi and antennæ piceous, the terminal seven joints of the latter clothed with yellowish pile. The thorax is longer than broad, emarginate at the apex, rounded on the sides, and becoming narrower at the posterior angles, which are not quite so largely produced as in *P. alternans*; the upper surface is a little convex, very nitid, and black with a golden green reflection, particularly on the lateral margins and posterior angles; the median and two basal lines are deeply marked.

The elytra are of oval form, convex, broader than the thorax and about twice the length; the sculpture resembles that of *P. alternans*; the costæ are smooth and of a violet black colour, the intervals are deep and densely filled with somewhat transverse granules of a very brilliant greenish-gold. The legs and under surface of the body are piceous-black, and present no distinguishing specific characters.

Long. 13 lin., lat. 5 lin.

There is nothing to indicate the locality where this species was obtained, but there is every probability that it was in the neighbourhood of Brisbane, as the northern parts of the East Coast of New South Wales, and the southern parts of Queensland, seem to be the home of the genus.

There are two distinct plans of sculpture of the elytra in *Pamborus*, one of the type of *P. alternans*, comprising *morbillosus*, *Macleayi*, *viridis*, and the present species, the other of the type of *P. Guerinii* including *Brisbanensis*, and *Pradieri*.

#### CATASCOPUS LATICOLLIS.

Greenish black, very nitid; antennæ, palpi, legs and under surface of body dark piceous. Head with the eyes, which are large and prominent, as broad as the thorax, the frontal impressions nearly parallel. Thorax: broader than long, almost truncate in front, except at the angles which are prominent and recurved, slightly rounded on the sides, and truncate at the base. with the posterior angles acute; there is a deep transverse impression at some distance from the apex, a still deeper one close to the base, a distinct median line, and a recurved lateral margin in which are a few puncture, each puncture with a long seta. Elytra broader than the thorax, and slightly convex, with seven minutely punctured striæ on each elytron, and a few large punctures on the lateral margins, which are broad, slightly recurved and of a coppery lustre; the suture terminates in a spine, but the other angle of the elytral sinuosity is simply acute.

Long. 5 lin.

Probably from Cape York, but marked, "Albania Downs."



## EUTOMA PUNCTIPENNE.

Blue, subnitid, the antennæ, palpi, and legs dark piceous. Head as broad as the thorax, the frontal impressions deep, diverging posteriorly and reaching the back of the head. Thorax longer than broad, parallel-sided, truncate in front, and rounded at the posterior angles and base; there are three seta-bearing punctures in each lateral margin. Elytra twice the length of the thorax, convex, parallel-sided, and rounded in front and behind, with four (sometimes five) impressed punctures on each elytron in a line nearer to the lateral margin than to the suture, there is also a close row of punctures in the lateral margins and on the base. The anterior tibiæ are strongly bidentated externally. The somewhat dull blueness of this species is caused by the whole upper surface being densely covered with very minute punctures, visible only under a powerful lens.

Long. 7 lin., lat. 1 lin.

## CARENUM TERRÆ REGINÆ.

Of the type of *C. marginatum*, but smaller and of less elongate form. Black, subnitid. Head broad and flat, with the frontal impressions quite parallel. The antennæ are more slender than in *C. marginatum*. The thorax is broader than the head, broader than long, truncate in front with the anterior angles very slightly produced, rounded on the sides, and broadly rounded behind with an indistinct emargination at each posterior angle, and a distinct one in the middle; the median line is rather faintly marked; the lateral margin narrow, reflexed, of a green hue, and furnished each with two seta bearing punctures. The elytra are as wide as the thorax, and about twice the length, convex, ovate, slightly opaque owing to minute punctures only visible under a lens, and lightly but distinctly striate-punctate, with an impressed puncture on the posterior third of each elytron on the fourth stria from the suture, and a series of large punctures along the lateral margins, which are green. The anterior tibiæ are strongly bidentated externally, with one or two very minute teeth above, as in many of the *C. marginatum* group.

Long. 8 lin., lat. 3 lin. Ticketed Albania Downs.

A3

## CARENUM IANTHINUM.

Also of the *C. marginatum* group.

Black, nitid, thorax and elytra dark violet blue. Head broad, the frontal impressions diverging much behind. Thorax much like that of *C. terræ-reginæ*, but with the anterior angles more produced and the base more completely rounded. Elytra rather narrower than the thorax, convex, and ovate, with the faintest traces of striæ, with an impressed puncture on the posterior third of each elytron, and with a series of punctures in the reflexed lateral margins. The anterior tibiæ are bidentated externally with a few minute teeth above.

Long. 9 lin., lat. 3 lin.

## CARENUM DE VISII.

Of the *C. perplexum* group.

Black, subnitid, the margins of the thorax and elytra of a bluish green. Head broad, slightly convex, the frontal impressions diverging in a semi-circular sweep. Thorax a little broader than the head, broader than long, truncate in front with the angles produced, and rounded on the sides and behind with the margin slightly emarginate on each side of the base, and on the base itself, which is narrow; the median line is moderately well marked, and there is a puncture in each lateral margin near the anterior angle. The elytra are as broad as the thorax and about twice the length, ovate, slightly concave on the base, and obsoletely striate-punctate, with the interspaces seemingly a little elevated, and without impressed punctures, excepting in the lateral margin. The anterior tibiæ strongly bidentated externally.

Long. 9 lin., lat  $3\frac{1}{2}$  lin.

## CARENUM PUSILLUM.

The smallest *Carenum* I have seen. It belongs to the group of which *C. Bonelli* is the type. Nitid, bluish-green above, piceous black beneath and on the antennæ, palpi and legs. Head broad, the frontal impressions diverging backwards and terminating in a transverse depression. Thorax scarcely broader than the head,

and broader than long, truncate in front, and rounded towards the base which is narrow and not emarginate; there is a deep impression at each angle of the base, and a well-marked median line on the disc. The elytra are not quite the width of the thorax, and about twice its length, of oval form, and marked with coarsely punctured almost obsolete striæ: there are two impressed punctures on each elytron; the one, a third of the length from the base, the others about one-fourth from the apex. The anterior tibiae are strongly bidentated externally.

Long.  $4\frac{1}{2}$  lin., lat. 1 lin.

In the descriptions given of the foregoing species of *Scaritidæ*, I have alluded to the groups of *Carenum* to which they seemed to belong, and in explanation of that term I must refer the reader to a paper on the *Scaritidæ* of New Holland, read by me at a meeting of the Entomological Society of Sydney in the year 1865, and printed in the first volume of the Transactions of that Society. A reference to the table at the end of that paper will explain tolerably well what I mean, even though there have been vast additions to the number of species since that period, and some of my sub-divisions of the genus *Carenum* have been elevated into independent genera.

Indeed so many have been the additions made and changes propounded in this very interesting and beautiful Family of Insects of late years, that a complete revision of it is much required, and the task is one which I have almost decided upon undertaking. Indeed it seems natural that I should, for the only naturalists who besides myself have paid much attention to the study of the Australian *Scaritidæ*,—Count Castelnau and Baron De Chaudoir, are both unfortunately dead.

The two other species of *Adephagous Coleoptera*, which I now proceed to describe belong to the largest sub-family of the *Carabidæ*—the *Feronidæ*—also very numerous represented in Australia, and curiously enough, the insects of that family had also long been an especial subject of study and investigation to the two eminent naturalists whose names I have just mentioned with reference to the *Scaritidæ*.

## TIBARISUS ROBUSTUS.

Black, nitid. Head broad, smooth, slightly convex, with two short oblique impressions on each side in front. Mandibles strong. Thorax broader than the head, and broader than long, the anterior angles prominent, the sides strongly margined with a strong puncture in the upper half of the margin, rounded in the middle, the base truncate and slightly narrower than the apex; the median line is distinct, and there are two impressions on each side of it at the base, one deep and elongate, the other, close to the posterior angle, very short and less deeply impressed. Elytra twice the length of the thorax and a little broader, convex, of oval form, strongly striated, the interstices broad and moderately convex, the stria nearest to the lateral margin very lightly impressed, but with deep punctures along it near the shoulder and towards the apex.

Long. 8 lin., lat. 3 lin.

Like *T. melas* *Casteln.* but proportionately shorter in the elytra.

## PÆCILUS LEVIS.

Black, nitid, antennæ, palpi and legs piceous. Head with the frontal impressions moderate. Thorax broader than the head, rather flat, anterior angles rather rounded, sides a little rounded behind the anterior angles, and very slightly emarginate towards the base, which is truncate and rather broader than the apex; the posterior angles are rectangular, the median line is distinct and there are two impressions on each side at the base, one elongate, the other near the angle circular. Elytra broader than the thorax and three times the length, very slightly convex and almost smooth; one very slight stria may be traced on each side of the suture, the others are almost if not quite undistinguishable, excepting the two nearest to the lateral margin, which are distinct and strongly punctured; on the base on each side of the scutellum there is a broad depression.

Long. 9 lin., lat. 3 lin.

I have a specimen of this species in my collection from Port Darwin.

## Fam. MELOLONTHID Æ.

## DIPHUCEPHALA HIRTIPENNIS.

Most resembles *D. pilistriata*.

Metallic green, the antennæ, palpi and legs reddish. Head densely punctured, clypeus broad, the angles in the male sharp, prominent, and recurved. Thorax punctured, broadest at the base and clothed with short ashen pubescence, the median and lateral foveæ are broad and deep and join in the centre of the disc; a tooth at the lateral extremity of the lateral foveæ. Scutellum rounded behind without pubescence.

Elytra punctate, clothed with a short ashen pubescence disposed in longitudinal rows. The abdominal segments are similarly clothed. The anterior tibiæ are bidentated externally at the apex.

Long.  $3\frac{1}{2}$  lin.

## DIPHUCEPHALA CÆRULEA.

Blue, nitid, with a purplish hue on the elytra. Head small, punctate, the clypeus terminating on each side in a prominent sub-obtuse recurved point. Thorax thinly punctate with the median line narrow and the lateral foveæ small. Elytra coarsely punctate, with three almost obliterated costæ on each. Under surface densely clothed with short cinereous pubescence. Anterior tibiæ bidentated externally.

Long.  $3\frac{1}{2}$  lin.

## DIPHUCEPHALA LATIPENNIS.

Metallic-green, nitid, more or less clothed all over with an ashen pubescence. Head not broad, punctate, with the clypeus profoundly emarginate, and the angles prominent, rounded and reflexed. Thorax coarsely punctate, the median line broad, and the lateral foveæ large, but not joining in the middle of the disc. Scutellum large, triangular, smooth, and impressed in the middle.

Elytra broad, and coarsely punctured in crowded rows. Pygidium densely pubescent. Anterior tibiæ unarmed.

Long. 3 lin.

## LIPARETRUS CONVEXIUSCULUS.

Rufous, subnitid. Head black, densely punctate, slightly emarginate on the clypeal suture; the clypeus broad, rounded at the angles, reflexed and nearly truncate in front. Thorax punctate, much broader than long, somewhat lobate at the base with the median line scarcely visible. Elytra convex, not covering the penultimate segment of the abdomen, irregularly punctate in rows, with a distinct stria on each side of the sutural costa. Pygidium and penultimate segment of abdomen minutely punctate and naked above. Under surface of body clothed with yellow hair: Anterior tibiae tridentate.

Long. 4 lin.

Nearest to *L. atriceps* mihi, but a very different insect.

## NOTES AND EXHIBITS.

Baron Macleay exhibited a sketch of a new species of *Heterodontus*, recently received at the Australian Museum from Japan, and pointed out the marked differences between it and *Heterodontus Phillippi*, the species with which the Japan Fish had hitherto been confounded. He suggested for it the specific name of *japonicus*, and said that he would give a detailed description of it at the next meeting of the Society.

Mr. Macleay exhibited in illustration of Mr. De Vis's Paper, casts of a gigantic humerus of a *Diprotodon*, and a smaller humerus, probably of *Nototherium*. The fossils were both from Darling Downs.

Mr. Thomas Whitelegge exhibited under the microscope a living specimen of the species of *Fredericella*, one of the fresh water Bryozoa which had not previously been noticed in New South Wales. It appeared to be identical with the European *F. sultana*, of Blumenbach.

Mr. Whittell exhibited specimens of a caterpillar of the family *Cossidae* found at Mount Wingen, in which the original tissues of the animal had become replaced by the mycelium of a species of *Sphaeria*.

Mr. Littlejohn exhibited a large specimen of *Gastrotokeus biaculeatus* from Torres Straits.

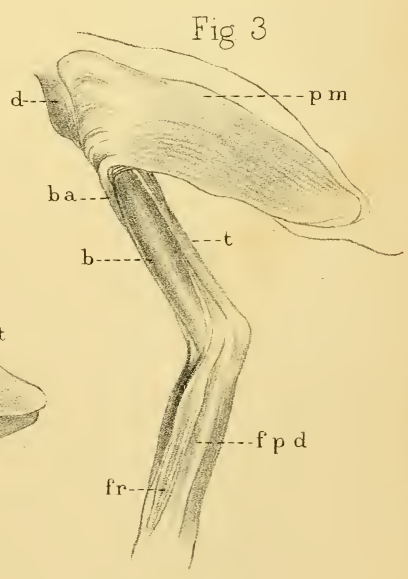
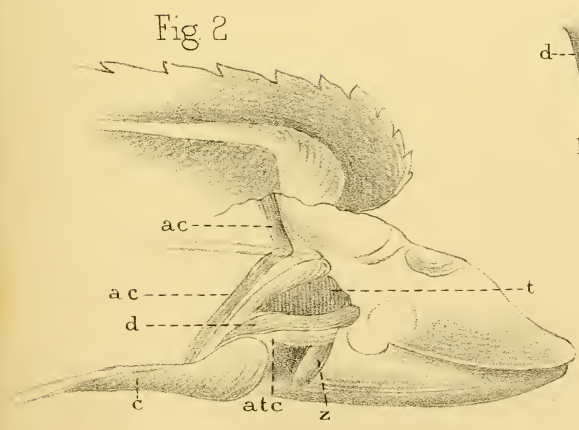
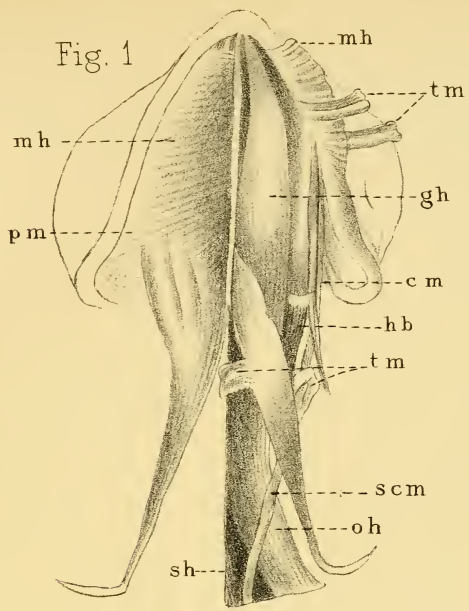
Dr. Cox exhibited a large nodule of ironstone with a remarkably polished surface, and stated that large numbers of similar appearance were observed scattered over the surface of the ground in the Liverpool Plains district. They seemed to be hard concretionary nodules freed by the weathering away of the softer rock matrix in which they had been originally enclosed.

Dr. Cox also exhibited a remarkable blenny of the genus *Cristiceps* from Broken Bay.

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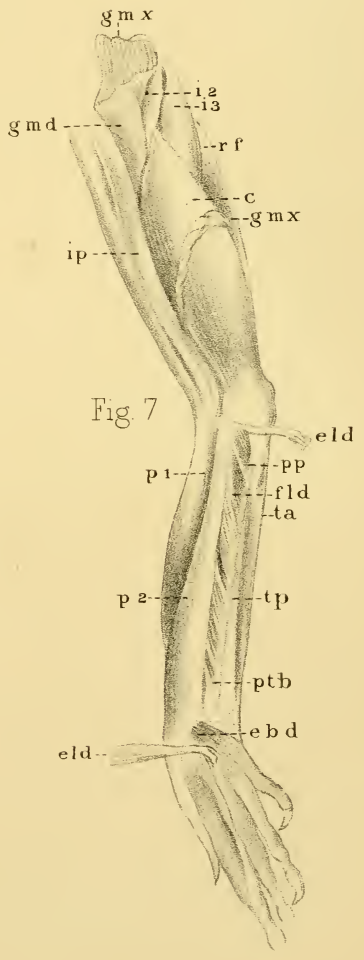
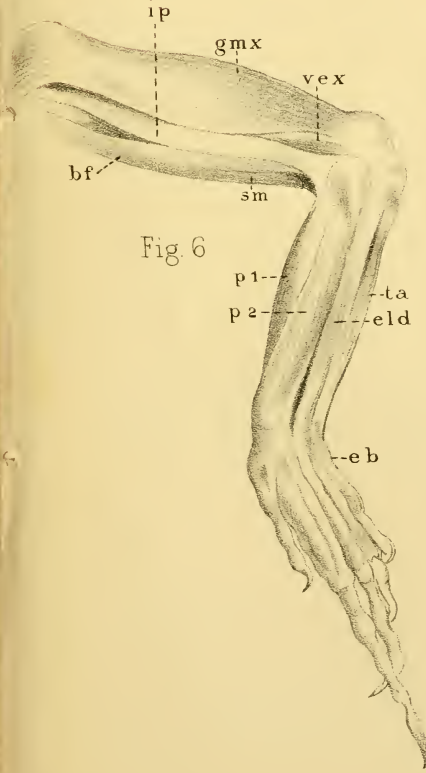
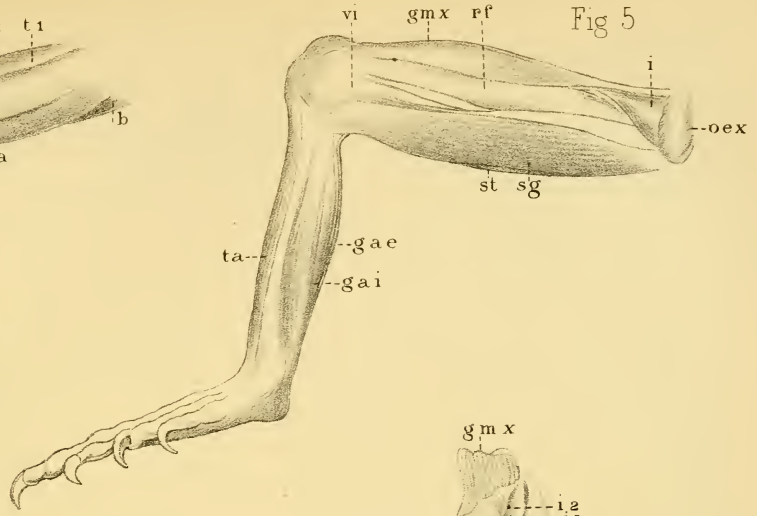
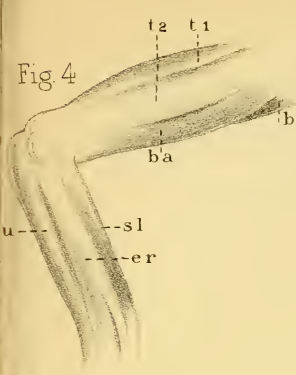




Fig. 8

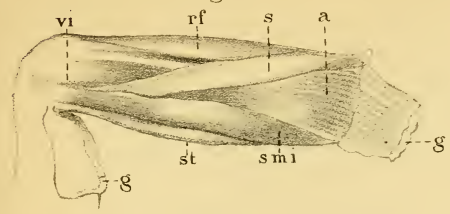


Fig. 9

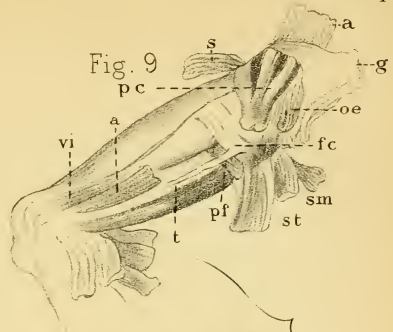


Fig. 9

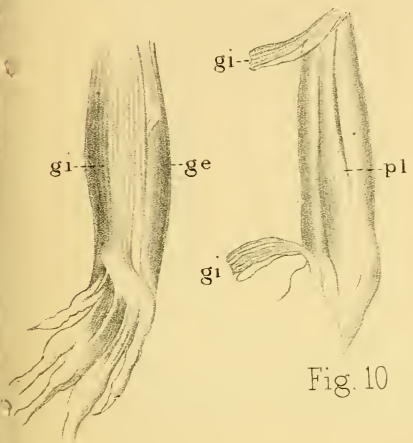


Fig. 10

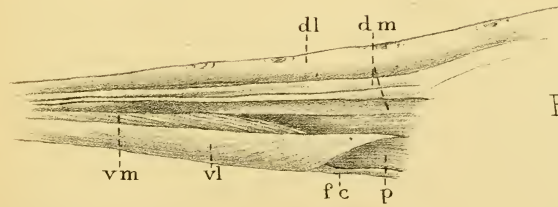
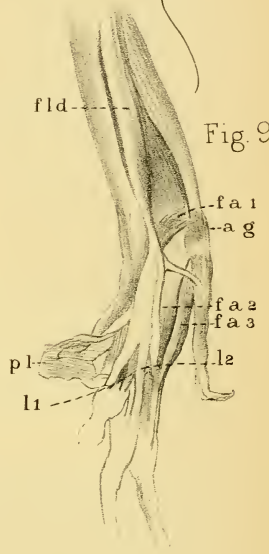


Fig. 12

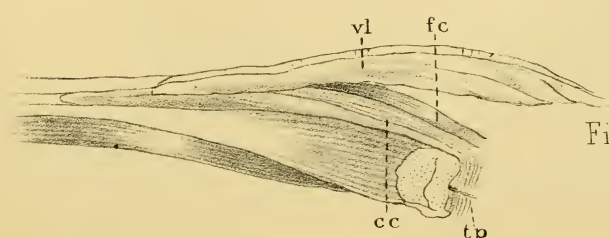


Fig. 13









Fig. 2.

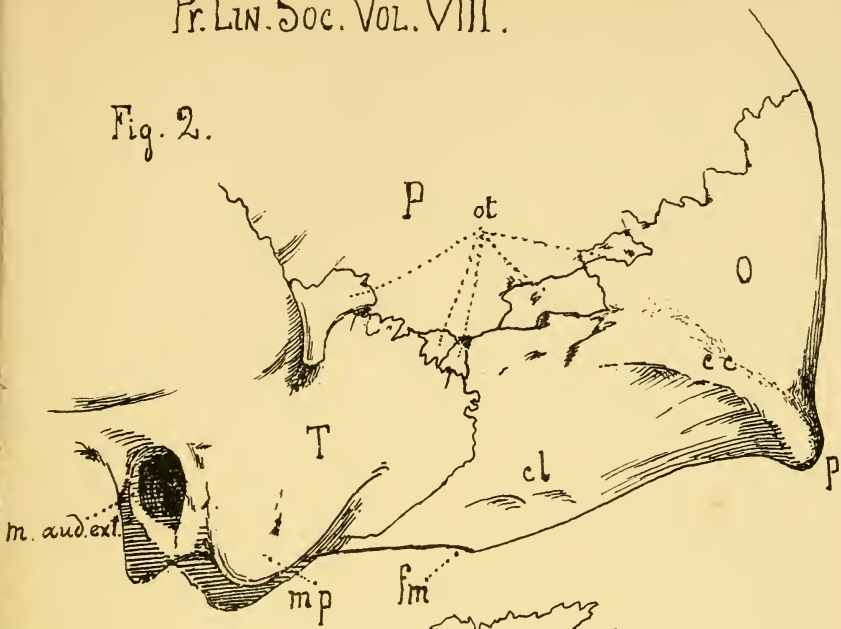


Fig. 1.

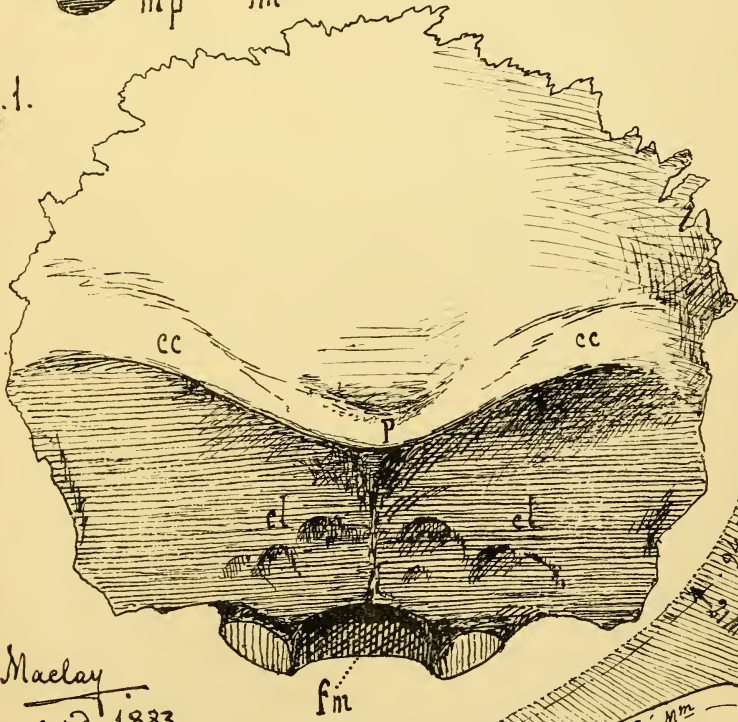
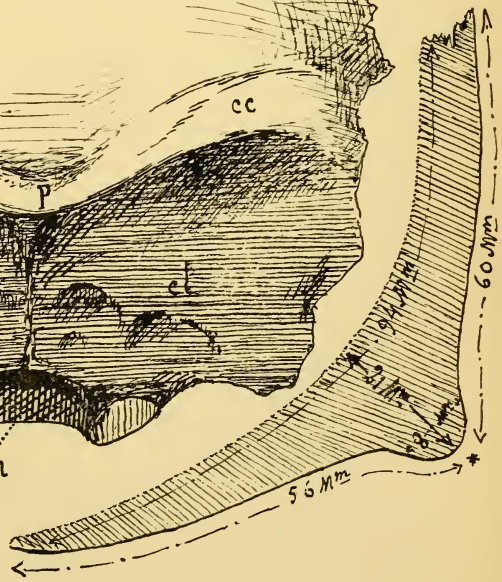


Fig. 3.



Maclay  
and. 1833.





Fig. 1.

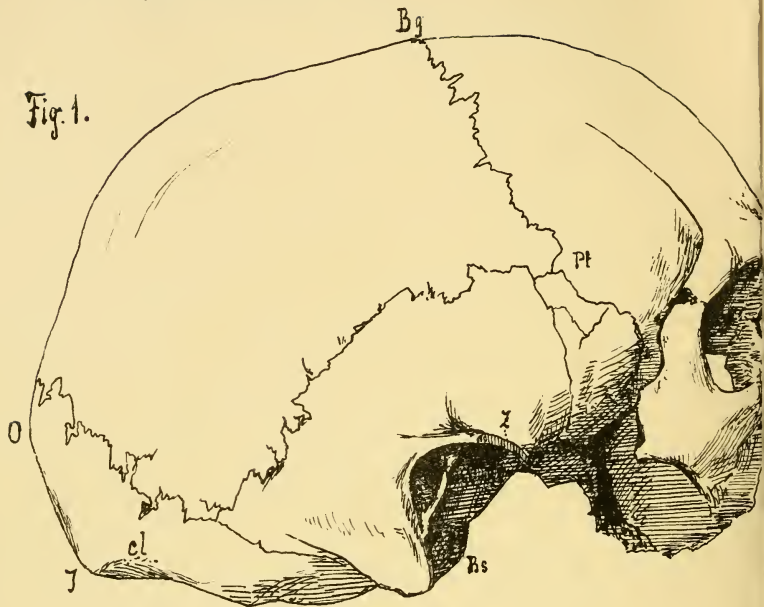
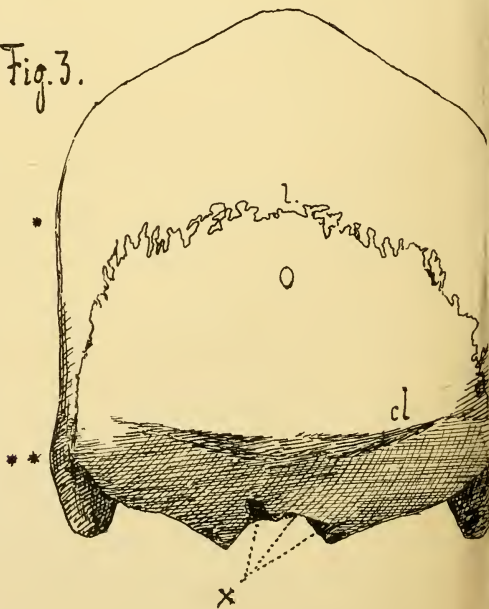
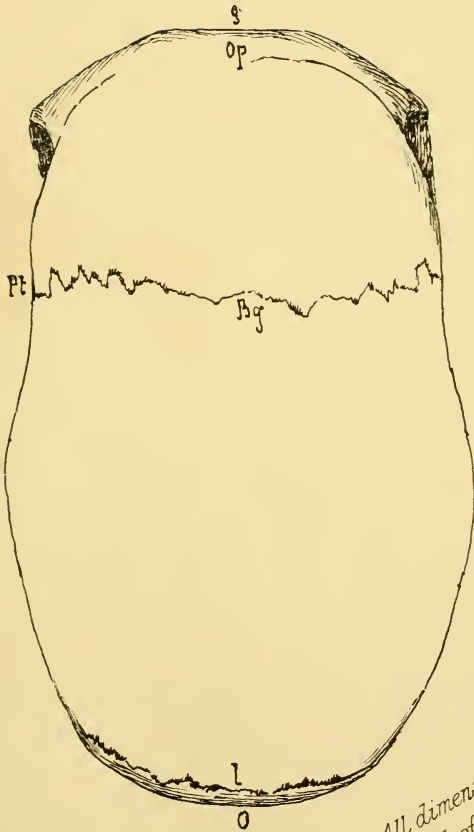


Fig. 3.



Maclay

Fig. 2.



All dimensions of the Fig.  
 $\frac{1}{2}$  of the nat. size.



WEDNESDAY, OCTOBER 31st, 1883.

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The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., Government Geologist, in the chair.

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MEMBERS ELECTED.

Kenneth R. Stuart, Esq., of Sydney, and F. W. Hawkins, Esq., L.S., Mines Department.

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DONATIONS.

“Plagiostomata of the Pacific.” By N. de M. Macleay and William Macleay. Part I., with plates. From Baron Macleay.

“Mittheilungen aus der Zoologischen Station zu Neapel.” IV. Band, 3 Heft, 1883.

“Micrographic Dictionary.” Griffith and Henfrey’s 4th edition, 1883. From the Hon. William Macleay.

“Proceedings of the Zoological Society of London.” Part 2, for 1883. From the Society.

“Acta Societatis Scientiarum Fennicæ” Tomus XII., 1883.  
“Bidrag till Kännedom af Finlands Natur och Folk.” 37th and 38th Parts. 1882. “Ofversigt af Finska Vetenskaps-Societetens Forhandlingar. xxiv., 1881:1882. From the Royal Society of Sciences of Finland.

“Feuille des Jeunes Naturalistes.” No. 155, September, 1883. From the Editor.

“Bulletin of the Museum of Comparative Zoology at Harvard College.” Vol. VII., Nos. 9 & 10. Vol. XI. Parts 1 & 2. From the Museum.

“Catalogue of a Collection of Fossils in the Australian Museum,” 1883, and “Guide to the Contents, &c.” From the Trustees.

A large and valuable Collection of Works on Natural History. Presented by Dr. James C. Cox, F.L.S.

“British Marine Conchology.” By Charles Thorpe, 1844. From J. F. Bailey, Esq., of Melbourne.

“Descriptions of Five New Species of Shells.” By G. B. Sowerby, Junr. “Official Catalogues of the Victoria and New Zealand Courts of the Sydney International Exhibition, 1879.” “African Birds.” Two Volumes. By W. Swainson, F.L.S., “Voyager’s Companion or Shell Collectors’ Pilot.” By J. Mawe, 1825. “Epitome of Lamarck’s Arrangement of Testacea.” By Charles Dubois, F.L.S., 1828. Introductory and Advanced Text Books of Zoology. Nicholson. Two Volumes, 1870 & 1871. From John Brazier, Esq., C.M.Z.S.

“Journal of the Royal Microscopical Society of London.” August 1883. Vol. III. Part 4, From the Society.

“Science.” Vol. II. Nos. 29 to 31. Aug. 24th to Sept. 7th, 1883. From the Editor.

“Announcement of the Wagner Free Institute of Science, for the Collegiate Year, 1883.” From Mr. William Wagner

“Aperçu sur la Théorie de l’evolution. Par le Dr. Ladislau Netto, Directeur Général du Museum National de Rio de Janeiro.” From the Author.

“Fossil Chilostomatous Bryozoa from Muddy Creek, Victoria.” By Arthur Wm. Waters, F.G.S. From the Author.

“On the Caves perforating Marble deposits, Limestone Creek.” By James Stirling, Esq., F.G.S. From the Author.

“Cultural Industries for Queensland.” First Series. By Lewis Adolphus Bernays, Esq., F.L.S. From the Author.

Annual Report of the South Australian Institute for 1882-3” From the Secretary.



PAPERS READ.

OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE  
NEIGHBOURHOOD OF SYDNEY. No. 5.

BY E. HAVILAND.

This paper consists of a few notes on *Myrsine variabilis*; a tree belonging to the order Myrsinaceæ. I am indebted to our friend, Mr. Deane, for all the specimens of the flowers and fruit of the plant that I have examined; for although I visited the locality with him, we could not at the time, find any tree, bearing flowers.

Of the genus *Myrsine*; Bentham, writing in 1869, gives but four species, but Von Mueller in his census of Australian plants, just published, enumerates six species; of which, three are peculiar to Queensland; one common to Queensland and New South Wales; one to Tasmania and New South Wales; and one peculiar to New South Wales.

*Myrsine variabilis*, in favorable localities, is a tree attaining a height of 30 to 40 feet. Its flowers are very small, certainly not exceeding one or one and a-half lines in diameter; and grow in small clusters in the axils and internodes of the leaves. I do not know to which of its peculiarities R. Brown referred, when in the year 1810 he gave it its specific name; but certainly none could be more appropriate. Indeed it varies so much, that I have found, from the same tree, flowers with five lobes to the corolla and five to the calyx; some with four lobes to each; some with five to the corolla and four to the calyx; and others with four to the corolla and five to the calyx; but in every case, the number of stamens has been the same as that of the lobes of the corolla. Again, I have found flowers with perfect ovaries and ovules, and with anthers full of pollen; and from the same plant, others without ovules, with stamens and fully developed anthers, but entirely without pollen.

It was while examining the flower in the endeavour to identify it, that my attention was directed to its peculiar construction. The corolla, which, as I have said, is not more than one line or one

and a-half lines in diameter, is nearly or quite globular ; and, so far as I have seen, always closed. The lobes, although divided to fully two-thirds of their whole length, keep so closely together, as to give the flower the appearance of a minute ball that has been cut in different directions across the top, but without causing the parts to gape or separate. If the corolla is taken off one of the most perfect flowers, slit open, and pinned, with insect pins, to a flat piece of cork, it can not only be examined and studied, with the stamens, anthers and pollen together ; but it can be readily transferred to the stage of the microscope. It will be found to have five broadly acute lobes, thick, fleshy, and very concave ; and having the stamens, which rise from the base, closely adnate with the lobes, nearly their whole length ; bearing the anthers deep in the concavities, but sufficiently high on the lobes to be brought, owing to their dome shape, exactly over the stigma. The anthers are very large as compared with the rest of the flower, and peculiarly shaped, very broad at the base and tapering to a point at the apex. In fact, I cannot help comparing them to a chemist's precipitating glass, on a small scale. Owing to this peculiar form, the pollen, which is very dry and loose when fully ripe, falls without being impeded by the walls of the anther ; and this is facilitated by the anther opening, not only in a longitudinal slit, but across the base, and gaping widely, so that it becomes quite empty at once. The style is very short, so that the stigma is almost sessile. Here too a great variation occurs. In those flowers which had imperfect ovaries, and no ovules, I have found the style solid throughout ; but in the perfect flowers, having ovules, it appears to be simply a short hollow tube, with the stigma marginal. In fact, the ovary and style may aptly be compared with a globular shaped bottle, having a short, wide, open neck, in which case the stigma will answer for the rim or tip of the neck. In several cases I could, with a low power, see through the open tubular style, down into the ovary. I have found the tube partly filled with pollen, and I have also found pollen in the ovary, which must have fallen from the anthers directly through the tubular style. For, sometimes I thought it just possible,

that the fovilla might be discharged by the pollen grains directly upon the foramen of the ovule, as occurs in a genus of not very dissimilar construction, in the Gymnospermous order Gnetaceæ, but subsequent examination proved that this could not be so. Measuring, in four or five flowers, the diameter of the tube of the style by the micrometer eye piece, I found it to be  $\frac{4}{1000}$  of an inch, while the pollen grains were less than  $\frac{1}{1000}$ . So that the tube is more than four times the diameter of the grains of pollen which have to pass through it. In some flowers, however, I found the wall of the tube thick and the passage very much smaller. The placenta is not, as in many flowers, a mere point of attachment of the ovules to the ovary, but is large, fleshy, and globular, nearly filling the ovary. It is quite free, except its connection at the base; and the ovules are embedded in it. It is owing to this, that the ovules cannot be fertilised by the direct action of the pollen grains, as I at first thought possible, but require the intervention of pollen tubes. The substance of the placenta, however, is very spongy and open, so that the pollen tubes can easily penetrate it. In a section of the nearly mature fruit, I have rarely found more than one seed perfect, but small depressions can be seen in the mass of the placenta filled with the *debris* of the ovules that have not been fertilised. I have been asked once or twice, by young botanists, how it occurs, that plants having many ovules, frequently produce but two or three seeds. I think a transverse section of the fruit of this plant under a low microscopic power, would be the best answer that could be given to such an enquiry.

The proportion of perfect and imperfect flowers upon any plant of this species of *Myrsine* I should think nearly equal. In the first supply I received from Mr. Deane, I found all perfect, the ovaries containing ovules, the anthers full of pollen, except in cases where they had matured and opened; and in most the style a short open tube. I am inclined to think, that the opening of the style increases as the pollen ripens; so that when it is fully ripe, the style is fully open to receive it; but I merely suggest this, I am not at all sure of it. In the second supply of flowers, from the same tree, I found every one imperfect. Ovaries without ovules,

and the placenta rudimentary only ; stamens, with anthers fully developed, but without pollen ; and the style, not a tube, but solid. The genus is said to be, to some extent, Polygamous, and I have no doubt it is, but in the specimens that I have examined, I have found no unisexual flowers, nor even the state of some Lobelias, which, one flower having a perfect pistil with imperfect stamens, while another has perfect stamens with an imperfect pistil, are virtually unisexual. In this plant, however, all the flowers that I have found imperfect, have been so entirely, so far as fertilisation is concerned ; for although the ovary has externally been of the usual form, it has contained no ovules, and though the stamens have borne fully developed anthers, they have been void of pollen.

In every part of the flower, corolla, calyx, ovary, and even far down the pedicel, there are embedded in its substance, peculiar granular masses of a red colour, and varying in size from  $\frac{1}{2000}$  to  $\frac{1}{500}$  of an inch. In the ovary they form a circle embedded in its walls, and even with the assistance of an ordinary pocket lens, any one, not on his guard, may be misled into the belief that they are ovules. An inspection with the microscope, however, soon convinces one to the contrary. Although so embedded in the substance of the flower, they can be picked out separately with a fine needle, leaving a clean cell-like impression behind.

In my former papers I have expressed my belief that, as a rule, flowers are cross-fertilised, either from others on the same plant, or more remotely, from those of a separate plant. *Myrsine variabilis* is, no doubt, one of the exceptions to that rule. With the corolla so closed as to prevent any pollen bearing insect having access to the stigma (and that not for a time only, but certainly till after the work of fertilisation has been completed), and with the anthers opening directly over the stigma, or mouth of the tubular style, and the apparently easy access of the pollen to the ovary, I think there can be no doubt that the plant is self-fertilised.

Taking the word in its simple botanical sense, as applied to plants closely fertilised in unopened blossoms, then this plant *Myrsine variabilis* may be considered as Cleistogamous. I am not, however,

at all prepared to say, that the whole of this species or even any individual plant of the species is entirely so. It is a very rare thing for a plant to bear cleistogamous flowers only. There are generally some few opening and exposing themselves to cross-fertilisation in the usual way, as though nature in any case were loth to depend entirely on self-fertilisation.

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TEMPERATURE OF THE BODY OF ECHIDNA HYSTRIX CUV.

BY N. DE MIKLOUHO MACLAY.

During my stay in Brisbane in July 1879, I had an opportunity of getting two *Echidna hystrix* for the study of the brain. I kept them for several weeks before I had time to begin the anatomical dissection, and they enjoyed the most perfect health, appearing very sleepy during the day, but more active during the night, and leaving a soup plate of milk thickened with some flour quite empty in the mornings. Being at last ready to examine the brain of one of them, and before injecting a dose of hydr. chlor., I took the opportunity of observing the temperature of the body of the animal. A very sensitive thermometer, placed in the cloaca, after lying there undisturbed for ten minutes showed the temperature of  $28^{\circ} 3$  C. (about  $83^{\circ}$  F.)

Believing that the large opening of the cloaca had interfered with the correctness of the observations, I made a small incision, just large enough to introduce the oblong ball of the thermometer into the cavity of the abdomen. The thermometer was left there over ten minutes and showed a temperature of  $30^{\circ} 0$  C. ( $86^{\circ} 0$  F.)

Not satisfied with this observation, and finding that the observed temperature of the Echidna is much below the known average temperature of the body of Mammalia, I repeated the observation on the other specimen. The second observation was made the 9th July. The temperature of the air that day was  $20^{\circ} 0$  C. ( $68^{\circ} 0$  F.) I made again a small incision, and observed the temperature, in this incision and in the abdominal cavity.

I found the temperature (the thermometer lying in the cavity for over ten minutes)  $26^{\circ} 95$  C. (about  $80^{\circ}$  F.) To be quite sure, and to prevent any mistakes, I introduced again the thermometer into the abdominal cavity in half-an-hour's time, and let it remain there for over fifteen minutes.

The very sensitive thermometer (made for observation of temperature of the human body on the sickbed) showed again the temperature of  $26^{\circ} 65$  C. (about  $79^{\circ}$  F.) Wishing to be quite sure about the observations, I induced Mr. R. T. Steiger, the Government Analytical Chemist in Brisbane, to place his thermometer in the cavity, and we obtained there with this other thermometer a temperature of  $78^{\circ}$  F., (or  $25^{\circ} 5$  C.), which result agreed very nearly with the previous observations.

Taking the average of these three observations, we find the mean temperature of the body of the *Echidna hystrix* to be about  $28^{\circ}$  C. (or,  $82^{\circ} 4$  F.)

Comparing the same with the mean temperature of Mammalia, which is, after Dr. J. Davy's observations of thirty-one different species,  $38^{\circ} 4$  C., or  $101^{\circ} 10$  F., we find that the mean temperature of the Echidna is about  $10^{\circ}$  C., or  $19^{\circ}$  F., lower than the former.

I have to add that in the month of July the Echidnas appeared to be in a very sleepy state, moving about in the day time only when disturbed. It is possible that during the winter months the Echidna is subject to a state of hibernation, which may also to a certain extent depress the usual temperature of the body.

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PLAGIOSTOMATA OF THE PACIFIC.

BY N. DE MIKLOUHO MACLAY AND WILLIAM MACLEAY. PART 2.

PLATE XX.

It is now exactly five years since we read a Paper with the above heading at a meeting of this Society, and which was published in the third volume of our Proceedings.

At that time we contemplated, as indeed the title of our Paper indicated, a succession of Papers descriptive and illustrative of all the Plagiostomatous Fishes, known to inhabit the Pacific Ocean. A lengthened absence from the country on the part of one of us, has prevented the fulfilment of our intentions with the regularity which we contemplated. We now resume our task, but only at present to deal with what may be regarded as matter supplementary to our first Paper.

A few weeks ago the Australian Museum received among a collection of Fishes from Japan, a specimen of the *Heterodontus* of those seas, a fish which from its first discovery has been accepted by naturalists almost without exception as identical with *H. Phillippi*—the Port Jackson Shark. We were led to suspect when writing our former Paper, that the Japanese species was distinct, and that possibly the same might be the case with the species found by Dr. Bleeker in the East Indian Archipelago, and we stated some reasons for our belief (Proc. Lin. Soc., N. S. W., Vol. 3, p. 313), but authors were evidently puzzled on the subject, and the confusion had become so universal, that until now, when we have the fish actually before us, we were unable to pronounce with any certainty as to the distinctness of the species. We have no longer any doubt on the subject, the species, though somewhat resembling *H. Phillippi*, is most distinct in its marking, which in *H. Phillippi* is very constant, in its dentition and various other less important particulars. To give some idea of the confusion that exists among authors respecting the Fishes of this genus we may mention that the figure (a very bad one) of *Cestracion Phillippi* in the "Voy. of the Coquille, Pl. 2," is not the Port Jackson fish, that Muller and Henle's figure (Plate 31), is most likely the Japanese species, the number of vertical bands being identical, that the tooth given in the same plate as that of *Phillippi* is certainly not of either species, and that Schlegel in the Fauna Japonica describes the Japanese fish as *Cestracion Phillippi*. It is very probable that the *Cestracion Zebra* of Gray and Richardson, and *Heterodontus Zebra* of other authors, were properly described as distinct species, and were really the

Japanese fish, but as these names have been long looked upon only as synonyms, and as we have not access to the books in which they were originally described, we have deemed it best to remove all future doubts, by giving the present species the distinctive name of *Japonicus*.

#### HETERODONTUS JAPONICUS. Mcl.

In form much resembling *H. Phillippi*. Supraorbital ridges, strong, with large dark scutella, and a little emarginate over the eye, terminating a little behind the eye and continued in front towards the snout, leaving a large flat depressed space between the ridges.

The snout is very bluntly rounded. The mouth differs from that of *H. Phillippi* in having the inner nasal fold less long, the fold of the upper lip rounder and shorter, and the inferior margin of the fold of the lower lip covered with soft skin with only very few scutella.

The teeth are in 23 vertical rows in both jaws, the 7 middle rows of the upper jaw consist of 5 cuspid teeth, of which the three middle cusps are largest, but all well marked and distinct. The number of teeth in the central row is 8. The lateral cuspid teeth in rows 7, 8, 16 and 17 (Pl. 20, fig. 4) are more elongate, and the middle cusps are less distinct than in the teeth of the more central rows; in rows 6 and 18 the united cusps take the form of a longitudinal crest, which corresponds with the longitudinal line on the large pavement like lateral teeth (rows 1-5 and 19-23).

In the upper jaw there are in most cases 5 teeth in each of the vertical rows of pavement like teeth. Rows 3 and 21 show the largest teeth in the upper jaw, whilst in the lower, rows 4 to 20 show the largest. The number of the rows of the pavement like teeth are different in the two jaws, there being 10 rows (5 on each side) in the upper, and 12 rows (6 on each side) in the lower jaw.

All the teeth of the middle rows of the lower jaw are alike in shape, those of the upper jaw (rows 8 and 17) vary considerably, the lateral teeth being different from those of the central rows.



We may repeat, however, what we noticed in our description of *H. Phillippi* in our former Paper that the teeth vary much in form, size, and numbers, according to the age and size, and perhaps sex of the individual.

The spiracles are distinct, larger than in *H. Phillippi*, and placed a little under the eye, and in a vertical line distinctly behind the eye. The lateral line is straight and continuous from the supra-orbital ridges. The first dorsal fin is high and falciform, the height is exactly twice the length of the portion of the base attached to the back, the spine is slight and acute and half the length of the fin. The second dorsal is shaped like, but less in height than, the first, and its base of attachment to the back is about the same; the distance between the two dorsals is equal to that between the second dorsal and the commencement of the caudal fin, and to that between the first dorsal and the eye. The pectorals are large and triangular, and about equal in length to the caudal. The ventrals are situated in a line intermediate between the two dorsals, the anal commences distinctly behind the second dorsal, and does not nearly reach the caudal. The lower lobe of the caudal is very deeply and less than rectangularly notched.

The coloration and markings are not by any means distinct, the specimen having evidently been long in spirits, but the remains of numerous dark brown bars across the back present a very different style of marking from the other known species of the genus. The best description of this Fish is to be found in Perry's United States Exped. to Japan (Vol. 2 p. 285 Pl. 13 fig. 2), in which Brevoort describes a young specimen of 8 inches in length. We quote his description, because it is probably the only instance of a description taken of this species from a fresh specimen. It must be noted however, that it was little more than an embryo. "Its general colour is of a pale sepia-like brown, darker on the back and fins, with a pinkish tinge on lower parts of the body. Irregular bands and large blotches of several shades of the same brown are distributed from the pectorals to the caudal, grouped in five principal bands with smaller ones near the back, between the first three large ones; the first of these is just back of

the pectorals, the second back of the first dorsal, and in front of the ventrals, spreading laterally near the abdomen. The snout and cheeks are shaded also with darker brown cloudings. Small pale brown dots besides the above cover the back of the head and body; and about one-half of the pectorals, dorsals, and caudal ventrals, anal and lower lobe of dorsal of a more uniform brown.

“Sa-siwari” of the Japanese, common in Spring and Autumn, and much sought after for food.”

The specimen which we have now figured and described, is a female of 16 inch in length, or about half grown. In marking as we have previously observed it is distinct from all its congeners, in general aspect it much resembles *H. Phillippi*, the species with which it has always been confounded, but in its dentition it comes nearest to *H. Francisi*, differing however from it considerably in the 5 cuspid middle teeth.

The number of known species of *Heterodontus* now amounts to five, distributed as follows:—

North Pacific Ocean, East or American side, *Heterodontus Francisi*, San Francisco. West side, China and Japan, *Heterodontus Japonicus*, Japan. South Pacific Ocean, West or Australian side, *H. Phillippi* and *galeatus*, Sydney. East or American side, *H. Quoyi*, Galapagos Islands.

Dr. Bleeker seems to have found a species in the Indian Ocean, which he at once set down as *H. Phillippi*. It is not at all improbable however, that it may be distinct, or that it is identical with the Japanese Fish; indeed it is most unlikely to be *H. Phillippi*, a species which seems to have only a limited range in a direction N. of Sydney, not being known on the Queensland Coast, while it extends to the South as far at least as the mouth of the Derwent in Tasmania.

We may note here that *H. galeatus* Gunth. regarded when we last wrote as so rare, has been got frequently of late years, its rarity arising probably more from the ignorance and want of observation on the part of the fishermen, than the actual paucity of its numbers. Echini form the chief food of this species and probably of all the genus, the strong dorsal spines and prominent supraorbital ridges

enabling them to force their way under rocks and stones in pursuit of these animals. A fine specimen of *H. galeatus* in the Macleay Museum—a strong young female adult, had the dorsal spines worn down to half their proper length, evidently in this way, and its viscera were full of finely triturated *Echinus* tests indicating pretty clearly how the grinding of the dorsal spines had been effected.

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EXPLANATION OF PLATE 20.

HETERODONTUS JAPONICUS. Mcl.

- Fig. 1.—Profile view of a spirit specimen of *H. Japonicus* in the Australian Museum, Sydney;  $\frac{2}{3}$  of nat. size, the specimen being about 19 inches long.
- Fig. 2.—View of the same animal from above, also  $\frac{2}{3}$  of nat. size.
- Fig. 3.—Anterior part of the head from the ventral side, to show the arrangements of the nasal groove, the labial folds and the anterior teeth.
- Fig. 4.—Diagrammatic sketch of the teeth of the upper (Fig. 4, a.) and the lower (Fig. 4, b.) jaws of *H. Japonicus* about 4 times the nat. size. The cyphers indicate the vertical rows of teeth to illustrate the references in the text.  
(The jaws not having been taken out, the drawing of the teeth has been rather difficult, so that only a *diagrammatic* sketch could be obtained. The spaces beneath the front teeth are represented a little larger on the sketch than in nature, but it is done on purpose to show more distinctly the cusps of the teeth.)
- Fig. 5.—One of the front 5 cuspid teeth of the middle row, enlarged about 5 times.

LETTERING FOLLOWED THROUGHOUT ALL THE FIGURES.

- a.*—Superior oral fold.  
*b.*—Inferior oral fold.  
*n.*—External orifice of the nasal groove.  
*sp.*—Spiracle.

NOTES ON SOME REPTILES FROM THE HERBERT RIVER, QUEENSLAND.

BY WILLIAM MACLEAY, F.L.S., &c.

I received a few days ago from Mr. Archibald Boyd of Ripple Creek, Herbert River, an earthenware jar containing specimens in spirits of several species of bats, muridæ, antechini, lizards and snakes. A very cursory glance at the contents of the jar satisfied me that Mr. Boyd had hit upon a new and untried and also a very prolific field for the Zoologist. The mammals I have not yet examined in detail, but I believe that most of them are of undescribed species. Of the reptiles, I herewith give a list. Of Lizards there were three species.

1. ODATRIA OCELLATA.

A species of wide distribution in tropical Queensland.

2. LIASIS PUNCTULATA.

Found everywhere throughout Australia.

3. TIARIS BOYDII. n. sp.

Of a reddish brown colour, with seven or eight narrow dark-brown fasciæ on the body, and similar but indistinct fasciæ on the tail and feet; the front of the head and nape is greyish, the sides of the head stone blue, the gular pouch and the space between the tympanum of the eye yellow, and the under side of the body greyish-yellow. The front of the head is triangular and shelving, a little concave except above the orbits, and covered with minute roughly keeled scales; sides of the head covered with small non-imbricate scales or tubercles, very small on the eyelids, and largest below the mouth, and behind the ear expanding into a few ivory looking tubercles of larger size. The gular pouch is covered with very minute pointed scales, with broad, pointed, compressed, triangular teeth along its median fold. On the nape, there is a large compressed skinny crest, densely covered with very small smooth scales, and armed with three or four erect, broad, pointed, triangular, very compressed bony teeth. The scales of the back and sides of the body are small and more or less keeled, and the ridge of the back is armed from the nape to

well down the tail, with acute, very much compressed triangular spines ; the scales of the legs are keeled and those of the tail very strongly so ; occasionally bands of larger keeled scales cross the tail at irregular intervals. The scales of the belly are larger and more strongly keeled than those of the back.

There are no head shields, excepting the upper and lower rostrals, and a long low series of upper and lower labials.

Length of head and body 6 inches, length of tail 12 inches.

In every other species of *Tiaris* I have seen, the dorsal crest is formed of erect triangular compressed scales, in the present species the armature on the occipital and dorsal ridges is distinctly bony.

The Ophidians of the collection number seven.

1. ACANTHOPHIS ANTARCTICA or Death Adder.

This snake has been found in all parts of Australia, but I should say that the East Coast of New South Wales is its most common habitat.

2. MORELIA VARIEGATA. The Carpet Snake of the Colonists.

It is found in all parts of Australia, but is certainly least abundant in Eastern New South Wales. It seems to take the place of the Diamond Snake (*Morelia spilota*) in the tropical Queensland brushes and the arid deserts of Central Australia.

3. VERMICELLA ANNULATA.

A venomous snake, but little deadly. It is found in all parts of this country.

4. TROPIDONOTUS PICTURATUS.

Only a small and injured specimen, which may probably be another species of the genus.

The three following species are undoubtedly new.

5. TROPIDONOTUS ANGUSTICEPS. n. sp.

Scales in fifteen rows.

Abdominal plates... ..	130
Anal plates .. .. .	2
Sub-caudals .... .	40/40
Total length..... .	28½ inches
Length of tail .....	5 inches

Scales of back elongate, ovate, and strongly keeled. Colour black, with the belly whitish, but much clouded with black. Head very slightly broader than the neck, flat, tapering and rounded at the muzzle; the body is cylindrical, the tail rather short. The rostral shield is large and rounded behind; there are two nasal shields with a rather small nostril between them; the loreal is rather higher than long; there are two anterior and two posterior oculars; there are eight upper labials, the third, fourth and fifth abutting on the eye, the sixth and seventh are much the largest; the anterior frontals are as long but much less broad than the posterior, and narrowed a little in front; the vertical is broadest and a little rounded at its anterior edge or base, is gradually narrowed behind, and terminates triangularly.

For the next species I am compelled to create a new genus, and from the locality in which it was found I propose to name it

#### HERBERTOPHIS.

Body round and moderately thick, with flat belly. Tail of moderate length, not distinct from trunk, tapering. Head somewhat depressed, rounded in front and considerably wider behind than the neck. Rostral shield emarginate in front, and extending a little backwards in a rounded triangular form between the anterior frontals; one nasal with nostril in the centre, two anterior and two posterior oculars, scales smooth, in seventeen rows, sub-caudal shields two-rowed. Teeth short, molar like and rounded.

This genus will come under Gray's family or group, Coronellidæ.

#### 6. HERBERTOPHIS PLUMBEUS. n. sp.

Scales in seventeen rows.

Abdominal plates .....	219
Anal plate.....	1
Sub-caudals.....	74/74
Total length .....	4 feet
Length of tail .....	9 $\frac{1}{4}$ inches
Head .....	1 $\frac{1}{4}$ inch

Of an uniform nitid leaden-black colour above, a pure yellowish white on the belly, the scales on the sides showing white edges as

they approach the abdominal plates, which also have one similar mark on each side, the sub-caudals are uniformly marked with a dark basal patch. The nostril is large and deep, the loreal shield is oblong, lying between the second labial and the posterior frontal, the lower anterior ocular is nearly square, and lies between the upper anterior ocular and the third labial, there are nine upper labials, the fourth, fifth and an acute angle of the third touching the eye, the posterior frontals are large, the vertical short, broad, and rounded behind, the superciliaries small and the occipitals very large, the mental shield is small and triangular behind; ten lower labial shields. Eye of medium size.

This is the first of the Family I have known to be found in Australia; a species of *Coronella* has long been quoted as Australian, but I have not seen it, nor have I even heard of any one who had.

7. DENDROPHIS BILOREALIS. n. sp.

Scales in thirteen rows.

Abdominal plates.....	200
Anal plate .....	bifid
Sub-caudals.....	120/120
Total length .....	52 inches
Length of tail.....	14 inches

Of rather robust form, with very tapering tail, the abdominal plates are slightly keeled, giving a flattish appearance to the belly, the sub-caudals are very strongly keeled. The colour is jet black, excepting on the under surface, which is pinkish white on the labial shields, chin and cervical plates, and obscure black on the remainder of the ventral plates. A very fine whitish line marks the course of the ventral keels along their entire length.

The head is rather broad, obtusely rounded in front, flat above, and broader than the neck, the rostral shield is broad, deep, and a little rounded behind, there are two nasals with a large nostril between, two loreals placed exactly above one another, of rather oblong form, the upper one highest; one anterior ocular deeply impressed and equal in height to the two loreals; two small posterior ocular shields. Eye large. The four frontal shields are of about

equal size, and of a nearly square form, the vertical is very broad and somewhat sinuate on its basal margin, behind that it narrows in a curve for about half its length, when it becomes parallel-sided, and finally terminates in a rounded apex; the superciliaries are large and broader than the vertical; there are eight upper labials, the fourth and fifth abutting on the eye.

The obtuse deep head, two loreal shields, and jet black colour, sufficiently indicate an almost more than specific difference between this species and all the other Australian Tree snakes. There are two specimens in the collection, the dimensions given I have taken from the largest.

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NOTES ON SOME CUSTOMS OF THE ABORIGINES OF THE ALBERT DISTRICT, NEW SOUTH WALES.

BY C. S. WILKINSON, F.G.S. F.L.S., PRESIDENT.

Mr. W. H. J. Slee, the Government Inspector of Mines, has given me the following particulars regarding a singular ceremony which the Aboriginal tribes of the Mount Poole district perform, when, as is often the case in that arid region, they need rain.

In many parts of that country gypsum occurs abundantly in the soil, but the fibrous variety known as *Satin Spar* is comparatively rare. The latter is highly prized by the natives, and is called by them "rain-stone," for they believe that the Great Spirit uses it in making rain, and probably also because they regard it as solidified rain on account of the resemblance of its fibrous or striated structure to heavy rain; the more pronounced are the striations, the more the stone is valued.

About two years ago, Mr. Slee, when Warden of the Mount Poole Goldfield, was specially invited by the principal chiefs of the Mount Poole and Mokely tribes to attend a ceremony of "making rain." On the day appointed, the natives with the exception of the females, who are not allowed to see either the rain-stone or the ceremony, assembled and formed in a circle, in the centre of which stood the oldest chief and Mr. Slee, no other person being permitted to enter the circle. After a great deal of talking, dancing, singing,



and mystical performances had been gone through by all the natives, the old chief produced the "rain-stone," which had been carefully kept wrapped-up in leaves and a piece of rag, and showed it to Mr. Slee, but would not let him to touch it. He then buried it in the sand.

On one of the creeks near the diggings are some marks of a high flood, which the natives said took place after they had performed the above mentioned ceremony over an unusually large rain-stone.

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### ON THE BRAIN OF GREY'S WHALE (*Kogia Greyi*.)

BY WILLIAM A. HASWELL, M.A., B.Sc.

[PLATE XXI.]

The acquisition recently by the Australian Museum of a fresh specimen of Grey's Whale has afforded me the opportunity of examining the brain of this rare Cetacean. For comparison I have the brain of only one other species, viz., that of the species of *Delphinus* (*D. Fosteri*) common on the New South Wales Coast.

The total length of the *Kogia* was nine feet six inches, which may be regarded as about the average length of these small Cetaceans. The length of the encephalon is  $6\frac{1}{2}$  inches, of which  $4\frac{1}{4}$  inches are taken up by the cerebral hemispheres; the weight of the whole brain with the membranes removed is about 16oz. In the medulla the olivary bodies are very large, though scarcely so prominent as in *Delphinus*. The cerebellum is relatively much smaller than in *Delphinus*; the greatest breadth is about four inches, the mesial lobe is smaller in proportion, and the lateral lobes are nearly symmetrical. The pons is not prominent, its breadth is about an inch, and its antero-posterior extent less than three-tenths of an inch. The antero-posterior extent of the nates is greater than that of the testes, but the latter are much the more prominent; they are separated on either side by a well-marked groove which makes an angle of about  $60^\circ$  with the mesial longitudinal axis.

The greatest breadth of the cerebrum (six inches) is considerably greater than its length ( $4\frac{1}{4}$  inches), and in fact exceeds the total length of the encephalon. Its greatest vertical thickness is two inches. It is narrower in front than in *Delphinus*, and the general shape is more nearly triangular. The convolutions of the upper surface are, as in most Cetacea, highly complex, and arranged in parallel longitudinal folds, but these are better defined than in *Delphinus*, and their dividing sulci are remarkably deep. There is an inner narrow longitudinal fold thinning off anteriorly; and external to it three wider ones; the two inner of these are cut off from one another throughout the greater length of the brain by a deep sulcus, the second and the third are not so deeply divided and are united about the middle of their length by an annectent gyrus which is much broader on the right side than on the left. A fifth fold is traceable, but not so well defined. On the inner surface of the hemispheres the convolutions are arranged in two tiers, the upper very complex with numerous transverse gyri, the lower simpler; these are separated by a very deep longitudinal sulcus. The convolutions of the orbital and ethmoidal surfaces are chiefly longitudinal. The most remarkable peculiarity of this region, and perhaps of the whole brain, is the great depth of the ectorhinal sulcus, a feature marking off the present form very strongly from *Delphinus*. The temporo-sphenoidal lobe is marked by numerous short, irregularly arranged convolutions. The apex of the lobe, consisting of two convolutions placed nearly longitudinally, is sharply divided off from the rest by a deep sulcus. The convolutions of the tentorial surface follow a radiating arrangement.

The corpus callosum is an inch and three-eighths in antero-posterior extent. It is thin towards the middle and dilated at either end, more particularly in front where it forms a prominent thickening; in transverse section it does not appear uniformly curved, but bent at a very obtuse angle a little behind the middle of its length. The lateral ventricles are of very great breadth (more than an inch.) The optic thalami are of large extent and cover the greater part of the floor of the ventricles. The anterior cornua of the lateral ventricles do not pass forwards beyond the

anterior extremity of the corpus callosum ; the posterior cornua are rudimentary. The hippocampus major is well-defined and ends in a prominent pes ; the hippocampus minor is comparatively low and inconspicuous.

EXPLANATION OF PLATE XXI.

- Fig. 1.—Upper view of the brain.  
 „ 2.—Lower view of one half of the brain.  
 „ 3.—Mesial longitudinal section.



ON A NEW GENUS OF FISHES FROM PORT JACKSON.

BY WILLIAM MACLEAY, F.L.S. PLATE XXII.

The Fish here described was captured in a seine net at Watson's Bay by a fisherman, last Friday morning, was taken by Mr. Mulhall, Sub-Inspector of Fisheries, to Dr. Cox, and was by him presented to the Australian Museum. Finding it to be something perfectly new, I lost no time in transferring to paper as accurate a description of it as was possible under the circumstances, for unfortunately the taxidermist of the Institution had already skinned the fish, and thrown away the body. I have had therefore no means of ascertaining the size or shape of the air-bladder, or the number of pyloric appendages, and my measurement of the height of the body of the Fish as compared with its length, has been also to some degree a matter of guess work. For the genus I propose the name of *Psilocranium* from its bald head, and for the species that of the learned President of the Commissioners of Fisheries.

Genus PSILOCRANIUM.

Of elongate form, scarcely if at all laterally compressed. One dorsal fin, the soft portion much larger than the anal fin. Caudal fin forked. The lower rays of the pectoral fins simple. Teeth in a viliform band in both jaws. Præorbital and præoperculum entire. Scales large, thin, cycloid. Head naked, except on the operculum which is clothed with small non-imbricate scales embedded in the skin. Branchiostegals five, the inner one very small.

This Fish is clearly one of the *Cirrhitidæ*, but differs in a marked degree from all the genera included in that Family of the Perches. Its closest relationship however, is to *Chilodactylus*, a genus which is represented by numerous species on our Coasts, and which with its congeners the Trumpeters (*Latris*) are I think about the best food Fishes the sea provides us with. The most striking generic distinctions are to be found in the elongate almost cylindrical form of the body, and the bald head, *Chilodactylus* being of compressed form and having scaly cheeks.

PSILOCRANIUM COXII. n. sp.

D. 16/25. A. 3/10. L. lat. 46. L. tr. 4/10.

The height of the body at the highest part immediately behind the head, is less than one-fifth of the total length, the length of the head is about the same. The head is convex between the eyes; the eyes are large, situated about the middle of the length of the head, and about two of their diameters apart, the snout is convex, rounded and somewhat tumid at the extremity, the mouth is rather small, the lips very thick and fleshy, the maxillary does not nearly reach half-way to the eye, the intermaxillary is very protractile, the lower lip has a large fleshy fold beneath, and when the mouth is shut is received completely within the upper jaw. The only teeth are a band of fine villiform teeth in both jaws. The head is covered with a smooth soft skin, the side of the operculum is rough with small scales embedded in the skin, which extend towards the back part of the orbit. The lateral line is straight and situated near the back along its whole length. The scales of the body are large, thin, smooth edged and of an oblong square form. The dorsal fin is moderately notched, the seventh spine is the longest, being about  $2\frac{1}{2}$  times in the height of the body, the soft dorsal gets gradually lower towards the tail, the caudal fin is large, broad, and deeply bilobed, the third anal spine is longer than the others, and is half the length of the first ray, the rays get shorter after the second, the pectorals have five simple rays, the upper, one-sixth longer than the next to it, extends to the tenth scale of the body.

The colour is blackish, with the scales of the body more or less silvery in the centre; two ill-defined silvery longitudinal bands are traceable on the caudal half of the body.\* The fins are all black, the anal and ventrals have a lightish coloured edge.

The length of this fine fish from the snout to the extremity of the tail is 2 feet  $8\frac{1}{2}$  inches.

Since writing the foregoing I have seen three species of the *Cirrhitidae* from South Australia just received by the Australian Museum. One of them much resembles this Fish in many respects. It has large scales, naked cheeks, and a more elongate form than *Chilodactylus*, and might I think be placed in the present genus, but I am inclined to think that it is identical with the *C. nigricans* of Richardson, a species abundant at King George's Sound, and which he describes as being of a more elongate form than usual in the genus, and as being without scales on the cheek, though that he ascribes to accident. The other two South Australian species evidently belong to Mr. De Vis's genus *Dactylophora* (Proc. Linn. Soc., N. S. Wales. Vol. VIII. P. 284.) One of them indeed is his *D. semimaculata*.

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#### NOTES AND EXHIBITS.

Dr. Cox exhibited a specimen of *Conus nodulosus*. He stated that an unique specimen was possessed by Mr. Taylor, from whose collection it was first described by Sowerby, in 1865, which was said to have come from Australia. Hitherto no second specimen had been recorded from Australia, but the one now exhibited had been sent to him by Mr. Flateau, of Melbourne, with a number of West Australian shells, to be named, and he concluded from that circumstance that it also had come from that locality. Dr. Cox also exhibited a specimen of *Conus abbas*, a rare species from West Australia.

Dr. Cox also exhibited some fine specimens of "water-stones," with globules of water enclosed. They were obtained from near

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\* This only shows on one side and is probably accidental.

Beechworth, Victoria. The President explained that these were pseudomorphs, formed in cavities between crystals by the deposition of silica from water holding that mineral in solution.

Also, a rare form of *Cypræa Lynx* of Linn. This rare form differs from those abnormal forms found in New Caledonia by having the marginal callus as a thick opaque cream-coloured layer reflected over the whole dorsal surface of the shell except at the median line. The base of the shell was not thickened and opalized as in the New Caledonian specimens.

Dr. Cox also exhibited some remarkable forms of deformed eggs from the common hen. One of these measured over two inches long, was of a conical form, and bent towards one end. These specimens were all the property of Mr. Flateau.

Also, three cocoons of a large silkworm of the genus *Attacus*, and a gall of a *Coccus*, obtained at the North Shore, which had been sent to Dr. Cox by Mr. William Hemming.

Mr. Brazier exhibited on behalf of Mr. J. F. Bailey, of Melbourne—specimens of *Voluta maculata* nearly all white, *Voluta volva* four inches long, *Cypræa eximia* Sowerby, from Eocene beds, Port Phillip; *Cypræa*, a new species also fossil; a fine specimen of Cornelian from Basalt in the bed of the Yarra River; and a number of fossil Micro-Bryozoa from the Gippsland Lakes, which he placed at the disposal of the Members.

Mr. Haswell exhibited a beautifully prepared skeleton of the Port Jackson Shark, prepared by Mr. H. Barnes of the Museum—according to a process recently invented by Professor S. Jeffrey Parker, of Dunedin.

Mr. J. G. Griffin, Assoc. M.I.C.E., C.E., exhibited nine native stone weapons from various parts of New South Wales; one a flat piece of slate, 7 inches long and  $2\frac{1}{2}$  wide by  $\frac{3}{8}$  of an inch thick, is peculiar, and was probably used to cut bark, or even for skinning animals. Another, a pebble of Diorite, was dredged from the Hawkesbury.

Mr. Gilliatt exhibited a specimen of Salt from the Holy-Box Well, about half-way between the Darling and Lachlan Rivers. He stated that the salt was left in large quantities about the troughing of the well on the evaporation of the water.

The Hon. James Norton exhibited the nest of *Origma rubricata* from Springwood, which was taken from a flat horizontal sandstone rock from which it suspended by its upper portion, had been worked by the bird into a kind of string, and wedged into a small semi-detached flake of the rock.

Mr. Macleay exhibited the lizard and snakes described in his Paper.

WEDNESDAY, 28TH NOVEMBER, 1883.

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The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., in the chair.

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Mr. Caldwell, Fellow of Caius College, Cambridge, and Mr. Mountain, City Surveyor, were introduced as visitors.

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DONATIONS.

Dr. Petermann's "Geographische Mittheilungen," 1855 to 1876 inclusive, 29 volumes, 4to; and "Freund's Latin Lexicon," 1 vol. 8vo, 1851. "Weller's French and English Dictionary," 1 vol., 8vo, 1863. From Prof. W. J. Stephens, M.A.

"Bulletin de la Société Impériale des Naturalistes de Moscou," Tome LVIII., No. 1, 1883. From the Society.

"Observations on New Vegetable Fossils of the Auriferous Drifts," 2nd Decade, 1883; and "The Plants indigenous around Shark's Bay and the vicinity," 1883. By Baron Ferd. von Mueller, K.C.M.G., F.R.S., &c., &c. From the Author.

"Proceedings of the Royal Society of London," vol. xxxiv., Nos. 221 to 223, vol. xxxv., Nos. 224 to 226; June, 1882, to June, 1883. From the Society.

"Loudon's Encyclopædia of Plants," 1 volume, 8vo, 1872. From Edwin Haviland, Esq.

"Feuille des Jeunes Naturalistes," No. 150, October, 1883 From the Editor.



A valuable edition of "Izaak Walton's Complete Angler," 1 vol., 8vo, 1815. Atlas of Maps of the various Parishes of the County of Cumberland. Photo-lithograph of a relief model of the Colony of Victoria. From G. A. Cheeke, Esq.

"Science," vol. II., Nos. 32 to 35, September 14th to October 5th, 1883. Also duplicate copies of vol I., Nos. 2 to 13.

"On the naturalised weeds, and other plants in South Australia" and "On the Urari, the deadly arrow poison of the Macusis, an Indian Tribe in British Guiana." By Dr. Richard Schomburgk, F.R.S., &c. From John Brazier, Esq., C.M.Z.S.

"Proceedings of the Linnean Society of New South Wales." Vol. I. Parts 1 and 4. Vol. III. Parts 1 and 4. Vol. IV. Parts 1, 2, and 3. Vol. V. Parts 2, 3, and 4. Vol. VI. Parts 1, 2, and 3. From Mrs. Onslow.

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PAPERS READ.

FISHES FROM SOUTH SEA ISLANDS.

BY CHARLES W. DE VIS, M.A.

To Government agents and captains employed in hiring hands for the plantations, I am indebted for several opportunities of examining fish from the prolific waters around the Islands from which the labour supply is derived. In the collections thus incidentally made, undescribed species have so often appeared that I have no doubt a systematic research would be grandly rewarded. The following are the species which now seek admittance into our lists :—

SERRANUS PERGUTTATUS.

D. 9/14. A. 3/9. L. Lat, plus 100.

Height  $3\frac{1}{2}$  in the length, head the same. Snout,  $\frac{1}{3}$ ; Orbit, and Interorbit  $6\frac{1}{2}$  in the head.

Caudal rounded. Preopercle entire, emarginate over angle. Interopercle feebly serrated. Inter-maxillary reaching far beyond the orbit. Pectoral reaching the vent.

Light brown; head, body and vertical fins covered with blue black-edged spots.

Loc. New Hebrides. Collector, Mr. Cheeke.

SERRANUS CRUENTUS.

D. 11/15. A.  $\frac{3}{8}$ .

Height  $3\frac{1}{2}$ ; head,  $3\frac{1}{5}$  in the length. Orbit, and snout, 3; inter-orbit  $7\frac{1}{2}$  in the head.

Fourth and fifth dorsal spine longest,  $\frac{1}{3}$  of the height. Pectoral reaching vent. Inter-maxillary reaching beyond the eye. Upper limb of inter-operculum finely serrated, with strong teeth at the angle.

Light red with six half cross bands, the first over the vertex to the pre-operculum. Fins bright red, upper fore corner of webs of spinous dorsal black, edge of pectoral yellow.

Length,  $8\frac{1}{4}$  inches. Loc. New Britain.

MESOPRION FLAVIROSEA.

D. 11/12. A.  $\frac{3}{7}$ . L. Lat. 52. Tr. 10/16.

Height  $3\frac{1}{2}$ , head  $3\frac{1}{3}$  in the length. Orbit  $2\frac{1}{2}$ , snout 4 in the head; interorbit,  $\frac{1}{2}$  of orbit. Canines  $\frac{2-2}{0-0}$ .

Pre-operculum strongly serrated at the angle, scarcely emarginate on the one side, deeply on the other. Pectoral reaching origin of anal, caudal emarginate.

Light brown washed with yellow posteriorly. Fins, except spinous dorsal, yellow. A faint spot over lateral line beneath origin of soft dorsal, another fainter on end of caudal peduncle above, middle rays of caudal dark.

Loc. New Britain.

In the young the spots on the body are rather more distinct.

TETRAROGE VESTITUS.

D. 16/9, A.  $\frac{3}{6}$ .

No barbels. Cleft of mouth reaching centre of eye. Jaws equal. Spinous dorsal commencing on the nape. Pectoral hardly reaching anal. Scales very distinct.

Olive brown, dark speckled, the markings tending to form four bands across the back.

Loc. South Seas. Collector, Captain Brown.

ACANTHURUS ZEBRA.

D.  $9/28$ . A.  $3/20$ . V.  $4\frac{1}{2}$ .

Height  $\frac{1}{2}$ , head  $\frac{1}{3}$  of the length, s.c. Preorbital  $2\frac{1}{4}$  in the head.

Caudal spine moderate, caudal emarginate. Half of outer ventral ray undeveloped.

Five vertical bands, first through the eye, second curved backwards on the abdomen. A black spot on the end of the caudal peduncle above. Upper part of head dark grey.

Loc. Duke of York's Group.

RHYNCHICHTHYS NOVÆ-BRITANNIÆ.

D.  $10\frac{1}{11}$ . A.  $4/7$ . L. Lat. 43. L. Tr.  $4/7$ . V.  $1/7$ .

Height  $3\frac{3}{4}$  in the length s.c. ( $4\frac{1}{2}$  c.c.), head 3 in the length s.c. Orbit,  $2\frac{1}{2}$ ; snout,  $3\frac{1}{2}$ ; inter-orbit,  $4\frac{1}{4}$  in the head.

No vomerine teeth, snout pointed. Third dorsal spine longest, more than  $\frac{1}{2}$  of the height. Third anal spine,  $5\frac{2}{3}$  in the total length, or  $\frac{4}{5}$  of the head. Inter-maxillary not reaching the middle of the eye. Operculum with two spines, the upper largest with two small ones above it. Inter and sub-opercles entire. Pre-opercular spine short. Caudal lobes equal.

Silvery with a strong red blush. Longitudinal rows of dark spots on the body, a double line of round spots from the angle of the operculum to the tail. Four oblique lines of spots on the pre-operculum. Fins immaculate. Inner half of caudal lobes white.

Length 6 inches. Loc. New Britain.

HARPAGE, Fam. BERYCIDÆ.

Muzzle short, gape rather oblique, jaws equal. Teeth viliform on jaws, vomer, palatines and tongue. Five branchiostegals, opercles serrated. Operculum distinctly and pre-operculum scarcely

spiniferous, scales etenoid, larger and more distinct anteriorly than posteriorly. Dorsals slightly connected. Ventrals contiguous, with 7 rays, the outer simple. Caudal forked, anal with 3 spines. Spinous dorsal sheathed.

#### HARPAGE ROSEA.

D. 12 1/14. A. 3/11. L. Lat. 42. L. Tr. 5/10. P. 1/16. V. 1/7.

Height  $2\frac{3}{4}$ ; head  $3\frac{1}{3}$  in the total length. Orbit  $3\frac{1}{2}$ , snout  $4\frac{1}{2}$ , interorbit  $5\frac{3}{4}$  in the head.

Moderately elevated, thick. Profile regular, more convex above. Dorsal, anal and lobes of caudal, obtusely pointed. Inter-maxillary reaching much beyond orbit, very deep posteriorly and overhanging the mandible. Caudal small. Profile of spinous dorsal regularly arched, 4th to 6th spines longest; lower than the soft. Scales spinose on the edge, the anterior ones with 6—7 rather long teeth. Opercular spine distinct from the serrations, but short. A short bifid spine on the angle of the pre-operculum. Second anal spine much longer and stronger than the third. Lateral line almost obsolete on the caudal peduncle. Cheek and operculum sharply granular. Interopercle scaly.

Ruddy brown stained with red. Fins pale.

Length, 5 inches. Loc. S. S. Islands Collector, Captain Eastlake.

#### GOBIODON AXILLARIS.

D. 6 1/9. A. 1/7.

Height  $3\frac{1}{4}$  in the length, head considerably higher than long, profile parabolic, no scales, lower canines sharp, right one bifid in both of two specimens.

Pale greenish—a red brown line below the base of the dorsals. Base of fins yellow, edges broadly brown. Four brown vertical lines on the head, the first from the eye; a blackish red spot above the axil of the pectoral.

Loc. Bank's Group. Collector, Mr. C. F. Browne.

## GOBIODON FLAVIDUS.

D. 6  $\frac{1}{9}$ . A.  $\frac{1}{8}$ .

Height  $4\frac{1}{2}$  in the length, head as long as high, profile vertical with a slightly projecting snout. No scales. Lower canines rather large.

Pale greenish yellow. An orange line from over orbit along edge of operculum and on base of pectoral. An orange band down middle of body. Two short blue lines on cheek opposite angle of mouth, sometimes absent

Loc. Bank's Group. Mr. C. F. Browne.

## GOBIODON LINEATUS.

D. 6  $\frac{1}{10}$ . A.  $\frac{1}{9}$ .

Height  $\frac{1}{2}$  nearly of the length, profile parabolic with a slightly protruding muzzle; no scales; habit elongate; canine teeth.

Smoky brown, anal and caudal brownish black. Bases of pectoral and caudal pale yellow, traversed by a slender dark-edged blue line. All the head and fore part of the body with similar undulatory vertical lines, which become very obscure posteriorly.

Loc. Bank's Group. Collector, Mr. C. F. Browne.

## GOBIODON INORNATUS.

D. 6  $\frac{1}{11}$ . A.  $\frac{1}{9}$ .

Height  $4\frac{1}{3}$  in the length, head much longer than high, profile parabolic with a rather projecting snout, no scales, lower canines moderate.

Flesh-yellow. Chin, base of pectoral and of caudal yellow. No markings save an obscure purplish streak beneath the base of the dorsals. Spinous dorsal black-edged.

Loc. Bank's Group. Collector, Mr. C. F. Browne.

## GOBIOSOMA PUNCTULARUM.

D.  $\frac{5}{25}$ . A. 24.

Height  $10\frac{1}{2}$ , head  $4\frac{3}{4}$  in the length, third dorsal filament 4 in the same.

Yellowish, minutely dotted with brown. Distant brown spots on the upper part of the head and neck and on soft dorsal; caudal with three faint crossbars.

A shorter fish than 9 *guttulatum* Macl., with a longer head and a much shorter and more delicate filament. The body is without traces of bands. *Guttulatum* is minutely freckled with white, and the bars on the tail are frequently multiplied and broken up into spots—in the present fish they are constantly linear and faint, its mandibular cirrhi also are much smaller.

Loc. South Sea Islands probably.

SALARIAS GRISEUS.

D. 30. A. 20.

Height 5, head  $5\frac{3}{4}$  in the length.

Lower canine moderate. A bifid tentacle on nostril and orbit. A pair of short fringed tentacles on nape. Anterior profile oblique. Dorsal rising on vertical of upper opercular angle, continuous with caudal, violet grey. Pectoral brown spotted; ventral brown tinged.

Loc. South Sea Islands.

SALARIAS ÆQUIPINNIS. Gunth.

A specimen which may be of this species has a dorsal formula 12/19, and a pointed caudal. It is dark grey with pale spots arranged anteriorly in short vertical bands. The anal rays are black, but there is no marginal black band. Possibly it is distinct, the number of dorsal spines being reduced beyond the usual limits of variation.

AMPHIPRION ARION.

D. 10/17. A. 2/13 L. Lat. 55. L. Tr. 5/20.

Height  $2\frac{1}{3}$  ( $1\frac{1}{5}$  s.c.), head  $3\frac{3}{4}$  in the total length. Snout and orbit,  $3\frac{3}{4}$ ; interorbit  $2\frac{1}{2}$  in the head.

Muzzle very obtuse, rounded, jaws equal. Pre-operculum feebly denticulated. Opercle radiately toothed, in two main lobes.

Brownish yellow. A narrowly dark-edged broadly elliptical (slug-shaped) pearly band from the base of the anterior dorsal to the chest. A large ovate black-brown blotch covers the hinder half of the trunk from the distal third of the pectoral to the caudal peduncle, but does not reach the anal. Vertical fins yellow. Ventrals and anal spines black.

Length,  $3\frac{1}{2}$ . Loc. South Seas. Collector, Mr. Cheeke.

POMACENTRUS ONYX.

D. 12/11. A. 2/12. L. Lat. 26. L. Tr. 2/9.

Height  $\frac{3}{5}$  of the length, s.c. ; head  $\frac{1}{3}$  barely.

Pre-orbital finely serrated, and  $\frac{1}{2}$  of orbit, pre-opercle finely serrated on posterior, more strongly on lower limb. Profile very convex above, less so beneath.

Four black bands, first over the eye to the chin and chest. Second from anterior half of spinous dorsal to ventral. Third from posterior half of soft dorsal to anal. Fourth forming a large ovate patch covering the end of the caudal. Ventrals black.

Loc. South Seas. Collector, Captain Browne.

POMACENTRUS NOTATUS.

D. 13/12. A. 2/13. L. Lat. 25. L. Tr. 2/7.

Lobes of caudal prolonged, of dorsal and anal moderately so. Operculum with a spine.

Brownish grey with a blue tinge. Pectoral and tip of soft dorsal yellow. Tip of anal and caudal lobes white. Scales of head and belly with short longitudinal bars of blue ; of back and flanks with vertical streaks, many of which are curved, and have a process directed backwards from their middle.

Length, 3 inches. Loc. New Britain.

POMACENTRUS NIOMATUS.

D. 13/13. A. 2/13. L. Lat. 26.

Height  $2\frac{1}{3}$ , head  $3\frac{1}{5}$  in the length. Operculum entire, pre-orbital narrow, almost entire pre-operculum strongly serrated.

Uniform pale brown. A minute black super-axillary spot.  
Locality, probably South Sea Islands.

POMACENTRUS TRIFASCIATUS.

D. 12/11. A. 2/4. L. Lat. 24.

Height  $2\frac{1}{8}$ , head 4 in the length; orbit and post-orbit  $2\frac{3}{4}$ , snout  $3\frac{1}{3}$ , inter-orbit  $2\frac{1}{2}$  in the head.

Fourth and fifth dorsal spines longest,  $\frac{1}{2}$  of the head, posterior rays rather prolonged, pointed; soft dorsal higher than long; second anal spine strong, shorter than soft dorsal. Lilac brown, with three transverse bands—first, from nape and occiput to chin leaving inter-orbit and muzzle clear; second, across middle of body; third, across its hinder part (including soft dorsal and anal) and caudal peduncle. Point of soft dorsal white.

Locality, probably South Sea Islands.

GLYPIDODON PALLIDUS.

D. 12/11. A. 2/11. L. Lat. 26.

Height,  $2\frac{1}{2}$  in the length; Preorbital 3 in the orbit; snout, shorter than the eye.

Teeth uniserial, long; caudal emarginate, lobes rounded. Pale yellowish blue; a blue line from base of dorsal to muzzle on each side. Two curved lines beneath the eye; small oval spots or short streaks above lateral line, and extending upon the webs of the dorsal; streaks on a few scales below the lateral line.

Long. 2 inches. Locality, Bank's Group, Collector, Mr. C. F. Browne.

GLYPHIDODON AMABILIS.

D. 13/11. A. 2/11. L. Lat. 27. L. Tr.  $1\frac{1}{2}/8$ .

Height  $2\frac{1}{5}$  in the length, snout equals eye. Preorbital 3 in the head.

Violet brown, with three pale transverse bars—one on the operculum spreading behind the base of the pectoral; second, from base of sixth dorsal spine to the vent; third, broad across



caudal peduncle. Pale spots on the operculum, and forming two curved lines below the orbit and with an angular streak on its posterior third, and a few small white spots anteriorly; spinous dorsal dark edged, soft, with a blackish base gradually rising higher posteriorly; caudal largely white tipped, dark between the lobes.

Locality, South Sea Islands. Collector, Captain Eastlake.

GLYPHYDODON UNIOCELLATUS. Quoy and Gainard.

Dr. Gunther regards *G. assimilis* as quite distinct from *uniocellatus*, and judging from his diagnosis of it, with good reason. But a fish occurs in Captain Eastlake's collection, which appears to be a link between the two, and is therefore worthy of notice. It is blue with a darker blue spot on the base of each scale. In *G. assimilis*, the lower part of the head is brown (in life yellow.) In the present fish this colour is continued with a nearly straight upper limit to the posterior third of the anal and is traversed longitudinally by an irregularly undulating blue streak. The black dorsal spot is on the base of the posterior rays, and there are traces of blue longitudinal lines on the anal. On the whole however, its distinctive characters are not sufficient to separate it from either of the two species referred to. Two specimens alike.

NESIOTES n. g. Fam. Labridæ.

Anterior canines  $\frac{4}{4}$ , posterior none; laterals confluent, with distinct serration. Lateral line resumed. Cheeks and opercles scaly. Base of dorsal not scaly. Twelve dorsal spines.

Differs from *Decodon* in the absence of a posterior canine, and from *Semi-rossyphus* in the serrations of the dental ridge.

N. PURPURASCENS.

D. 12/13. A. 3/14. L. Lat. 37.

Height  $3\frac{1}{2}$ , head 4 in the total length; orbit  $\frac{3}{4}$ , snout 4 in the length of the head; interorbit  $\frac{1}{2}$  of orbit.

Scales on cheeks in 4 series, imbricate; on operculum few, large, not imbricate. Profile convex above, much less so beneath. Pre-orbital low. Caudal bluntly pointed. Dorsal and anal acuminate, last rays rather prolonged.

Purplish brown. Base of pectoral and of caudal pale, in the latter space a vertical ellipse of the ground colour. Scales of body with conspicuous dark edges and obscure pale spots tending to form longitudinal lines.

Length,  $2\frac{1}{2}$  inches. Locality, South Seas. Collector, Captain Eastlake.

*EXOCÆTUS LONGIBARBA.*

D. 14. A. 13.

From the chin a long barbel  $\frac{4}{5}$  of the length of the head. Head longer than the height. Snout  $\frac{2}{3}$  of the eye.

Pectoral reaching beyond the base of the caudal. Insertion of the ventral nearer to the snout than to the caudal. Dorsal low not reaching the caudal.

Pectoral black with the basal half paler. Two dark grey bars across the posterior part of the trunk not meeting below. Base of caudal black.

Loc. New Britain.

*ARIUS ARMIGER.*

D. 1/7. A. 22. P. 1/8.

Teeth in two bipartite divisions, forming a curved band. Vomerines sub-granular; in separated groups, which are more than twice as long as broad and elliptical. Palatines in granular groups contiguous to vomerines, elongate, ovate. Cephalic shield as broad as long with the sides emarginate; fore end angular, hind end truncate. Base bone of dorsal moderate, chevron shaped.

Height,  $6\frac{1}{2}$ , head  $4\frac{2}{3}$  in the length.

Dorsal spine longer than the head; pectoral  $\frac{3}{4}$  of dorsal; ventral  $\frac{4}{5}$  of pectoral. Outer maxillary barbel reaches beyond the pectoral spine; mandibulary nearly to its tip. Adipose fin  $\frac{2}{3}$  of dorsal. Eyes about  $\frac{1}{2}$  of snout. Upper lobe of caudal longest. Dorsal spine in front, granulate at base, sub-serrated above; behind strongly toothed. Pectoral spine smooth before, strongly toothed behind.

Paired fins white at base, black for the rest.

Loc. New Britain. Length, 8 inches.

## OPHICHTHYS COBRA.

Head  $\frac{1}{10}$  of trunk; snout  $\frac{1}{5}$  of head; pectoral  $6\frac{1}{2}$  in head. Habit round, firm. A line of pores from interorbit to snout on each side. Head depressed, attenuated. Gape reaching beyond level of orbit. Dorsal and anal very low, membranous, immersed each in a groove. Dorsal rising a little behind the gill orifice, which is short and immediately in front of the pectoral.

Brown with about 27 black half-bands across the back.

Loc. South Seas. Collected by Captain Browne.

## OPHICHTHYS NAJA.

Head one-eleventh nearly of the trunk; tail one-fourth longer than the head and trunk together. No pectorals. Teeth molar, uniserial on jaws and vomer. Dorsal and anal higher than the grooves in which they are seated, with distinct rays.

Yellow, with twenty-seven complete brown rings which are narrower than the interspaces: some of the interspaces with a large oval spot.

Loc. South Sea Islands. Collector, Mr. C. F. Browne.

The teeth are neither pointed, granular, nor conical, but flat tubercular molars: the fish therefore does not fairly enter either of Dr. Gunther's subdivisions of the genus; yet it has nothing further to justify its separation under another generic term.

It reproduces closely the style of colouring and general facies of the fish described as *Herpetichthys cobra* (Proc. Linn. Soc. N. S. Wales, 1883, p. ) and finding that the statement that maxillary teeth are wanting in that species was too hasty, I am now of opinion that *Herpetichthys* should sink into a synonym.

## TRACHYCEPHALUS N.G. Fam. SCLERODERMI.

Body, more or less, naked. Teeth villiform, on jaws only. Mouth oblique, gape very wide. Pre-operculum armed. Branchiostegals 4. Gills 4, no slit behind the fourth. Nopseudobranchiæ. Pectorals broad, fleshy, on a strong carpal. Lateral line continuous. Dorsal and anal rays few. Ventrals abdominal, rudimentary.

## TRACHYCEPHALUS BANKIENSIS.

D. 7/14. A. 2/10.

Height  $2\frac{1}{3}$ , head  $3\frac{2}{3}$  in the length, suborbital  $\frac{1}{2}$  nearly of the head.

Head above nearly to base of dorsal, armed with short columnar spines, bearing spinelets on their tips much as in *Monacanthus trachylepis*. Rest of head and body naked, skin finely wrinkled. Gape very oblique. Lower jaw thick and prominent. Profile of head very obtuse. Ventrals as two minute spines.

Length 1— $1\frac{1}{2}$  inches. Locality, Banks Group. Collector, Mr. C. F. Browne.

## TETRODON INSULARUM.

Nasal process single, open fore and aft. Lips, cheek, chin and caudal peduncle from before the dorsal fin, naked. Operculum and axillary band slightly, and the rest distinctly spinose. Osseous interorbit shorter than snout. Eye considerably nearer tip of snout than to gill orifice. Interorbit rather convex. Blue black above, with irregular dark spots, nearly obliterating a dingy yellow ground colour, and descending on the flanks as broad, on the cheeks as narrower, vertical streaks. Below white.

Loc. Api. Collector, Mr. C. F. Browne.

## TETRODON LÆVIS.

Nasal tentacle single, open fore and aft. Osseous interorbit broader than snout. Eye further from snout than from gill orifice. Interorbit convex. Back broad, rather depressed.

Naked, smooth, except on the abdomen, which is covered with spine-pores.

Brownish black above, white below. An indistinct broad inter-orbital band, and one crossing the back behind the pectoral. A broad black oval patch descending from the base of the dorsal and another similar blotch on the root of the caudal.

Length, 5 inches. Loc, South Seas. Collector, Mr. C. F. Browne.

The following localities have afforded known fish :—

*New Britain*—*Pterois volitans*, L. *Therapon trivittatus*, Blk.  
*Muræna nebulosa*, Bl. *PlatyGLOSSUS scapularis*, Benn. *Saurus varius* Lacep. *Exocætus evolans* L. *Genyoroge melanura*, Rup,

*New Ireland*—*Tetrodon nigropunctatus*, Blk. *Serranus lauti*.  
 Forsk. *Ostracion cornutus*, L.

*Api*—*Chrysophrys Australis*, Gunth. *Chætodon xanthurus*,  
 Blk. *Chætodon vittatus*, Blk. *Muræna Brummeri*, Blk.

*Duke of York's Group*—*Balistes verrucosus*, L.



#### SOME RESULTS OF TRAWL FISHING OUTSIDE PORT JACKSON.

BY WILLIAM MACLEAY, F.L.S., &c.

Whatever adds to our knowledge of the natural productions of the country, either on land or water, must be a matter of general interest. I need scarcely then, I think, offer any apology for the frequency with which I trespass on the time of this Society by laying before it short notices of new Fishes found in Port Jackson and its neighbourhood. I am aware that to the Ichthyologist these isolated descriptions of species, are, to say the least of it, troublesome, and that it would be far better and more convenient for the student, if I were to reserve these descriptions until the publication of a Supplement to my Catalogue of the Fishes of Australia, a work which I have now in hand. But I have an object to serve of a more utilitarian character, than the mere identification and nomenclature of species; I am desirous of seizing every possible opportunity of forcing upon the notice of the public the great value of our Fisheries, or rather of what might be their great value, were we disposed to develop them.

I have often said, and I repeat—and it cannot be repeated too often—we have in our seas a wonderful variety of the most excellent fishes, not surpassed in numbers, excellence and variety in any country in the world. We have herrings of various kinds visiting our shores annually in countless shoals, we have similar

shoals of mackerel, tailor, king-fish, trevally, and yellow tail. We might catch mullet—a fish equal to the salmon—in any quantity, if we had a market for it. We have whiting, garfish, schnapper, morwhong, Jew fish, sole, skate, John Dorey, and in fact good representatives of all the best kinds of Fishes in the world. It has always been inexplicable to me, how men of intelligence should deliberately shut their eyes and ears to such facts as these, and advocate the introduction from distant places of fishes which a bountiful nature has already amply supplied us with. And even if we had our seas as full of *Clupea harengus*, as they are now of *Clupea sagax*, of what use would it be, the schnapper line would be as useless to catch them, as the shallow seine net, and beyond these miserable appliances our fishermen seem incapable of going. It is however, gratifying to know that efforts towards improvement in fishing appliances are being made by the Commissioners of Fisheries. It is in this way, much more than by enforcing useless provisions in Acts of Parliament, that they have it in their power to confer lasting benefits on the country, and it is much to be regretted that their efforts are not more liberally aided by the Government than they are.

This Paper is, as its heading implies, a statement of the results of a trial made of a Beam Trawl a few weeks ago by order of the Commissioners, and it is to Dr. Cox, the President of the Commission that I am indebted for the information I am now enabled to give.

The Trawl was of the kind used at Grimsby, but made I believe here; a steamer was supplied by Government, and the trial was intended to occupy one week. The results were disappointing as regards the amount of work done, but that seems to have been due entirely to the severity of the weather, and the unfitness of the steamer for a heavy sea.

The Trawl was only put over the side twice during the week, and then only for an hour or two, so that the actual amount of ground trawled over was very small.

The following minutes of the actual results have been furnished to me by Dr. Cox—"November 26th. Trawl put down six miles

off the South Head of Botany Bay, in 40 fathoms of water, it was kept down for three hours, at the end of which time it was working in 55 fathoms of water. The Trawl was found to contain no weeds, but showed evidence of having been well on the ground.

In the Trawl were found,

3 dozen *Lepidotrigla*.

Several small John Dorey (*Zeus australis*.)

2 dozen small sting rays.

4 skates (*Raia*), about 4 lbs. weight.

Several small saw-fish."

"2. November 27th. Trawl put down four miles off Colamulla Reef in 22 fathoms water, steering south-by-east. The Trawl was kept down three hours, and when raised was in 40 fathoms of water, the haul consisted of,

Several dozen of *Lepidotrigla*.

14 John Dorey.

6 saw-fish sharks (*Pristiophorus*.)

A number of sting rays.

A flathead.

3 small soles."

Of these the *Lepidotrigla* and *Raia* are new, and will be described at the end of this Paper. Looked at as a whole, I consider the results of this trawling experiment as decidedly promising. The existence of a true skate so near us and in such apparent quantity, is of itself a valuable discovery; the abundance of the John Dorey is also important, for it has hitherto been considered rare, and for its quality as a food fish it is unrivalled in the world. The new species of *Lepidotrigla* seems to be very abundant in these moderate depths, but its size is not sufficient to make it valuable in a commercial sense. The paucity of *Pleuroneatidae* I should feel inclined to ascribe, notwithstanding the opinion given to the contrary in the minute quoted above, to the probability that the trawl did not as a rule closely scrape the ground, and the fact that it came up free of weeds seems to strengthen this supposition.



This, the first attempt at deep water trawling in New South Wales, whether looked upon as unsuccessful or fairly successful, proves one thing incontestably, and that is, that we know very little indeed of the inhabitants of our seas excepting those which are mere surface animals. Of the few fishes dredged up from depths of 40 or 50 fathoms, two were utterly unknown before, and the others were looked upon as extremely rare. I trust that the Commissioners will make further attempts to educate our fishermen in trawling, and to show what can be done by that mode of fishing; but I may be allowed to suggest also, that they should have the survey of the sea bottom out to the 100 fathom line, which was commenced in October 1882, completed as soon as possible, as it is unreasonable to suppose that fishermen can risk the entire loss of such costly nets as the Beam Trawl on unknown ground.

The following are the descriptions of the two new captures:—

LEPIDOTRIGLA MULHALLI.

D. 9/15. A. 15. L. lat. 53.

Scales regular and smooth, only those on the lateral line slightly keeled and spinous. Head rough and granular, projecting over the mouth in a subspatulate form with the angles strongly spinous, the sides strongly serrated and the middle in front emarginate. The top of the head between the eyes is concave. The operculum is armed with one acute spine, the coracoid bone is very large and terminates in a long acute spine; there is a prolongation of the skull on each side above the lateral line which also terminates in a large acute spine. The caudal fin is scarcely emarginate, the ventrals are nearly as long as the pectorals and are inserted slightly in advance of them, both fins reach the anal. The colour is of a beautiful red all over, with occasional deeper red blotches on the fins and parts of the body; the pectorals are, except at the base, entirely-bluish black beneath.

This Fish was found in abundance in 40 fathoms of water outside the Heads; the average length was 9 inches. The genus *Lepidotrigla* is represented in these seas by several species; of which one *L. papilio* is known to inhabit Port Jackson, but I



have not been able to find that the present species has ever been seen before. I name it after Mr. Sub-Inspector Mulhall, to whom I am indebted for much of my knowledge of the Fishes of this country.

RAIA AUSTRALIS. n. sp.

Snout long, produced, roundly pointed, the terminal third covered with spinous granules above and beneath ; the width of the interorbital space one-fourth or nearly so of the distance of the eye from the end of the snout. The profile from the snout to the extremity of the pectoral fin is emarginate on the sides of the snout, then gently sinuate, and again lightly and lengthily emarginate. Mouth transverse, straight, teeth in the upper jaw in a semi-lunar patch. Outer pectoral angle rounded, along its edge from in front of the eye to near the angle, a dense band of small granular looking spines, becoming finer towards the angle ; six spines four of them small, in front of the eye ; three larger behind the eye. One strong short spine near the commencement of the vertebral column, the remainder of the back smooth. The disc is one-third broader than the length. A subcutaneous spine can be felt on each side near the commencement of the tail, that on the right side appearing to be behind the other. The tail is considerably shorter than the body measuring from the first spine, and is armed with three rows of strong, acute, recurved spines, for two-thirds of its length, beyond that the spines are continuous only in the central row, but the sides are covered with sharp granules ; it terminates in a point ; the spines are much more numerous in the female. The upper lobe of the ventral fin resembles a human hand with the fingers conjoined. The colour is brown on the back, becoming paler on the snout and pectoral fins. Under surface white.

This is the first instance I have known of a true *Raia* having been found in the neighbourhood of Port Jackson, though they are not uncommon farther south. In Tasmania and Port Phillip there are two known. *Raia Lamprieri* of Richardson, the Thorn back of the Melbourne fishermen, and *Raia rostrata* of Castelnau, a species which attains a great size. Another species, *Raia nitida*

taken in a trawl off Twofold Bay by the Challenger expedition, has since been described by Dr. Gunther. All of these, though belonging to the genus *Raia*, have no very marked resemblance to *Raia batis* the well-known Skate of Europe, but the species now described resembles the common Skate so closely, that to a casual observer they would appear identical. As an article of food, Skate has never been much in favour here, in fact, except in French Cafés and places of that kind, Rays flesh is scarcely used at all, but I believe the kind most in use is the *Trygon pastinaca* or the large black Sting ray. Whether the Australian Skate will become more popular as an article of food than the Sting ray, remains to be seen.

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THE "BAROMETRO ARAUCANO" FROM THE CHILOE ISLANDS.

BY N. DE MIKLOUHO-MACLAY.

Amongst the different interesting Ethnological, Archæological, and Zoological objects on board the Italian Corvette, "Caracciolo," which Captain C. de Amezaga, had the kindness to show me. I saw a peculiar instrument called the "Barometro Araucano," which as he explained to me, is used by the natives of the Chiloe Islands as an indicator of approaching rainy or dry weather, and change of wind.

This instrument is nothing else but the shell of a crab. Mr. W. Haswell has informed me that the crab belongs to the genus *Lithodes*, and Dr. F. Rho of the "Caracciolo" told me later, that he has seen the same in the collections of the Museum at Santiago in Chili, marked as *Lithodes Antarcticus*.

Capt. C. de Amezaga had this peculiar instrument with him during the voyage of the Corvette from the West Coast of South America to Sydney, and confirmed completely the statement heard by him from the Chiloans about the use of the instrument.

The ordinary colour of the shell during dry weather is light grey, which, as soon as the air gets damp becomes gradually covered with spots of a dark (reddish) tint. The increase of humidity in the atmosphere makes the spots larger, so that the shell is at last quite of a dark (reddish) colour.

Captain de Amezaga was kind enough to take before me the *Lithodes* shell out of its silver case with glass top, in which it has been kept hanging on the wall in his cabin, and to sprinkle the shell with a few small drops of water. In less than half a minute the wetted spots became of a pink colour, which soon got darker. It was a very decisive test of the hygroscopic property of the shell.

I think, however, that very likely not only the *Lithodes antarcticus* shells have this property, but many of other genera and species, the capacity of which in this respect have not been yet discovered.

The shells of the *Lithodes antarcticus*, which have this peculiar change of colour, are only of a certain size (age). The shells of large (old) specimens appear to lose completely the property of alteration of colour.

The shell which I saw on board the "Caracciolo" acting as the "Barometro," was not more than 4 inches wide and 3 inches long. The usefulness of the *Lithodes* shell as a Barometer is greater in such localities where the moisture of the atmosphere corresponds very intimately with the changes in the direction of the winds; for instance, as it is on the south-west coast of South America, where the "Barometro Araucano" is not only an indicator of approaching rain, but also of change in the direction of the wind, because there the predominant winds are the north and the south winds. The north wind from the end of April until September is moist, and brings rain, the south wind is dry, so that there the change of wind is constantly followed by a change of weather.

I have not hesitated to take this opportunity to mention the "Barometro," or more correctly, the "*Hygrometro Araucano*," because having consulted different books about Chiloe, I have found not one line about this strange instrument.

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#### NOTES AND EXHIBITS.

Baron Maclay exhibited and made some remarks on a very ingenious instrument invented by Dr. Gottschau of Wurzburg, to enable accurate measurements to be taken of photographed figures.

Mr. Macleay announced his having received a letter from the Vice-President, the Rev. J. E. Tenison-Woods, from Singapore, who, he was glad to inform the meeting, was in good health, and enjoying his trip very much. He had travelled all through Java, and inspected some of its active Volcanoes, had visited two places in Sumatra, and was preparing for an Elephant expedition into the interior of the Malacca peninsula.

Mr. Macleay also stated that he had been informed by Professor McCoy, that the large shark captured at Portland, Victoria, and which had been spoken of at last month's meeting of the Society, was the *Selache maxima*, or Basking Shark of the Arctic Seas, and that the dimensions had been correctly reported. Mr. Macleay added that this is the first specimen of the Fish recorded from the Southern Hemisphere.

Dr. Cox exhibited the skull of a common rabbit which had been sent to him by the rabbit inspector of the district on the Darling River between Hay and Wilcannia. In this skull the incisor teeth of both jaws were enormously elongate; the upper pair being over  $\frac{3}{4}$  inch in length, curving downwards and outwards; the lower,  $1\frac{1}{4}$  inch long, in the normal direction. Professor Stephens pointed out that similar overgrowths were common in all rodents, when one or more incisors had been lost; but that in this case the abnormal divarication of the upper pair, had led to the continued growth of all four teeth, since they could not meet so as to wear each other down.

Dr. Cox also exhibited some portions of large Encrinite stems from Camboon, Dawson River, Queensland; and two numbers of the Forest Flora of South Australia, by J. E. Brown, F.L.S.

Mr. Morton exhibited a fine collection of Australian Annelids and Soft Mollusks beautifully mounted on white and blue glass slides.

He also exhibited the following weapons, &c., from the South Sea Islands:—1. A spear from the Solomon Islands, having the head made from a human tibia. 2. Another spear from the same place, inlaid with small pieces of shell. 3. A staff or wooden

sword from the Island of Savo, beautifully ornamented with coloured grass plaiting. 4. A dagger with blade of obsidian, from the Admiralty Islands. 5. A collar from the same place, elaborately ornamented with shells. 6. Two bowls from the Island of Ugi, Solomon Group, one representing two human figures grasping the bowl, both inlaid with pearl shell. 7. Two arrows from the Island of Ambrym, the points coated with a glue-like matter, and with a reed covering, which were said by the natives to be poisoned. To test this, a cat was placed under chloroform, and the point of an arrow inserted about an inch in the fleshy part of the thigh, but no inconvenience seemed to result. 8. A mask from the same place, of considerable artistic merit, and ornamented with a profusion of long flowing locks made of banana fibre.

Mr. Brazier exhibited on behalf of Mr. J. F. Bailey, a beautiful specimen of *Cypræa contusa*, McCoy, from Eocene limestone, Victoria.

Mr. Whitelegge exhibited under the microscope a Plumatella-like form, which he considered to be new, from a pond in Moore Park.

THURSDAY, 27<sup>TH</sup> DECEMBER, 1883.

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The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., in the chair.

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MEMBER ELECTED.

J. N. Macintosh, Esq., of Bathurst.

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DONATIONS.

“Transactions of the Entomological Society of London.” Seven volumes complete, from 1876 to 1882, and three parts of the volume for 1883. From the Society.

“Journal of the Linnean Society of London.” Botany: Nos. 122 to 129, 29th November, 1882, to 24th September, 1883. Zoology: Nos. 95 to 100, 26th September, 1882, to 14th August, 1883. From the Society.

“Bulletins de l'Académie Royale des Sciences des Lettres et beaux Arts de Belgique.” 3<sup>me</sup> série, Tome v., 1883. From the Society.

“Nova Acta der Ksl. Leop. Carol. Deutschen Akademie der Naturforscher.” Band XL, No. 9; Band XLI., Part ii, No. 6. “Leopoldina,” xviii. Heft. 1882. From the Academy.

“The Parrot Family and Parrots of Victoria.” By T. Augustus Forbes Leith. From J. F. Bailey, Esq.

“Papers and Proceedings of the Royal Society of Tasmania for 1882.” From the Society.

“Feuille des Jeunes Naturalistes, Paris.” No. 157, November, 1883. From the Editor.

From the Zoological Society of London: “Proceedings,” Part 3 for 1883; “Transactions,” vol. XI., Part 9, October 1883, 4to; and List of Vertebrated Animals, 8th edition, 1883.

“Journal of Conchology,” vol. IV., No. 4, October 1883. From the Conchological Society of Great Britain and Ireland.

“Science.” Vol. II., Nos. 36, 37 and 40, 12th October to 9th November, 1883. From the Editor.

“Ancient Life History of the Earth.” By H. Alleyne Nicholson, D.Sc., F.R.S., 1877. From Thomas Whitelegge, Esq., Waterloo.

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PAPERS READ.

FAR SOUTHERN LOCALITIES FOR VARIOUS PLANTS IN NEW SOUTH WALES, RECORDED FROM MR. W. BAEUERLEN'S COLLECTIONS.

BY BARON VON MUELLER, K.C.M.G., M.D., F.R.S., F.L.S.,  
F.G.S., &c.

One of the most interesting of all subjects in Natural History, whether of plants or animals, is that of tracing the regional distribution of the species over their respective areas. But to effect this throughout the vast empire of Nature with any approach to completeness, will necessarily be a work of very much time, so that it is only by the accumulation of multitudes of observations, instituted all over the globe, that the natural range of each specific form may at last be determined, subject even then in many cases either to extension by further spreading of the species, or to reduction, as they may locally become annihilated through the agency of man. Any contributions to data of these kinds—however trifling in themselves—will tend towards accomplishing such enquiries; and it is therefore, without much hesitation, that the following notes are submitted. They emanated from collections recently formed on the writer's suggestion by Mr. Wilhelm Baeuerlen, during a stay in the Clyde district. It is not improbable

that some of the plants here recorded may be traced still further south, inasmuch as the tracts of country adjoining the Twofold Bay district northerly, are as yet imperfectly known in reference to their vegetation, although botanic gatherings by Miss Mary Bate, and previously by the late Mr. Reader about Mount Dromedary, brought to light several varieties, as recorded in a former volume of the Linnean Society of New South Wales.

*Comesperma sphaerocarpum* at Ulladulla.

*Boronia Barkeriana* ; Ulladulla, Milton.

*Mirbelia reticulata* ; Ulladulla.

*Phyllota phylicoides* ; Ulladulla.

*Rubus Moorei* ; Milton.

*Callicoma serratifolia* ; Yadburra.

*Baeckea crenulata* ; Ulladulla.

*Melaleuca thymifolia* ; Ulladulla.

*Melaleuca linearifolia* ; Milton.

*Melaleuca hypericifolia* ; Milton.

*Callistemon linearis* ; Brooman.

*Metrosideros glomulifera* ; Milton.

*Didiscus albiflorus* ; Milton.

*Lambertia formosa* ; Ulladulla.

*Grevillea linearis* ; Ulladulla.

*Persoonia revoluta* ; Milton.

*Passiflora Herbertiana* ; Milton.

*Cassinia denticulata* ; Yadburra.

*Polymeria calycina* ; Ulladulla.

*Prostanthera prunelloides* ; Yadburra.

*Myoporum Bateæ* ; Milton.

*Epacris longiflora* ; Milton.

*Dracophyllum secundum* ; Milton.

*Dendrobium cucumerinum* ; Yadburra.

*Calanthe veratrifolia* ; Milton.

*Pterostylis acuminata* ; Ulladulla.

*Cryptostylis erecta* ; Ulladulla.

*Calochilus paludosus* ; Milton.

*Hæmодovum teretifolium* ; Milton.



Blandfordia nobilis ; Ulladulla.  
 Xerotes flexifolia ; Yadburra.  
 Anisopogon avenaceus : Lake Burrill.  
 Schizaea rupestris ; Milton.  
 Hymenophyllum marginatum ; Milton.  
 Blechnum serrulatum ; Milton.  
 Adiantum diaphanum ; Milton.  
 Hypolepis tenuifolia , Milton.  
 Polypodium confluens ; Milton.  
 Alsophila Leichardtiana ; Milton.

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DESCRIPTIONS OF AUSTRALIAN MICRO-LEPIDOPTERA.

BY E. MEYRICK, B.A.

X. OECOPHORIDÆ—(*Continued.*)

35. PHILOBOTA. Meyr.

Head smooth, sidetufts large or moderate, meeting behind sometimes somewhat projecting. Antennæ moderate, in ♂ moderately and evenly ciliated ( $1-1\frac{1}{2}$ ), basal joint moderate, with strong pecten. Palpi rather long, second joint somewhat exceeding base of antennæ, densely scaled, rather loosely beneath, terminal joint rather shorter than second, slender, recurved. Thorax smooth. Forewings elongate, moderate or rather broad, hindmargin rounded or slightly concave. Hindwings almost as broad as forewings, elongate-ovate, hindmargin rounded or sometimes gently sinuate, cilia  $\frac{1}{3}-\frac{1}{2}$ . Abdomen moderate or rather broad. Posterior tibiæ clothed with very long hairs. Forewings with vein 7 to hindmargin, 2 from or somewhat before angle of cell. Hindwings normal.

This very large and interesting genus is at present wholly confined to Australia ; not even a stray species is known from New Zealand. The species are almost all of considerable size, and often exceedingly handsome ; and there is a strong tendency to longitudinal marking with costal, subcostal, or median stripes, connected with the grass-frequenting habit of most species. The species are

mostly rather local, but usually abundant where they occur. A large proportion, at least, of the larvæ must feed on grass, possibly in the roots; this is almost certain from the habits of the imago, but I have not hitherto succeeded in finding a single one.

The genus may be taken as typical of the group of *Oecophoridae* with vein 7 of the forewings ending in the hindmargin or apex; the more extensive, more highly developed, and more characteristically Australian of the two. The smaller and more triangular-winged species placed towards the end of the genus appear to me to be the most ancestral; their affinity being with *Eulechria* and *Peltophora*.

Sixty species are given here, and there can be no doubt that many other and perhaps more beautiful forms remain to be discovered.

- 1a. Head yellow.
- 2a. Forewings with well-defined longitudinal streak.
- 3a. Ground colour yellow.
- 4a. With a curved posterior dark fascia.
- 5a. Space beyond fascia fuscous-grey.
- 6a. Inner margin dark fuscous.....177. *arabella*.
- 6b. „ „ yellow .....180. *irruptella*.
- 5b. „ „ yellow.
- 6a. Cilia of hindwings towards anal angle yellowish 178. *biophora*.
- 6b. „ „ „ wholly grey .....179. *ancylotoxa*.
- 4b. Without dark fascia.
- 5a. With a dark fuscous streak along fold ....186. *auriceps*.
- 5b. Without „ „ „
- 6a. With a short oblique dark streak before apex.
- 7a. With a dark costal streak.
- 8a. Shoulders dark fuscous .....189. *latifissella*.
- 8b. Anterior half of thorax wholly dark fuscous..190. *hypocausta*.
- 7b. Without „ „ „ .....188. *molliculella*.
- 6b. Without „ „ „
- 7a. Costal edge dark fuscous.
- 8a. With a red subcostal streak .....218. *pretiocella*.
- 8b. Without „ „ „ .....217. *crocobapta*.

- 7b. Without red, not dark fuscous.
- 8a. With a white costal streak.....220. *adaptatella*.
- 8b. Without ,, ,, ,, .....219. *anachorda*.
- 3b. Ground colour grey.
- 4a. With an ochreous-white dorsal streak .....198. *atmobola*
- 4b. Without ,, ,, ,,
- 5a. With a yellow subcostal streak.....181. *chrysopotama*.
- 5b. Without ,, ,, ,, .....196. *acropola*.
- 3c. Ground colour white or whitish.
- 4a. With a dark fascia before middle.
- 5a. With a streak from fascia along fold .....223. *bracteatella*.
- 5b. Without ,, ,, ,, ,, .....224. *trijugella*.
- 4b. Without ,, ,, ,,
- 5a. With a dark fuscous fascia close to base ....205. *partitella*.
- 5b. Without ,, ,, ,, ,,
- 6a. With a dark streak below middle.
- 7a. With a dark costal streak.....222. *interlineatella*.
- 7b. Without ,, ,, ,,
- 8a. Subcostal streak with a tooth beneath.....225. *acutella*.
- 8b. ,, ,, without ,, ,, .. .....221. *brochosema*.
- 6b. Without ,, ,, ,, ,,
- 7a. With two slender very oblique dark streaks from costa.
- 8a. First streak reaching base.....207. *calamaea*.
- 8b. ,, ,, ,, disc only.....206. *cretucea*.
- 7b. Without ,, ,, ,, .....191. *crypsichola*.
- 2b. Forewings without longitudinal streak.
- 3a. Ground colour yellow.
- 4a. Base purple-fuscous.
- 5a. With dark median fascia .....230. *bimaculana*.
- 5b. Without ,, ,, ,, .....231. *tentatella*.
- 4b. ,, yellow.
- 5a. With oblique dark fuscous streak before apex 187. *declivis*.
- 5b. Without ,, ,, ,, ,,
- 6a. With discal dots or spot beyond middle.
- 7a. Apex of forewings subacute .....226. *aurinatella*.
- 7b. ,, ,, ,, rounded

- 8a. Light yellow, with ill-defined dots .....228. *euxantha*.  
 8b. Deep yellow, with dark fuscous spot .....229. *xanthiella*.  
 6b. Unicolorous, without marking.  
 7a. Cilia of forewings yellow .....236. *electrodes*.  
 7b. „ „ „ dark grey.  
 8a. Thorax wholly yellow.  
 9a. Forewings deep orange-yellow .....227. *monophaës*.  
 9b. „ light yellow or whitish-yellow ....215. *tyroxantha*.  
 8b. „ with anterior half dark fuscous ...216. *melirrhoa*.  
 3b. Ground colour ochreous fuscous ... .....185. *catalampra*.  
 1b. Head rather dark fuscous or grey.  
 2a. Hindwings yellow .....183. *ellenella*.  
 2b. „ grey.  
 3a. Forewings fuscous .....184. *monolitha*.  
 3b. „ grey.  
 4a. With a black fascia near base .....200. *pedetis*.  
 4b. Without „ „ .....199. *erebodes*.  
 1c. Head white, ochreous-whitish, or grey-whitish.  
 2a. Forewings with dark fuscous costal streak.  
 3a. Ground colour white.  
 4a. With a dark fuscous fascia near base .....212. *pruinosa*.  
 4b. Without „ „ „  
 5a. With dark median streak bent up to costa ...204. *glaucoptera*.  
 5b. Without „ „ „ „  
 6a. Cilia of forewings more or less greyish.. ..214. *productella*.  
 6b. „ „ „ wholly white .....210. *chionopectera*.  
 3b. Ground colour not white.  
 4a. With dark fuscous discal dots.  
 5a. With white longitudinal streak.  
 6a. Base of costa white .....195. *crepera*.  
 6b. „ „ „ dark fuscous .... .....197. *orinoma*.  
 5b. Without „ „ „ .....194. *phauloscopa*.  
 4b. Without „ „ „  
 5a. Ground colour ochreous-whitish .... .....192. *xiphostola*.  
 5b. „ very light grey.....193. *nephelarcha*.  
 2b. Forewings without dark fuscous costal streak.

- 3a. With rosy markings .....232. *occidua*.  
 3b. Without ,, ,,  
 4a. With four straight dark fasciæ.....202. *herodiella*.  
 4b. Without ,, ,, ,,  
 5a. Costa with three dark fuscous spots .....213. *squalidella*.  
 5b. ,, without ,, ,, ,,  
 6a. Ground colour white.  
 7a. Without longitudinal dark streak.....203. *hapala*.  
 7b. With ,, ,,  
 8a. Streak reaching apex .....209. *agnesella*.  
 8b. ,, not ,, .....208. *monogramma*.  
 6b. ,, not white.  
 7a. With dark streaks between veins.....234. *melanoploca*.  
 7b. Without ,, ,, ,,  
 8a. Without discal dots .....182. *catascia*.  
 8b. With three ,, ,,  
 9a. Forewings irrorated with dark grey.....235. *pulverea*.  
 9b. ,, not ,, ,, ,, .....233. *homotona*.  
 8c. With five or six ,, ,,  
 9a. Dots large, distinct .....201. *leucomitra*.  
 9b. ,, obscure .....211. *hydaræ*.

177. *Phil. arabella*, Newm.

(*Oecophora arabella* Newm., Trans. Ent. Soc. Lond., III. (n. s.), 296, Pl. XVIII., 4.)

Media, alis ant. aurantiacis, vitta subcostali abbreviata, altera dorsi, fascia etiam postica incurvata aream griseam excludente saturatius fuscis ; post. saturatius fuscis.

♂ ♀. 18-24 mm. Head orange, face dark fuscous. Palpi dark fuscous, internally whitish-yellow. Antennæ dark fuscous. Thorax dark fuscous, a small lateral spot and posterior margin orange. Abdomen and legs dark fuscous, hairs of posterior tibiæ whitish-orange. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very oblique, hardly rounded ; orange or reddish-orange ; costa much paler ; a moderately broad dark fuscous subcostal streak from base of costa to costa again beyond

middle, attenuated posteriorly; a similar streak along inner margin from base to near anal angle; a broad hindmarginal fuscous-grey band, irrorated and sometimes suffused with yellow, anterior edge convex, bordered by a dark fuscous narrow fascia from costa at  $\frac{3}{4}$  to before anal angle: cilia fuscous, base irrorated with yellowish. Hindwings rather dark fuscous, anteriorly sometimes lighter and slightly reddish-tinged; cilia dark fuscous.

A very handsome species; Victorian specimens average decidedly larger than those from New South Wales.

Sydney, and Blackheath (3,500 feet), in New South Wales; Melbourne, in Victoria; and the Mount Lofty range, in South Australia; from September to November, generally common.

178. *Phil. biophora*, n. sp.

Media, alis ant. ochreo-flavis, vitta costæ abbreviata, fasciaque postica incurvata saturate fuscis; post. saturate fuscis, ciliis angulum analem versus flavidis.

♂ ♀. 17-21 mm. Head whitish-yellow or ochreous-yellow, face dark fuscous beneath. Palpi dark fuscous, internally somewhat mixed with whitish-yellow. Antennæ dark fuscous. Thorax dark fuscous, two small posterior spots and a lateral spot pale ochreous-yellow. Abdomen dark fuscous, anal tuft pale ochreous-yellow. Legs dark fuscous, posterior tibiæ pale ochreous-yellow. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very oblique, hardly rounded; light or sometimes deep ochreous-yellow; a dark fuscous streak along costa from base to  $\frac{2}{3}$ , posteriorly attenuated; an inwards-curved narrow dark fuscous fascia from costa at  $\frac{4}{5}$  to before anal angle; space beyond this sometimes sprinkled with fuscous, cilia fuscous-grey. Hindwings dark fuscous; cilia fuscous-grey, becoming pale yellowish towards inner angle.

This and the two following species are closely allied, but all are very constant; it will be interesting to discover whether they remain equally distinct towards the limits of their respective regions. The present species has the wings somewhat more

elongate, and the ground colour paler yellow than in either of the other two, with the hindmarginal space not grey; and is specially characterised by the partially yellowish cilia of the hindwings.

Adelaide, South Australia; locally common in October.

179. *Phil. ancylotoxa*, n. sp.

Media, alis ant. saturate flavis, vitta costæ abbreviata, fasciaque postica incurvata saturate fuscis; post. saturatius fuscis, ciliis omnino griseis.

♂. 23-24 mm. Head deep yellow, face dark fuscous. Palpi dark fuscous, internally pale yellowish. Antennæ dark fuscous, Thorax dark fuscous, posterior margin and a lateral spot deep yellow. Abdomen dark fuscous. Legs dark fuscous, posterior tibiæ ochreous-yellow. Forewings elongate, costa moderately arched, apex round pointed, hindmargin very oblique, hardly rounded; deep yellow; a strong dark fuscous streak along costa from base to  $\frac{2}{3}$ , posteriorly attenuated; an inwards-curved narrow dark fuscous fascia from costa at  $\frac{1}{4}$  to before anal angle: cilia fuscous-grey. Hindwings rather dark fuscous; cilia fuscous-grey.

Distinguished from *P. biophora* by the larger size, deep yellow ground colour, and wholly grey cilia; from *P. irruptella* by the clear yellow hindmarginal space.

Murrurundi, New South Wales; taken in plenty in October by Mr. G. H. Raynor, to whom I am indebted for my specimens.

180. *Phil. irruptella*, Z.

(*Oecophora irruptella* Z., Hor. Ross. 1877, 388 (nec. Walk.)

Media, alis ant. ♂ saturate flavis, ♀ albido-luteis, vitta costæ abbreviata, fasciaque postica incurvata aream griseam excludente saturate fuscis; post. saturatius fuscis.

♂ ♀. 21-24 mm. Head orange, face dark fuscous beneath. Palpi dark fuscous, internally pale yellowish. Antennæ dark fuscous. Thorax dark fuscous, posterior margin and a lateral spot yellowish-orange. Abdomen and legs dark fuscous, posterior tibiæ ochreous-yellow. Forewings elongate, costa gently arched, hindmargin oblique, straight; in ♂ yellowish-orange, in ♀ whitish-yellow; a strong dark fuscous streak along costa from base to  $\frac{2}{3}$ ,

posteriorly attenuated: a broad fuscous hindmarginal band, anterior edge convex, bordered by a narrow dark fuscous fascia from costa at  $\frac{3}{4}$  to before anal angle: cilia fuscous. Hindwings rather dark fuscous; cilia fuscous.

Differs from both the preceding by the uniform fuscous hindmarginal space.

Sydney and Bulli, New South Wales; very common from August to October.

Zeller mistook this species for *irruptella* Walk., which belongs to the *Tineidae*; he had not seen it, but judged from the description. Specimens of this species stand in the British Museum collection mixed up with *arabella* Newm.

181. *Phil. chrysopotama*, n. sp.

Major, alis ant. griseis, vitta costæ abbreviata saturate fusca, altera subcostali latiore ochreo-flava; post. saturatius fuscis.

♂ ♀. 24-27 mm. Head ochreous-yellow. Palpi and antennæ dark fuscous, thorax dark fuscous, sometimes with a faint yellowish posterior spot. Abdomen dark fuscous, anal tuft ochreous-brown. Legs dark fuscous, posterior tibiæ ochreous-yellow. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very oblique, almost straight; fuscous-grey; a broad dark fuscous costal streak from base to  $\frac{2}{3}$ ; very obliquely truncate posteriorly, leaving extreme costal edge whitish-yellow from about  $\frac{1}{5}$ ; costal streak bordered beneath throughout by a somewhat broader deep ochreous-yellow streak, beneath which ground colour is somewhat darker: cilia fuscous-grey. Hindwings rather dark fuscous; cilia light ochreous-yellow, round apex suffused with fuscous-grey.

An elegant and very distinct species.

Parramatta, New South Wales, locally abundant; also from Melbourne, Victoria; from August to October, in shady grassy places.

182. *Phil. catascia*, n. sp.

Major, alis ant. dilute griseis, partim albido-suffusis, vitta costæ abbreviata saturatiori; post. saturate fuscis, disco partim vel omnino flavo-suffuso.



♂ ♀. 24-28 mm. Head ochreous-whitish. Palpi dark fuscous, internally mixed with whitish. Antennæ dark fuscous. Thorax fuscous-grey. Abdomen grey, anal tuft sometimes paler and ochreous-tinged. Legs dark fuscous, posterior tibiæ grey. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin very oblique, almost straight; light fuscous-grey; extreme costal edge whitish from near base to  $\frac{2}{3}$ ; a broad cloudy dark grey costal streak from base to before  $\frac{2}{3}$ , posteriorly attenuated, bordered beneath by a broad very ill-defined whitish suffusion; a similar whitish suffusion towards hindmargin, and on a spot before anal angle; a very indistinct darker grey dot in disc beyond middle: cilia whitish mixed with grey. Hindwings dark fuscous, disc generally more or less suffused with ochreous-yellow, sometimes wholly yellow with apex, costa, and inner margin dark fuscous; cilia grey, with a dark fuscous basal line.

This and the following species agree in possessing yellow hindwings; in this species, however, the yellow suffusion is occasionally obsolete.

Melbourne and Mount Macedon, Victoria; locally common, in October and November.

183. *Phil. ellenella*, Newm.

(*Oecophora ellenella* Newm., Trans. Ent. Soc. Lond., III. (n. s.), 295, Pl. XVIII., 3.)

Media, alis ant. fuscis; post. ochreo-flavis, ciliis griseis.

Head and thorax fuscous. Forewings elongate, moderate; fuscous, without markings. Hindwings yellow; hindmargin and cilia fuscous-grey.

I have seen no specimen of this species, but it is undoubtedly a *Philobota*, and appears to be quite distinct, with the forewings much as in *P. monolitha*. but with yellow hindwings.

Said to be from the Mount Alexander range, Victoria.

184. *Phil. monolitha*, n. sp.

Media, alis ant. fuscis; post. saturatius fuscis.

♂. 23 mm. Head, palpi, antennæ, thorax, abdomen, and legs rather dark fuscous; posterior tibiæ grey. Forewings elongate,

costa moderately arched, apex rounded, hindmargin very oblique, slightly rounded; fuscous, unicolorous: cilia rather lighter fuscous. Hindwings rather dark fuscous; cilia fuscous.

Differs from the preceding by the dark fuscous hindwings.

One specimen received from Melbourne, Victoria, taken by Mr. G. H. Raynor.

185. *Phil. catalampira*, n. sp.

Minor, alis ant. ochreo-fuscis, purpureo-nitidis, basi flavo-suffusa, costa media, dorsoque augustissime albido-flavis; post. griseis.

♂. 16-17. mm. Head deep yellow. Palpi fuscous, internally and beneath pale ochreous-yellow. Antennæ dark fuscous. Thorax ochreous-brown, with purple reflections. Abdomen whitish-ochreous. Legs dark fuscous, posterior tibiæ pale ochreous-yellow. Forewings elongate, moderate, costa moderately arched, apex almost acute, hindmargin oblique, sub-concave; shining ochreous-brown, with purple reflections, base suffused with deep yellow; costal edge narrowly whitish-yellow in middle third; inner margin very narrowly whitish yellow: cilia pale ochreous-fuscous, becoming grey at anal angle. Hindwings grey; cilia ochreous-whitish, with a grey line.

Not closely approaching any other.

I have two specimens, taken near Melbourne, Victoria, by Mr. G. H. Raynor.

186. *Phil. auriceps*, Butl.

(*Conchylis arriceps*, Butl., Ann. Mag., N. H., 1882, .)

Media, alis ant. saturate flavis, vitta subcostali abbreviata, altera plicæ, puncto disci, strigula anguli analis obliqua, signoque subapicali furcato saturatius fuscis, interdum partim obsoletis; post. saturatius fuscis.

♂. 18-22 mm. Head deep orange-yellow, face dark fuscous. Palpi dark fuscous, internally orange-yellow. Antennæ dark fuscous. Thorax fuscous, with a more or less distinct yellow stripe on each side of back. Abdomen whitish-ochreous. Legs dark fuscous, hairs of posterior tibiæ whitish-ochreous. Forewings

elongate, costa gently arched, apex pointed, hindmargin sub-concave, oblique; deep orange-yellow; markings rather dark fuscous, somewhat bluish-shining; costal edge sometimes white towards middle; a rather narrow subcostal streak from base to costa at  $\frac{2}{3}$ ; a rather narrow streak beneath submedian fold throughout; a dot in disc beyond middle; an irregular oblique mark from beneath this to anal angle; a short oblique streak from apex almost touching discal dot, and united anteriorly with a short narrow longitudinal streak from middle of hindmargin; all these markings except subcostal and apical streaks sometimes obsolete: cilia fuscous. Hindwings rather dark fuscous; cilia fuscous.

Apparently allied to the preceding, but peculiarly marked.

Sydney and Murrurundi. New South Wales; Melbourne, Victoria; and the Mount Lofty range, South Australia; widely distributed, but not taken commonly anywhere; in October, December, February, and March.

187. *Phil. declivis*, Walk.

(*Oecophora declivisella*, Walk., Brit. Mus. Cat., 687.)

Media, alis ant. albido-luteis, sericeis, costa ochreo-flava, strigula obliqua ante apicali, interdum etiam altera ad basim subcostali saturate fuscis; post. ochreo-flavis, costa et apice saturate fuscis.

♂ ♀. 20-24 mm. Head deep ochreous-yellow. Palpi dark fuscous, internally pale ochreous-yellow. Antennæ dark fuscous. Thorax whitish-ochreous. Abdomen dark ochreous-yellow. Legs dark fuscous, posterior tibiae ochreous-yellow. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; shining whitish-yellow; costal edge ochreous-yellow, near base blackish; a short oblique dark fuscous streak from costa just before apex, varying in intensity, reaching disc at about  $\frac{2}{3}$  from base, rarely a short dark fuscous streak from base beneath costa: cilia pale whitish-fuscous, with a narrow whitish-ochreous apical bar. Hindwings deep ochreous-yellow, costa and apex suffused with dark fuscous; cilia whitish-yellow.

Very distinct from any but the following.

Sydney and Newcastle, New South Wales ; very common, in September, November, and from January to March, in grassy places.

188. *Phil. molliculella*, Walk.

(*Oecophora molliculella*, Walk., Brit. Mus. Cat., 687.)

Media, alis ant. albido-luteis, striga subcostali abbreviata, altera e medio disco in costam ante apicem percurrente saturate fuscis ; post. ochreo-flavis.

♂. 23 mm. Head and thorax pale yellowish-ochreous. Palpi whitish-ochreous, externally suffused with dark fuscous. Antennæ dark fuscous. Abdomen whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin very obliquely rounded ; shining whitish-yellow ; costal edge blackish at base ; a slender dark fuscous streak beneath costa from base to beyond middle ; a slender fuscous streak from middle of disc to costa before apex : cilia pale whitish-yellow. Hindwings unicolorous ochreous-yellow ; cilia pale ochreous-yellow.

Closely allied to the preceding, of which it may possibly prove to be a local form ; characterised by the much longer ante-apical streak, the well-defined elongate subcostal streak, and the wholly yellow hindwings.

I have one specimen taken by Mr. G. H. Raynor, near Melbourne, and there is one in the British Museum, both quite similar.

189. *Phil. latifissella*, Walk.

(*Oecophora latifissella*, Walk., Brit. Mus. Cat., 686.)

Media, alis ant. ochreo-flavis, ♀ dilutioribus, vitta costæ abbreviata, strigulaque obliqua anteapicali saturate fuscis ; post. fuscis, ♂ basim versus, ♀ fere omnino albido-ochreo suffusis ; humeris saturate fuscis.

♂ ♀. 22-25 mm. Head deep ochreous-yellow. Palpi whitish-ochreous, externally suffused with dark fuscous. Antennæ dark fuscous. Thorax deep ochreous-yellow, with an interior dark fuscous spot on each shoulder. Abdomen whitish-ochreous, anal tuft ochreous-yellow. Forewings elongate, costa moderately arched,

apex almost pointed, hindmargin very oblique, slightly sinuate; ochreous-yellow, in ♀ much paler; a dark fuscous costal streak from base to  $\frac{2}{3}$ , attenuated at base and extremity, leaving extreme costal edge ochreous-yellow except at base; a short slender inwardly oblique dark fuscous line from costa at  $\frac{4}{5}$ , sometimes obscurely produced to disc; cilia ochreous yellow, tips whitish-ochreous, in ♀ paler. Hindwings in ♂ fuscous, paler and suffused with whitish-ochreous anteriorly, in ♀ almost wholly suffused with whitish-ochreous; cilia pale ochreous-yellow, tips paler.

Very closely allied to the following species, but broader-winged, the hindwings lighter and more or less suffused with whitish-ochreous, and with only a small dark fuscous spot on the inner edge of each shoulder.

Sydney and Wollongong, New South Wales; very common in September and October.

190. *Phil. hypocausta*, n. sp.

Media, alis ant. saturate ochreo-flavis, interdum partim fusco-suffusis, vitta costæ abbreviata, strigulaque obliqua anteapicali saturate fuscis; post. saturatius fuscis; thoracis dimidio antico saturate fusco.

♂. 17-22 mm. Head orange-yellow. Palpi and antennæ dark fuscous. Thorax deep yellow, anterior half, or sometimes wholly, suffused with dark fuscous. Abdomen whitish-ochreous, anal tuft yellow. Legs dark fuscous, posterior tibiæ ochreous-yellow. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, hindmargin very obliquely rounded; deep ochreous-yellow; dorsal  $\frac{2}{3}$  sometimes suffused with fuscous; a strong dark fuscous streak along costa from base to  $\frac{3}{4}$ , attenuated posteriorly; a short cloudy inwardly oblique dark fuscous streak from costa before apex: cilia ochreous-yellow, tips ochreous-whitish or fuscous, sometimes wholly suffused with fuscous. Hindwings rather dark fuscous, sometimes partially mixed with yellow; cilia pale ochreous-yellow.

Distinguished from *P. latifissella* by the narrower wings, with costa less arched, the deeper colour and tendency to suffusion with

dark fuscous, and especially the dark fuscous anterior half of the thorax ; these differences appear constant, but it is questionable whether they will be found to indicate more than a geographical form.

Adelaide, South Australia ; locally common in October.

191. *Phil. crypsichola*, n. sp.

Major, alis ant. dilutissime albido-ochreis, vitta costæ abbreviata nigricante ; post. saturatius griseis.

♂ ♀. 24-28 mm. Head light yellowish-ochreous. Palpi dark fuscous, apex of second joint whitish. Antennæ dark fuscous. Thorax ochreous-whitish, shoulders more ochreous, with a dark fuscous interior spot. Abdomen ochreous-whitish, anal tuft light yellowish-ochreous. Legs dark fuscous, hairs of posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded ; very pale whitish-ochreous, deeper towards costa posteriorly ; a strong blackish-fuscous streak along costa from base to  $\frac{2}{3}$ , attenuated at both extremities ; a very short fine black line from base beneath costa : cilia whitish-ochreous, tips paler. Hindwings dark grey ; cilia pale whitish-ochreous.

Readily separated from *P. xiphostola* by the yellower head and cilia, and especially by the dark grey hindwings.

Blackheath, New South Wales, at 3,500 feet ; six specimens in November.

192. *Phil. xiphostola*, n. sp.

Media, alis ant. ochreo-albidis, vitta costæ abbreviata, interdum etiam strigula brevissima obliqua anteapicali serieque punctorum marginis postici saturate fuscis ; post. ochreo-albidis, vix griseo-tinctis.

♂. 21-26 mm. Head ochreous-whitish. Palpi whitish, second joint externally dark fuscous except at apex. Antennæ dark fuscous. Thorax ochreous-whitish, with a blackish-fuscous interior spot on each shoulder. Abdomen ochreous-whitish, and tuft more ochreous. Legs dark fuscous, posterior tibiæ pale whitish-ochreous. Forewings elongate, moderate, posteriorly dilated, costâ moderately

arched, apex round-pointed, hindmargin very obliquely rounded, ochreous-whitish; sometimes a few scattered fuscous scales; a strong dark fuscous streak along costa from base to  $\frac{2}{3}$ , posteriorly attenuated; sometimes a very short oblique dark fuscous mark on costa before apex, and a hindmarginal row of fuscous dots, usually absent; cilia ochreous-whitish. Hindwings ochreous-whitish, sometimes greyish-tinged; cilia ochreous-whitish.

This species, the preceding, and the two following constitute a closely allied group; *P. xiphostola* differs from all the other three in the more whitish forewings, and very pale hindwings.

Sydney, New South Wales; Melbourne and Sale, Victoria; tolerably common from September to November.

A specimen of this species stands in the British Museum included under *P. latifissella*.

193. *Phil. nephelarcha*, n. sp.

Media, alis ant. griseis, vitta costæ abbreviata nigricante, altera subcostali alba; post. saturatius griseis.

♂ ♀. 21-25. Head pale whitish-ochreous. Palpi dark fuscous, apex of second joint white. Antennæ dark fuscous. Thorax fuscous-grey, posterior margin and a small lateral spot obscurely whitish. Abdomen grey, anal tuft greyish-ochreous. Legs dark fuscous, hairs of posterior tibiæ grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin slightly rounded, very oblique; brownish-grey; a narrow blackish streak along costa from base to  $\frac{2}{3}$ , much attenuated anteriorly, more suddenly posteriorly, margined beneath throughout by a moderately broad ochreous-white streak; in ♂ this white streak is bordered beneath at both extremities by a short blackish line: cilia light grey, on costa becoming more whitish-ochreous. Hindwings rather dark grey; cilia whitish-grey, darker towards base.

Easily recognisable by the ochreous-white subcostal streak contrasting with the grey ground colour.

Deloraine, Tasmania; four specimens in November.

194. *Phil. pharuloscopa*, n. sp.

Media, alis ant. fusco-albidis, fusco-sparsis, vitta costæ abbreviata, strigula obliqua anteapicali, punctis disci quinque serieque postica saturate fuscis; post. albido-griseis.

♂ ♀. 24·26 mm. Head pale whitish-ochreous, in ♀ fuscus-tinged. Palpi whitish, second joint externally dark fuscous except at apex. Antennæ dark fuscous. Thorax fuscous-whitish, with a dark fuscous interior spot on shoulder, in ♀ anteriorly suffused with fuscous. Abdomen ochreous-whitish. Legs dark fuscous, hairs of posterior tibiæ very pale whitish-ochreous. Forewings elongate, posteriorly somewhat dilated, costa moderately arched, apex round-pointed, hindmargin very oblique, slightly rounded; very pale whitish-fuscous, with scattered dark fuscous scales, a strong dark fuscous streak along costa from base to about  $\frac{2}{3}$ , posteriorly very obliquely truncate; a minute blackish dot in disc at  $\frac{1}{3}$ , a second somewhat beyond it on fold, two others transversely placed beyond middle, and sometimes another above middle; a short oblique dark fuscous streak from costa at  $\frac{4}{5}$ , emitting a cloudy strongly curved fuscous line or row of dots to before anal angle; a hindmarginal row of dark fuscous dots; cilia whitish, with two cloudy dark fuscous lines. Hindwings whitish-grey; cilia whitish, with two cloudy grey lines.

Closely allied to *P. xiphostola*, of which it may perhaps be a local form; distinguished by the fuscous-tinged ground colour, the dark fuscous irroration, discal dots and distinct posterior line.

Sydney, New South Wales; tolerably common in September.

195. *Phil. crepera*. n. sp.

Major, alis ant. dilute griseis, vitta subcurva subcostali abbreviata cana, spatio costali saturatius fusco, punctis disci quinque lineaque postica saturate fuscis; post. griseis.

♂ ♀. 25-29 mm. Head white, mixed with grey. Palpi and antennæ grey. Thorax fuscous-grey, irrorated with white on back. Abdomen light grey, anal tuft dull whitish-ochreous. Legs grey, posterior pair whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin rounded, very oblique;



light grey or fuscous, sometimes suffused with darker; a short blackish mark at base beneath costa; a cloudy suffused white slightly curved longitudinal streak from base of costa to costa at  $\frac{3}{4}$ , the included costal space rather dark fuscous; a dark fuscous dot in disc at  $\frac{1}{3}$ , a second slightly beyond it on fold, a third above middle, and two transversely placed beyond middle; sometimes these are enlarged or indistinct; a curved obscure dark fuscous transverse line from  $\frac{3}{4}$  of costa to anal angle, indented beneath costa; cilia whitish, with two obscure dark fuscous lines. Hindwings grey, base somewhat lighter; cilia grey-whitish.

·Longer-winged than the allied species.

Sydney, Blackheath (3500 feet), and Mittagong (2000 feet), New South Wales; not uncommon, in August and September, and again in March.

196. *Phil. acropola*, n. sp.

Major, alis ant. saturatius griseis, vitta lata media in costam præflexa cana, spatio costali saturate fusco; post. fuscis; capite luteo.

♂. 26.31 mm. Head light ochreous-yellowish. Palpi dark fuscous, apex of second joint whitish. Antennæ fuscous. Thorax ochreous-white, with a dark fuscous lateral stripe. Abdomen grey. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, moderate, costa gently arched, apex round-pointed, hind-margin hardly rounded, oblique; rather dark fuscous-grey; a broad white somewhat irregular-edged streak from near base in middle to beyond middle of disc, thence narrower and bent up to costa at  $\frac{3}{4}$ ; costal space above this dark fuscous; streak margined beneath with dark fuscous round angle; a few whitish scales towards hind margin: cilia fuscous-grey. Hind wings fuscous; cilia light fuscous.

Distinguished at once from both the preceding and following species by the yellowish head, and the white streak not connected with costa towards base.

Fernshaw and Mount Macedon, Victoria; several specimens in November and December.

197. *Phil. orinoma*, n. sp.

Media, alis ant. dilute griseis, vitta lata media in costam praeflexa cana, basim prope cum costa connexa, spatio costali punctisque disci plerisque saturate fuscis; post. fuscis; capite albido.

♂. 24 mm. Head grey-whitish. Palpi dark fuscous, apex of second joint whitish. Antennæ dark fuscous. Thorax dark fuscous, with a small lateral whitish spot. Abdomen light grey. Legs dark fuscous, hairs of posterior tibiæ whitish. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin oblique, slightly rounded; light fuscous-grey; a broad irregular white streak, somewhat mixed with grey, from near base to disc beyond middle, thence narrower and bent up to costa at  $\frac{2}{3}$ , connected with costa near base by a white spot; included costal space, and small angulated basal spot dark fuscous; three blackish dots obliquely placed on white streak before middle, one on upper edge in middle, and a curved mark on posterior margin of angle; a faint darker angulated line towards hindmargin; a row of obscure darker spots on hindmargin: cilia light fuscous-grey, basil half obscurely barred with whitish. Hindwings fuscous-grey, lighter towards base; cilia light grey.

Allied to *P. crepera*, but broader-winged, and with the white streak terminating in middle near base but connected with costa near base by a transverse spot.

Mount Macedon, Victoria; several specimens taken in December by Mr. G. H. Raynor, to whom I am indebted for my type.

198. *Phil. atmobola*, n. sp.

Media, alis ant. cinereis, vitta costæ abbreviata, striga plicæ alteraque dorsi postice confluentibus ochreo-albis, punctis disci sex nigris; post. griseis.

♂. 21-25 mm. Head light yellow-ochreous. Palpi grey, interiorly whitish. Antennæ dark grey. Thorax grey, with a small blackish spot on shoulder, posterior extremity whitish. Abdomen light grey. Legs dark grey, hairs of posterior tibiæ pale. Forewings elongate, moderate, costa moderately arched,

apex round-pointed, hindmargin oblique, slightly rounded; ashy-grey; a moderately broad ochreous-white costal streak from base to  $\frac{3}{4}$ , posteriorly obliquely truncate; a suffused ochreous white streak along fold from about  $\frac{1}{3}$ , and another along inner margin, confluent posteriorly, and abruptly truncate before anal angle; a black dot in disc at  $\frac{1}{3}$ , another directly beneath it on fold, a third above middle, a fourth sometimes obsolete slightly before middle, and two others transversely placed beyond middle; a hindmarginal row of blackish dots: cilia whitish-grey, at anal angle ochreous-white. Hindwings grey; cilia whitish-grey.

An extremely distinct and elegant species.

Deloraine and Hobart, Tasmania; rather common, from November to January.

199. *Phil. erebodes*, n. sp.

Media, alis ant. saturatius griseis, punctis disci quinque lineaque postica obsoleta nigrescentibus; post. saturatius griseis; capite fusco.

♂ ♀. 21-25 mm. Head palpi, antennæ, and thorax fuscous; mouth white. Abdomen whitish-grey. Legs dark fuscous, hairs of posterior tibiæ grey-whitish. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin slightly rounded, very oblique; rather dark fuscous grey, with scattered ashy-whitish scales; a blackish dot in disc at  $\frac{1}{3}$ , another beneath it on fold, a third above middle, and two others transversely placed beyond middle; an obscure darker curved line towards hindmargin, indented beneath costa; a row of obscure darker dots on hindmargin: cilia light fuscous, base mixed with ashy-whitish. Hindwings fuscous-grey, apex darker; cilia light grey.

Superficially similar to some of the ordinary forms of *Eulechria* and *Nephogenes*, but the resemblance is in the former case at least simply analogous.

Blackheath (3,500 feet), New South Wales; several specimens in January.

200. *Phil. pedetis*, n. sp.

Media, alis ant. saturate griseis, albido-sparsis, fascia angusta ad basim punctisque disci sex nigris, linea postica saturatori; post, fuscis; capite griseo.

♂. 23-25 mm. Head, palpi, antennæ, and thorax grey, head mixed with whitish. Abdomen grey-whitish, anal tuft greyish-ochreous. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hind margin very obliquely rounded; dark grey, closely irrorated with whitish; a narrow curved black fascia close to base; a double black dot in disc at  $\frac{1}{3}$ , another rather before it on fold, a third above middle, and three placed in a curved line transversely beyond middle; a curved darker posterior line, indented beneath costa; a row of obscure darker hindmarginal dots: cilia grey, basal half with obscure darker and lighter spots. Hindwings fuscous-grey, apex darker; cilia light grey.

Very closely allied to *P. erebodes*, but distinguished by the narrow suffused black fascia close to base.

Wirrabara, Port Lincoln, and the Mount Lofty range, South Australia; tolerably common in October and November.

201. *Phil. leucomitra*, n. sp.

Major, alis ant. saturatius griseis, partim cano-suffusis, punctis disci majusculis sex nigris, linea postica saturatori; post. fuscis; capite niveo.

♂ ♀. 24-28 mm. Head white. Palpi dark fuscous, apex of second joint white. Antennæ dark fuscous. Thorax dark fuscous, with a small white lateral spot. Abdomen grey. Legs dark fuscous, hairs of posterior tibiæ grey whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; rather dark greyish fuscous, suffusedly irrorated with white; the absence of irroration causes a darker streak along costa from base to before middle, a rather narrow fascia from costa beyond middle to anal angle, and a spot on costa at  $\frac{4}{5}$ ; a large blackish dot in disc at  $\frac{1}{3}$ , another on fold directly beneath it, a third above middle, a fourth below middle,

and two transversely placed beyond middle; a curved dark fuscous line from costal spot to anal angle; a row of cloudy dark fuscous hindmarginal dots: cilia light fuscous, basal half barred with dark fuscous. Hindwings fuscous, apex darker; cilia light fuscous.

Allied to the two preceding, but immediately separated by the clear white head, and partial white suffusion of the forewings.

Blackheath (3500 feet), New South Wales; Mount Wellington, Tasmania; common, from November to January.

202. *Phil. herodiella*, Feld.

(*Symmoca herodiella*, Feld., Reis. Nov. Pl. CXL, 31.)

Media, alis ant. niveis, fasciis quattuor rectis, tertia costam non attingente, macula costæ media elongata alteraque apicis parva saturate fuscis; post. fuscis.

♂ ♀. 20-25 mm. Head white. Palpi dark fuscous, second joint white internally and at apex. Antennæ dark fuscous. Thorax white, anterior margin suffusedly dark fuscous. Abdomen grey. Legs dark fuscous, hairs of posterior tibiæ grey-whitish. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; snow-white, markings dark fuscous; four straight transverse fasciæ, first near base, second before middle, third beyond middle, not reaching costa, fourth a little before apex, attenuated beneath and bent towards anal angle; an elongate-triangular narrow blotch along middle third of costa, confluent with second fascia; a small apical spot, produced along hindmargin; cilia whitish, with an obscure fuscous line. Hindwings fuscous-grey; cilia light fuscous.

Conspicuously distinct.

Blackheath (3500 feet), New South Wales; Fernshaw, Victoria; and the Mount Lofty range, South Australia; common, from November to January.

203. *Phil. hapula*, n. sp.

Media, alis ant. canis, fusco-sparsis, punctis disci tribus, striga anguli analis obliqua, lineaque postica ochreo-fuscis; post. fuscis.

♂ ♀. 18-21 mm. Head pale whitish-ochreous. Palpi dark fuscous, second joint ochreous-whitish internally and at apex. Antennæ dark fuscous. Thorax fuscous, posteriorly whitish. Abdomen whitish-grey, anal tuft whitish-ochreous. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; white, with scattered greyish-ochreous or fuscous scales; markings ochreous or ochreous-fuscous; a large dot in disc before middle, a second rather beyond it on fold, and a small one above middle; an oblique streak from disc beyond middle to anal angle; a cloudy curved line near hindmargin, sharply indented beneath costa; cilia pale greyish or fuscous, base mixed with white. Hindwings fuscous-grey; cilia light grey.

Not nearly resembling any other.

Blackheath (3,500 feet), New South Wales; common in January,  
204. *Phil. glaucoptera*, n. sp.

Media, alis ant. canis, vitta costæ abbreviata utrimque attenuata, altera media in costam praeфлекsa, punctis disci quinque, linea postica maculaque apicis fuscis; post. albido-fuscis.

♂ ♀. 19-22 mm. Head white. Palpi white, second joint externally dark fuscous except at apex. Antennæ whitish. Thorax white, anterior edge and a spot on shoulders fuscous. Abdomen ochreous-whitish. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; white, markings fuscous or ochreous-fuscous; a streak along costa from near base to  $\frac{3}{4}$ , attenuated at both ends; a moderately broad central longitudinal streak, anteriorly curved up to base of costa, posteriorly narrowed and curved up to costa at  $\frac{4}{5}$ ; two dots transversely placed before middle, one above middle, and two beyond middle, generally partly obsolete; a curved posterior line, confluent above with median streak; a cloudy apical spot: cilia whitish, mixed with pale ochreous-grey. Hindwings whitish-fuscous, apex darker; cilia grey-whitish.

Also a somewhat peculiar species.

Sydney, New South Wales; common in March.

205. *Phil. partitella*, Walk.

(*Oecophora partitella*, Walk., Brit. Mus. Cat. 683.)

Media, alis ant. canis, fascia ad basim, vitta costæ abbreviata utrimque attenuata, macula dorsi cum punctis disci tribus connexa, linea postica maculaque apicis saturate fuscis; post. griseis, basim versus flavido-tinctis; capite flavo.

♂ ♀. 19-22 mm. Head ochreous-yellow. Palpi dark fuscous, terminal joint and apex of second whitish. Antennæ dark fuscous. Thorax ochreous-white, with a dark fuscous spot on shoulder. Abdomen whitish-ochreous, anal tuft more yellow. Legs dark fuscous, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin obliquely rounded; white, sometimes ochreous-tinged; a straight dark fuscous fascia close to base; a broad dark fuscous streak along costa from near base to  $\frac{2}{3}$ , attenuated to both ends, connected with a discal dot before middle; an irregular fuscous blotch on inner margin, connected with a dark fuscous dot on fold, and two transversely placed in disc beyond middle; a curved dark fuscous line from costa at  $\frac{4}{5}$  to anal angle; indented beneath costa, its extremities connected by a direct fuscous shade; a cloudy fuscous apical spot: cilia light fuscous, base mixed with white. Hindwings grey, becoming yellowish towards base; cilia yellowish.

A handsome and distinct insect.

Sydney and Blackheath (3,500 feet), New South Wales; locally abundant in October.

206. *Phil. cretacea*, n. sp.

Media, alis ant. canis, plicæ basi, vitta costæ abbreviata basim non attingente, strigis duabus parallelis perobliquis e disco in costam percurrentibus, lineaque postica ochreis; post. albido-griseis.

♂ ♀. 19-22 mm. Head ochreous-yellow. Palpi whitish, second joint dark fuscous externally except at apex. Antennæ whitish. Thorax white, with a fuscous spot on shoulder. Abdomen whitish-ochreous, anal tuft more yellowish. Legs dark



fuscous, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin very obliquely rounded; white; a small blackish mark at base of costa; markings brownish-ochreous; an indistinct streak on fold at base; a rather narrow streak along costa from near base to  $\frac{3}{4}$ ; a narrow streak from disc before middle to posterior extremity of costal streak; two dots transversely placed in disc beyond middle, connected by an oblique streak with costa before apex; a fine curved line near hindmargin: cilia light ochreous-yellowish. Hindwings whitish-grey, yellowish-tinged towards base, apex grey; cilia light ochreous-yellowish.

This and the following species are closely allied together, and have a decided affinity to *P. partitella*; *P. cretacea* differs by the costal streak not reaching base, the first oblique streak also not nearly reaching base, the usually distinct posterior line, and yellower cilia.

Newcastle and Sydney, New South Wales; very common in September and October.

207. *Phil. calamaea*, n. sp.

Media, alis ant. canis, vitta costæ abbreviata, strigis duabus parallelis perobliquis, prima e basi, altera e disco in costam percurrentibus, ochreo-fuscis; post. griseis.

♂ ♀. 20-25 mm. Head ochreous-yellow or whitish-yellow. Palpi whitish, second joint externally dark fuscous except at base and apex. Antennæ whitish. Thorax white, with a small dark fuscous spot on shoulder. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin very obliquely rounded; white; a small dark fuscous mark at base of costa; markings ochreous-fuscous; a narrow streak along costa from base to  $\frac{3}{4}$ ; a narrow streak from middle of base to posterior extremity of costal streak, much attenuated towards base; two faint dots in disc beyond middle; a streak from upper dot to costa before apex: cilia pale whitish-ochreous. Hindwings grey, base yellowish-tinged pale; cilia whitish-ochreous.



Nearly allied to *P. cretacea* ; but both the costal and the first oblique streaks are produced to base, the discal dots are fainter, the posterior line absent, the markings darker, and hindwings greyer.

Toowoomba (2000 feet), Queensland ; common in September.

208. *Phil. monogramma*, n. sp.

Media, alis ant. niveis, partim ochreo-venosis, vitta subcostali abbreviata strigaeque obliqua a disco in costam percurrente saturate fuscis ; post. griseo-albidis.

♂. 20-22 mm. Head, palpi, antennæ, thorax, abdomen, and legs white. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely oblique, slightly rounded ; white, indistinctly streaked with greyish ochreous between veins ; a slender dark fuscous streak beneath costa from base to  $\frac{2}{3}$ , apex fainter ; a slender dark fuscous streak close beyond this from disc beyond middle to costa at  $\frac{3}{4}$  ; cilia white, mixed with pale greyish. ochreous. Hindwings very pale whitish-gey ; cilia grey-whitish.

Allied to the following, but smaller, the dark streak subcostal and not reaching beyond  $\frac{2}{3}$ , followed by an oblique streak.

Adelaide, South Australia ; four specimens in October.

209. *Phil. agnesella*, Newm.

(*Oecophora agnesella* Newm., Trans. Ent. Soc. Lond. III (n.s.), 297.)

Media, alis ant. niveis, vitta supra medium e basi in apicem percurrente, postice inferius leviter trifurcata ; post. albidogriseis.

♂. 25 mm. Head and antennæ white. Palpi white, second joint dark fuscous except at apex. Thorax white, becoming grey on back. Abdomen whitish. Legs dark grey, posterior tibiæ whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded ; white, slightly suffused with pale ochreous ; extreme base of costa blackish ; a narrow fuscous longitudinal streak above middle from base to apex, somewhat dilated beyond middle, posteriorly indistinct and tending to be trifurcate ; cilia ochreous-white. Hindwings whitish-grey, darker towards apex ; cilia whitish.

Allied to preceding, but easily recognisable.  
Melbourne, Victoria ; two specimens in October.

210. *Phil. chionopectera*, n. sp.

Media, alis ant. niveis, vitta costæ angusta utrimque attenuata ochrea vel fusca, ♀ linea media e basi in apicem percurrente ochrea, ciliis niveis ; post. albedo-griseis.

♂. 20-22 mm., ♀. 24-26 mm. Head, palpi, antennæ, thorax, abdomen, and legs white. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded ; snow-white ; a slender costal streak, in ♂ rather dark fuscous, in ♀ ochreous, from near base to near apex, finely attenuated towards base ; in ♀ an indistinct brownish-ochreous longitudinal median line from base to apex : cilia white. Hindwings whitish-grey, in ♂ sometimes rather darker ; cilia whitish.

In colouring the ♂ nearly resembles the same sex of *P. productella*, but may be immediately separated by the much more arched costa, and wholly white cilia of the forewings ; the females of the two species are however, markedly dissimilar both from the males and from each other, nor are the species in fact closely allied.

Newcastle, New South Wales ; locally abundant in January.

211. *Phil. hydara*, n. sp.

Major, alis ant. ♂ latiusculis, ♀ longis, dilute griseis, ♂ partim cano-suffusis, punctis disci quinque obsolete saturate fuscis ; post. ♂ albedo-griseis, ♀ saturatus griseis.

♂. 24-27 mm., ♀ 29-35 mm. Head, palpi, antennæ, thorax, and abdomen whitish, in ♀ greyish-tinged. Legs dark grey, posterior tibiæ whitish. Forewings in ♂ moderate, suboblong, in ♀ elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded ; in ♂ grey-whitish, irrorated with ochreous-grey, in ♀ grey, with scattered dark fuscous scales ; inner margin and a streak beneath costa from base to middle very suffusedly and indistinctly darker ; an indistinct dark fuscous dot in disc at  $\frac{1}{3}$ , a second beneath it on fold, a third above middle, and

two transversely placed at  $\frac{2}{3}$ ; cilia grey-whitish; in ♀ with two grey lines. Hindwings in ♂ light fuscous-grey, paler towards base, in ♀ darker fuscous-grey; cilia grey whitish, in ♀ with two grey lines.

The ♂ stands peculiarly characterised in the genus by the rather broad suboblong forewings, and does not at all approach *P. productella*; but the ♀ closely resembles the same sex of *P. productella* both in form and colour.

Duaringa, Queensland; eight specimens received from Mr. G. Barnard.

212. *Phil. pruinosa*, n. sp.

Media, alis ant. elongatis, niveis, vitta costæ suffusa abbreviata, fascia angusta ad basim, punctis disci quattuor, strigula anguli analis lineaque postica saturate fuscis; post. griseis.

♂ ♀. 17·20 mm. Head white or yellowish-white. Palpi white, second joint dark fuscous externally except at apex. Antennæ grey. Thorax white, with a dark fuscous spot on shoulder. Abdomen whitish-ochreous, anal tuft more yellowish. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, rather narrow, costa moderately arched, apex pointed, hindmargin extremely obliquely rounded; white; an ill-defined blackish fascia close to base; a short blackish streak from this beneath costa, merged in a dark fuscous suffusion along costa from  $\frac{1}{4}$  to  $\frac{3}{4}$ ; inner and hind margins strewn with dark fuscous scales; a small dark fuscous spot in disc before middle, a second obliquely before it on fold, and a third between these, sometimes all confluent; a fourth above middle, a fifth below and beyond middle, and three others generally confluent into an oblique streak from disc to anal angle; a dark fuscous line from costa at  $\frac{4}{5}$  to hindmargin above anal angle, indented above middle: cilia whitish, becoming grey towards tips. Hindwings grey, base paler; cilia pale whitish-ochreous, sometimes partially greyish.

A rather peculiar species, probably somewhat allied to *P. productella*, but differing from all the neighbouring species in the dark fuscous fascia near base.

Brisbane, Queensland ; Sydney, New South Wales ; very common in September and October.

213. *Phil. squalidella*, n. sp.

Minor, alis ant. angustis, ochreo-albis, ochreo-mixtis, maculis costæ tribus parvis, punctis disci tribus, quarto anguli analis, maculaque ante apicem, transversa nigricantibus ; post. griseis.

♂. 14-17 mm. Head ochreous-white. Palpi white, externally irrorated with blackish. Antennæ whitish-fuscous. Thorax ochreous-white, mixed with pale ochreous. Abdomen ochreous-whitish. Legs dark fuscous, ringed with ochreous-white, posterior tibiæ ochreous-whitish. Forewings elongate, narrow, costa slightly arched, apex round-pointed, hindmargin extremely obliquely rounded ; ochreous-white, irregularly mixed and suffused with light ochreous, and with a few blackish scales ; a small blackish spot at base of costa, another at  $\frac{1}{4}$ , and a larger triangular spot in middle of costa ; a black dot in disc at  $\frac{1}{3}$ , a second obliquely before it on fold, a third in disc at  $\frac{2}{3}$ , and a fourth on inner margin before anal angle ; an irregular blackish fascia-like blotch from costa before apex to middle of hindmargin : cilia whitish-ochreous, finely irrorated with grey, basal half narrowly barred with blackish. Hindwings grey, base paler ; cilia whitish, irrorated with grey.

Abnormal in the genus from its small size and very narrow wings ; it seems however to be a member of the group of *P. productella*, dwarfed by unfavourable conditions ; easily recognised by the costal spots.

Melbourne, Victoria ; Hobart, Tasmania ; several specimens in December.

214. *Phil. productella*, Walk.

(*Oecophora productella*, Walk., Brit. Mus. Cat. 688 ; *Oecophora griseicostella*, Z., Hor. Ross. 1877, 395.)

Major, alis ant. elongatis, ♂ niveis, ♀ griseo-suffusis, vitta costæ angusta utrimque attenuata, interdum etiam punctis disci plerisque lineaque postica saturate fuscis, ciliis griseo-mixtis ; post. griseis.

♂. 23-26 mm., ♀. 25-35 mm. Head, palpi, antennæ, thorax, and abdomen white, sometimes partially suffused with grey, anal tuft ochreous-whitish. Legs dark grey, posterior pair white. Forewings elongate, rather narrow, costa in ♂ hardly arched, in ♀ gently, apex round-pointed, hindmargin extremely obliquely rounded; white, sometimes slightly mixed with grey, in ♀ more or less wholly suffused with light fuscous grey; costa slenderly dark fuscous from base to near apex; sometimes a dark fuscous dot in disc beyond middle; in ♂ sometimes also a dark fuscous dot on fold before middle, several other scattered discal dots, and an indistinct line towards hindmargin, indented beneath costa: cilia ochreous-whitish, mixed with grey. Hindwings grey, base paler; cilia whitish, with a suffused grey line towards base.

Variable to some extent; the dotted form of the ♂ does not appear to occur in New South Wales, but is equally common with the type in Victoria and South Australia; every intermediate stage is found.

Sydney, New South Wales; Melbourne and Mount Macedon, Victoria; Mount Gambier, Adelaide, Petersburg, and Port Lincoln, South Australia; generally abundant in dry grassy places, from October to January.

215. *Phil. tyrozantha*, n. sp.

Major, alis ant. ♂ dilute flavis, ♀ dilute stramineis, ciliis marginis postici griseis; post. saturatius griseis; thorace dilute flavo.

♂. 23-25 mm., ♀. 33 mm. Head and thorax light ochreous-yellow. Palpi light ochreous-yellow, second joint dark fuscous externally except at apex. Antennæ yellowish. Abdomen pale whitish-ochreous. Legs dark grey, posterior tibiæ ochreous-whitish. Forewings elongate, costa moderately arched; apex round-pointed, hindmargin very obliquely rounded; in ♂ light ochreous-yellow, in ♀ very pale whitish-yellowish; extreme costal edge blackish towards base: cilia grey, on costa and at apex becoming yellowish. Hindwings rather dark grey; cilia grey.

The ♂ is very similar to the two following species, but easily recognised by the wholly yellow thorax ; the ♀ closely approaches that of *P. productella* in form, but differs in colour.

Murrurundi, New South Wales : three specimens in November.

216. *Phil. melirrhoa*, n. sp.

Media, alis ant. dilute flavis, ciliis marginis postici griseis ; post. saturate griseis ; thoracis dimidio antico saturate griseo.

♂. 22-26 mm. Head light ochreous-yellow. Palpi light yellow, second joint dark fuscous externally except at apex. Antennæ pale yellowish. Thorax light ochreous-yellow, anterior margin suffusedly dark fuscous. Abdomen light ochreous-yellow. Legs dark grey, posterior tibiæ ochreous-whitish. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin almost straight, oblique ; rather light ochreous-yellow ; extreme costal edge blackish towards base ; cilia grey, on costa light yellow. Hindwings dark grey ; cilia grey.

Readily distinguishable from *P. tyroxantha* by the dark fuscous anterior half of thorax ; from *P. crocobapta* by the yellow costal edge.

Murrurundi, New South Wales ; common in November.

Although this species and the preceding are very similar, it is questionable whether they are in fact very closely allied

217. *Phil. crocobapta*, n. sp.

Media, alis ant. flavis, margine costali cillisque saturate griseis ; post. saturate griseis ; thoracis dimidio antico saturate griseo.

♂ ♀. 20-23 mm. Head light ochreous-yellow. Palpi light yellow, second joint externally dark grey. Antennæ pale grey. Thorax light-ochreous yellow, anterior half dark grey. Abdomen ochreous-yellow, basal third dark grey. Legs dark grey, posterior tibiæ whitish yellow. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very oblique, slightly rounded ; ochreous-yellow ; costal edge narrowly dark grey : cilia wholly dark grey. Hindwings dark grey ; cilia dark grey.

Closely allied to *P. melirrhoa*, but immediately separable by the dark grey costal edge ; the dark grey basal band of the yellow abdomen is a curious special characteristic.

Port Lincoln, South Australia ; locally common in October and November.

218. *Phil. pretiosella*, Walk.

(*Psecadia pretiosella*, Walk., Brit. Mus. Cat., 538.)

Media, alis ant. flavis, margine costali nigra, vitta costæ abbreviata argentea, altera subcostali rubra, ciliis roseis ; post. griseis.

♂ ♀. 23-26 mm. Head and palpi yellow, partly suffused with red. Antennæ whitish-grey. Thorax yellow; anterior half suffused with red. Abdomen pale whitish-ochreous. Legs dark grey, middle femora reddish, posterior legs ochreous-whitish. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin almost straight, oblique ; bright yellow ; extreme costal edge blackish from base to  $\frac{4}{5}$  ; a silvery-white costal streak from base to  $\frac{4}{5}$ , margined beneath by a red streak, almost reaching apex : cilia rosy, becoming grey at anal angle. Hindwings grey ; cilia light grey, round apex pale rosy, towards anal angle more yellowish.

A singularly beautiful and conspicuous species.

Sydney and Blackheath (3,500 feet), New South Wales ; Melbourne, Victoria : and the Mount Lofty Range, South Australia ; in October and November, very generally distributed, but apparently nowhere common.

219. *Phil. anachorda*, n. sp.

Major, alis ant. dilutissime stramineis, vitta supra medium e basi in apicem percurrente saturate fusca, utrimque niveo-marginata ; post. griseis.

♂ ♀. 26-29 mm. Head yellow. Palpi yellowish-white, second joint externally dark fuscous. Antennæ pale grey. Thorax pale yellow, anterior margin broadly dark fuscous. Abdomen ochreous-whitish. Legs dark fuscous, posterior pair ochreous-white. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, oblique ; very pale whitish-yellow ; a straight longitudinal dark fuscous streak above middle from base to apex, margined on both sides with white : cilia grey, at tips and round apex whitish, on costa pale yellow. Hindwings grey, base paler ; cilia ochreous-whitish, base more ochreous.

A fine and distinct species.

Blackheath (3500 feet), new South Wales; rather common in October and November, seeming to be attached to *Banksia*.

220. *Phil. adaptatella*, Walk.

(*Oecophora adaptatella*, Walk., Brit. Mus. Cat. 689; *Oecophora propriella*, ibid. 691.)

Media, alis ant. flavis, vitta costali nivea, altera subcostali saturate rufa, inferius niveo-marginata, signo disci postico angulato fusco; post. griseis.

♂ ♀. 22-27 mm. Head yellow. Palpi white, second joint externally dark fuscous. Antennæ whitish. Thorax dark fuscous, posterior margin narrowly pale yellow. Abdomen whitish-yellowish. Legs dark fuscous, posterior pair whitish-yellowish. Forewings elongate, moderate, costa moderately arched, apex round pointed, hindmargin faintly sinuate, oblique; bright yellow, deeper and more ochreous posteriorly; a snow-white costal streak from base almost to apex, beneath which is a broad dark reddish-ochreous-brown streak reaching to apex, margined beneath by a suffused snow-white streak, becoming obsolete towards extremities; an irregular angulated suffused fuscous mark in disc beyond middle, sometimes partially obsolete, apex pointing to anal angle: cilia dark grey, becoming white at tips and round apex, yellowish on costa. Hindwings grey, apex darker, base paler and yellowish-tinged; cilia whitish-yellowish.

Allied to the preceding, but conspicuously distinct.

Brisbane, Queensland; Sydney, Blackheath (3500 feet), and Shoalhaven, New South Wales; common from September to January, certainly attached to *Banksia*.

221. *Phil. brochosema*, n. sp.

Major, alis ant. niveis, vitta subcostali, altera infra medium, ciliisque saturate fuscis; post. griseis.

♂. 27 mm. Head yellow. Palpi dark fuscous, internally whitish. Antennæ dark fuscous. Thorax dark fuscous, with a small white lateral spot. Abdomen whitish-ochreous. Legs dark



fuscous, posterior tibiæ whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin faintly sinuate, very oblique; snow-white; a rather broad dark fuscous subcostal streak from base to apex; a similar streak from inner margin near base to middle of hindmargin, produced upwards to apex: cilia fuscous-grey, tips paler. Hindwings grey, tinged with whitish-ochreous, especially towards base; cilia whitish-ochreous.

Not to be confused with any other.

Mount Lofty range, South Australia; one specimen in October.

222. *Phil. interlineatella*, Walk.

(*Oecophora interlineatella*, Walk., Brit. Mus. Cat. 692.)

Media, alis ant. niveis, vitta costæ angusta, altera supra medium, tertia dorsi, lineola plicæ, striga transversa postica lineaque marginis postici ochreo-fuscis; post. griseis.

♂ ♀. 18-22 mm. Head ochreous-yellow or pale whitish-ochreous. Palpi dark fuscous, internally white. Antennæ whitish-grey. Thorax ochreous-brown, posterior margin narrowly snow-white. Abdomen whitish-ochreous. Legs dark grey, posterior pair pale whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, very oblique; snow-white; markings ochreous-brown; a slender costal streak from base to near apex, very finely attenuated anteriorly; a straight moderately broad longitudinal streak above middle from base to apex; a streak along inner margin from base to anal angle, attenuated at extremities; a narrow streak from this to median streak, near and parallel to hindmargin; a short linear mark on fold before middle, sometimes confluent with dorsal streak; a narrow interrupted line on hindmargin: cilia fuscous-grey, with a suffused white bar beneath and another above apex. Hindwings grey; cilia ochreous-whitish, with an indistinct grey line.

A handsome species, allied to the two following, but without the anterior fascia.

Sydney and Blackheath (3,500 feet), New South Wales ; Melbourne, Victoria ; Port Lincoln, South Australia ; locally rather common, from October to December.

223. *Phil. bracteatella*. Walk.

(*Oecophora bracteatella*, Walk., Brit. Mus. Cat. 696.)

Media, alis ant. argenteis, margine costali, vitta supra medium, strigula dorsi ad basim, fasciis duabus angulatis saepius in plica connexis, lineaque marginis postici rufis ; post. griseis.

♂ ♀. 18-22 mm. Head ochreous-yellow. Palpi dark fuscous, internally white. Antennæ whitish. Thorax white, anterior half and a posterior spot dark reddish-fuscous. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, oblique ; silvery-white ; markings rather dark reddish-ochreous-brown ; costal edge dark fuscous ; a straight streak above middle from base to apex, sometimes interrupted at  $\frac{1}{4}$ , dark-margined near base, lower margin with a short tooth beyond middle ; a narrow streak along basal  $\frac{1}{4}$  of inner margin ; two narrow transverse fasciæ, angulated outwards on median streak, first before middle, second beyond middle, first with a projecting tooth from posterior edge along fold, often reaching lower extremity of second ; a narrow dentate streak along hindmargin : cilia white, on apex and anal angle grey. Hindwings grey, paler and tinged with whitish-ochreous towards base ; cilia pale whitish-ochreous, becoming ochreous-yellow round apex.

This and the following species are closely allied, and at first sight extremely similar ; *P. bracteatella* may however be at once distinguished by the short tooth from lower margin of median streak not being produced to unite with second fascia, and by the presence of the streak from first fascia along fold.

Sydney and Blackheath (3,500 feet), New South Wales ; Melbourne, Victoria ; Albany, West Australia ; locally common, from November to March.

224. *Phil. trijugella*, Z.

(*Oecophora trijugella*, Z., Hor. Ross. 1877, 391, Pl. V., 136.)

Media, alis ant. argenteis, margine costali, vitta supra medium, altera dorsi angusta, fasciis duabus, alterius parte inferiori discum versus bifurcata, lineaque marginis postici rufis; post. griseis.

♂. 19-22 mm. Head ochreous-yellow. Palpi dark fuscous, internally whitish. Antennæ whitish. Thorax white, anterior half and a posterior spot dark reddish-fuscous. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex almost acute, hindmargin slightly sinuate, oblique; silvery-white; markings reddish-ochreous-brown; costal edge dark fuscous; a strait streak above middle from base to apex: a narrow streak along inner margin throughout, interrupted at  $\frac{1}{4}$ ; a narrow somewhat bent transverse fascia before middle; a bar from costa beyond middle to median streak; a streak rather near and parallel to hindmargin from inner margin to median streak; a bar from median streak beyond middle to this streak above lower extremity; a slender dentate streak along hindmargin: cilia white, somewhat mixed with grey, on apex and anal angle fuscous-grey. Hindwings grey; cilia whitish-ochreous, with a grey basal line, more yellowish round apex.

Differs from *P. bractearella* by the oblique bar from median streak to second fascia, the slender dark streak along inner margin throughout, the absence of the streak on fold, and the disconnection of the upper and lower portions of the second fascia.

Sydney, New South Wales; not uncommon, in November and December.

225. *Phil. acutella*, Walk.

(*Oecophora acutella*, Walk., Brit. Mus. Cat. 1031.)

♂. 21 mm. Head and thorax yellow. Forewings silvery-white, with two ochreous-brown longitudinal streaks connected at base; first near costa, emitting from lower edge a spot and two posterior streaks, of which the first is acutely angulated

inwards, the second oblique ; second longitudinal streak including a short white line near base. Hindwings grey, towards base yellowish-tinged.

I saw this species in the British Museum (a very poor specimen), and noted it as new and allied to *P. bracteata*, but omitted to describe it ; the above description (doubtless inaccurate) is interpreted from Walker.

West Australia.

226. *Phil. aurinatella*, Walk.

(*Oecophora aurinatella*, Walk., Brit. Mus. Cat. 693.)

Media, alis ant. apice acuto, saturate flavis, macula disci parva transversa ciliisque saturate griseis ; post. saturate fuscis.

♂ ♀. 18-22 mm. Head deep yellow. Palpi yellow, externally dark fuscous except at base. Antennæ yellowish. Thorax deep yellow, suffused in middle with dark grey. Abdomen whitish-ochreous. Legs dark fuscous, posterior tibiæ whitish-yellow. Forewings elongate, moderate, posteriorly dilated, costa moderately arched, apex almost acute, hindmargin almost straight, oblique ; deep yellow ; a small transverse blackish-grey spot in disc beyond middle ; cilia dark grey, base mixed with blackish. Hindwings dark fuscous ; cilia dark grey.

Readily distinguished from *P. monophæës* by the discal spot, from *P. xanthiella* by the almost acute apex of the forewings.

Sydney (rarely), Mittagong (2000 feet) and Blackheath (3500 feet), New South Wales ; locally abundant from November to January.

227. *Phil. monophæës*, n. sp.

Media, alis ant., saturate flavis, ciliis saturate griseis ; post. saturate fuscis.

♂ ♀. 18-22 mm. Head and thorax deep orange-yellow. Palpi yellow, paler internally. Antennæ pale yellowish. Abdomen whitish-ochreous, anal tuft yellow. Legs dark fuscous, posterior tibiæ ochreous-whitish. Forewings elongate, moderate, posteriorly dilated, costa moderately arched, apex round-pointed, hindmargin sinuate, oblique ; deep orange-yellow ; cilia dark grey, with a black basal line. Hindwings dark fuscous ; cilia dark grey.

A splendid species, distinguished from its allies by the total absence of marking, and the intensity of colour.

Blackheath (3500 feet), New South Wales; rather common in November.

228. *Phil. euxantha*, n. sp.

Media, alis ant. dilutius flavis, puncto disci duplici saturate fusco, ciliis angulum analem versus griseis; post. saturate griseis.

♂ ♀, 19-22 mm. Head and thorax yellow. Palpi yellow, terminal joint whitish. Antennæ whitish. Abdomen whitish-yellow. Legs dark fuscous, posterior tibiæ whitish-yellow. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin obliquely rounded; rather light yellow; a faint double fuscous dot in disc beyond middle: cilia light yellow, becoming grey on anal angle. Hindwings dark grey; cilia whitish-ochreous, mixed with grey.

Allied to *P. xanthiella*, but lighter yellow, with the discal spot represented only by a faint double dot.

Melbourne, Victoria; Launceston, Tasmania; three specimens in January.

229. *Phil. xanthiella*, Walk.

(*Oecophora xanthiella*, Walk., Brit. Mus. Cat. 693.)

Media, alis ant. apice rotundato, saturate flavis, macula disci transversa, ciliisque angulum analem versus saturate griseis; post. saturate griseis.

♂ ♀, 17-22 mm. Head, palpi, and thorax deep yellow, terminal joint of palpi whitish. Antennæ whitish. Abdomen whitish-yellow. Legs dark fuscous, posterior tibiæ light yellow. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin obliquely rounded; deep yellow; a transverse dark fuscous variable spot in disc beyond middle, sometimes fascia-like and nearly reaching both margins; cilia yellow, becoming dark grey towards anal angle. Hindwings dark grey; cilia varying from whitish-ochreous to grey.

Varies considerable in the development of the discal spot, which is however always strongly marked; the larger forms, with spot approaching a fascia, are characteristic of lower and warmer regions, and at first sight appear distinct, but there is no constant point of difference.

Sydney and Blackheath (3,500 feet), New South Wales; Melbourne, Victoria; Mount Lofty Range, South Australia; common, from November to March.

230. *Phil. bimaculana*, Don.

(*Tortrix bimaculana*, Don., Ins. New Holland; *Oecophora bimaculella* Newm., Trans. Ent. Soc. Lond., III. (n. s.), 295; *Oecophora bimaculana* Walk. Brit. Mus. Cat., 657, Feld. Reis. Nov. Pl. CXXXVIII., 48.)

Media, alis ant. flavis, basi, fascia media latiore sinuata, altera etiam marginis postici angusta ciliisque saturate fuscis, purpureo-suffusis; post. saturate fuscis.

♂ ♀. 20-23 mm. Head yellow. Palpi dark fuscous, internally yellow. Antennæ whitish. Thorax dark purple-fuscous. Abdomen fuscous, anal tuft yellow. Legs dark fuscous, posterior tibiæ yellow. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin slightly sinuate, oblique; bright yellow; markings dark fuscous, irrorated and suffused with purple, except on edges; a narrow basal fascia; a rather broad fascia from middle of costa to beyond middle of inner margin, somewhat dilated beneath, both margins sinuate; a narrow fascia along hindmargin, extremities attenuated: cilia fuscous-grey, suffused with purple at base. Hindwings dark fuscous; cilia fuscous-grey.

A handsome and distinct species.

Duringa and Brisbane, Queensland; Newcastle, Sydney, Blackheath (3,500 feet), and Shoalhaven, New South Wales; Mount Lofty, South Australia; and I have seen a normal specimen from New Guinea: generally common amongst *Eucalyptus*, flying freely in the sunshine.

231. *Phil. tentatella*, Walk.

(*Oecophora tentatella*, Walk., Brit. Mus. Cat., 685.)

Media, alis ant. flavis, basi, triangulo anguli analis cum fascia marginis postici angusta connexa purpureis, nigrescenti-marginatis; post. griseis.

♀. 20-21 mm. Head light yellow. Palpi whitish, second joint externally dark fuscous. Antennæ grey-whitish. Thorax dark purple-fuscous. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior tibiæ pale whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin almost straight, oblique; bright yellow; base purple-fuscous; costal edge very slenderly dark fuscous towards base; an erect triangular reddish-purple spot on inner margin, edged with dark fuscous, reaching more than half across wing, confluent at base with a rather narrow reddish-purple irregularly dark-margined streak along hindmargin from apex to anal angle: cilia light yellow, on apex and anal angle dark grey. Hindwings grey, apex darker; cilia pale whitish-ochreous, mixed with grey.

A beautiful insect, recalling *Coesyra*, with which it has probably real relationship.

Blackheath (3,500 feet), New South Wales; two specimens in January.

232. *Phil. occidua*, n. sp.

Minor, alis ant. albido-ochreis, punctis disci tribus, strigula anguli analis erecta, lineaque marginis postici purpureo-roseis; post. griseo-albidis.

♂ ♀. 13-15 mm. Head, palpi, antennæ, and thorax whitish-ochreous. Abdomen grey-whitish, anal tuft whitish-ochreous. Legs dark fuscous, middle tibiæ reddish tinged, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex almost rectangular, hindmargin almost straight, oblique; whitish-ochreous, sometimes irrorated with carmine; a purplish-carmine dot in disc before middle, another on fold slightly beyond it, and a third in disc beyond middle; an erect

purple-carmine streak from anal angle, reaching half across wing ; a purple-carmine streak along hind-margin : cilia whitish-ochreous, tips whitish. Hindwings grey-whitish, greyer posteriorly ; cilia grey-whitish.

The smallest species, characterised by its rosy markings.

Sydney and Mittagong (2000 feet), New South Wales ; several specimens in February and March.

233. *Phil. homotona*, n. sp.

Minor, alis ant. ochreis, punctis disci tribus serieque postica nigris, macula supra angulum analem grisea ; post. ochreo-albidis.

♂. 16 mm. Head, palpi, antennæ, and thorax light brownish-ochreous. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior tibiæ pale whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin almost straight, oblique ; pale brownish-ochreous ; extreme costal edge blackish near base ; a blackish dot in disc before middle, another on fold beyond it, and two almost confluent in disc beyond middle ; a cloudy grey spot above anal angle ; a row of cloudy blackish dots near and parallel to hindmargin : cilia whitish-ochreous, with a faint fuscous line, tips whitish. Hindwings ochreous-whitish, margin greyish ; cilia ochreous-whitish with an indistinct grey line.

Very similar to some forms of *Eulechria*, as *E. convictella* and its allies.

Bulli, New South Wales ; one specimen in October.

234. *Phil. melanoploca*, n. sp.

Media, alis ant. fusco-albidis, strigis plerisque inter venas interruptis saturate fuscis, serie maculorum postica nigrescentium ; post. dilate griseis.

♂. 19 mm. Head, palpi, antennæ, thorax, and abdomen grey-whitish ; shoulders dark fuscous ; second joint of palpi mixed externally with dark fuscous. Legs dark fuscous, posterior pair whitish. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin almost straight, oblique ; very pale whitish-fuscous, with some scattered dark fuscous scales ; all spaces



between veins indicated by cloudy broadly interrupted dark fuscous streaks, sprinkled with black; a row of cloudy blackish spots on veins near hindmargin: cilia fuscous-whitish. Hindwings pale grey; cilia grey-whitish, with a cloudy grey line.

Easily known by the intervenal streaks.

Sydney, New South Wales; one specimen in March.

235. *Phil. pulverea*, n. sp.

Minor, alis ant. ochreo-albidis, griseo-conspersis, punctis disci tribus serieque postica saturate fuscis; post. dilute griseis.

♀. 16-17 mm. Head and antennæ grey-whitish. Palpi whitish, second joint externally dark fuscous except at apex. Thorax grey-whitish, irrorated with grey. Abdomen ochreous-whitish. Legs dark fuscous, posterior pair ochreous-whitish. Forewings elongate, somewhat dilated, costa slightly arched, apex round-pointed, hindmargin almost straight, oblique; ochreous-grey-whitish, coarsely irrorated with rather dark grey; a dark fuscous dot in disc before middle, another slightly beyond it on fold, and two sometimes confluent in disc beyond middle: a row of dark fuscous dots near and parallel to hindmargin: cilia ochreous-whitish, irrorated with grey. Hindwings pale grey; cilia whitish, with a faint grey line.

Characterised by the dark grey irroration.

Brisbane, Queensland; two specimens in September.

236. *Phil. electrodes*, n. sp.

Minor, alis ant. saturate flavis; post. saturate griseis.

♂ ♀. 17-18 mm. Head, palpi, antennæ, and thorax deep yellow. Abdomen whitish-yellow. Legs yellow. Forewings elongate, somewhat dilated, costa very slightly arched, apex round-pointed, hindmargin somewhat concave, oblique; deep yellow: cilia deep yellow. Hindwings dark grey; cilia grey.

Apparently allied to *P. pulverea*, but much more gaily coloured.

Murrurundi, New South Wales; several specimens in November.

36. LEISTOMORPHA, Meyr.

Head loosely haired, sidetufts moderate, loose, meeting above, slightly projecting. Antennæ in ♂ somewhat serrate, moderately and evenly ciliated (1), basal joint stout, with well-developed

pecten. Palpi moderate or long, second joint exceeding base of antennæ, densely scaled, almost smooth, terminal joint shorter than second, slender, recurved. Thorax smooth. Forewings elongate, moderate, hindmargin obliquely rounded. Hindwings rather narrower than forewings, elongate-ovate, hindmargin rounded, cilia  $\frac{21}{52}$ . Abdomen moderate. Middle tibiæ much thickened with dense rough hairs; posterior tibiæ clothed with dense long hairs. Forewings with vein 7 to hindmargin, 2 from angle of cell. Hindwings normal.

Differs from *Philobota* principally by the dilated hairs of the middle tibiæ; the exact affinity of the genus is at present somewhat uncertain. The second species is only known in the ♀, and its position here is therefore not assured. Both recall some forms of *Peltophora*.

- 1a. Head dark fuscous.....237. *brontoscopa*  
 1b. ,, yellow .....238. *ochrocausta*

237. *Leist. brontoscopa*, n. sp.

Minor, alis ant. saturate fuscis, signo anguli analis antice cano-marginato, interdum etiam punctis disci tribus saturatoribus; post. saturate fuscis, costa dilute flavido-suffusa.

♂ ♀. 13-16 mm. Head, antennæ, thorax, and abdomen dark fuscous. Palpi dark fuscous, becoming pale whitish-yellow towards base; second-joint in ♀ extremely elongate. Legs dark fuscous, posterior pair whitish-yellow. Forewings elongate, costa gently arched, apex rounded, hindmargin very obliquely rounded; dark fuscous, generally finely sprinkled with whitish or ochreous-whitish; sometimes a small darker spot in disc before middle, a second on fold beneath it, and a third beyond middle, usually obsolete; a darker fuscous erect mark on anal angle, preceded by some white scales, more distinct in ♀: cilia dark fuscous, beneath anal spot white, tips beneath apex whitish-ochreous. Hindwings dark fuscous, costa suffusedly whitish-yellow; cilia pale whitish-yellow, towards base becoming fuscous.

Not to be mistaken, though inconspicuous.

Blackheath, (3,500 feet), New South Wales ; Sale, Victoria ; and Launceston, Tasmania ; common in October and November, flying in the sunshine, but liable to be overlooked from its dark colour and rapid flight.

238. *Leist.* (?) *ochrocausta*, n. sp.

Media, alis ant. ochreis, dorsum versus leviter purpureo-micantibus, costa flava, triangulo anguli analis saturate griseo ; post. ochreo-fuscis, margine postico saturate fusco.

♀. 22 mm. Head ochreous-yellow. Palpi dark fuscous, base and apex of second joint whitish. Antennæ grey. Thorax brownish-ochreous, somewhat purple-shining. Abdomen yellowish-fuscous. Anterior legs dark fuscous (middle and posterior pair broken). Forewings elongate, suboblong, costa bent at  $\frac{1}{3}$ , gently arched, apex rounded, hindmargin oblique, slightly rounded ; ochreous, lighter towards costa, deeper and somewhat purple-shining towards inner margin ; costal edge ochreous-yellow ; a dark fuscous triangular spot on anal angle : cilia ochreous, becoming dark grey on anal angle, whitish-yellow beneath it. Hindwings ochreous-fuscous, hindmargin broadly suffused with dark fuscous ; cilia grey, darker round apex.

This species is only placed here provisionally ; the middle legs are broken, and the ♂ is unknown.

Melbourne, Victoria ; one specimen received from Mr. G. H. Raynor.

37. *COMPSOTROPHA*, Meyr.

Head smooth, sidetufts moderate, spreading. Antennæ moderate, in ♂ with dense rather long fine cilia (2-3), basal joint stout, without pecten. Palpi moderate, second joint reaching or exceeding base of antennæ, with appressed scales, terminal joint shorter than second, slender, recurved. Thorax smooth. Forewings elongate, moderate, hindmargin obliquely rounded. Hindwings almost as broad as forewings, oblong-ovate, hindmargin rounded, cilia  $\frac{1}{3}$  to  $\frac{1}{2}$ . Abdomen moderate. Middle tibiæ somewhat thickened with dense hairs ; posterior tibiæ clothed with long fine hairs, Forewings with vein 7 to hindmargin, 2 from before angle of cell. Hindwings normal.

Distinguished from *Philobota* (from the last group of which it may probably be a development) by the longer cilia of the antennæ, and absence of basal pecten. The three species are very similar and nearly allied, resembling some forms of *Eulechria*.

- 1a. Hindwings pale yellow ..... 239. *selenias*  
 1b.       ,,       fuscous.  
 2a. Thorax anteriorly dark fuscous..... 240. *strophiiella*  
 2b.       ,,       wholly ochreous-whitish ..... 241. *charidotis*

239. *Comps. selenias*, n. sp.

Media, alis ant. dilute albido-griseis, macula dorsi ad basim, punctis disci tribus, tertio duplici, fasciaque antemarginali nigrescentibus; post. dilute flavis.

♂. 16-22 mm. Head ochreous-white. Palpi ochreous white, second joint with an oblique blackish median band. Antennæ white, annulated with dark fuscous. Thorax light grey, with a transverse blackish stripe before middle. Abdomen whitish-yellow. Legs dark fuscous, tarsal joints with ochreous-whitish apical rings; posterior tibiæ whitish-yellow. Forewings elongate, posteriorly dilated, costa gently arched, apex rounded, hindmargin obliquely rounded; pale whitish-grey; costal edge ochreous-whitish, becoming black near base; a small black spot on inner margin near base; a large black dot in disc at  $\frac{1}{3}$ , a second beyond it on fold, connected with inner margin by a grey spot, and two transversely placed and confluent in disc beyond middle; an irregular dark fuscous fascia from costa at  $\frac{4}{5}$  to before anal angle, dilated below middle; a row of blackish dots on hindmargin: cilia grey-whitish, becoming grey towards base and on anal angle. Hindwings pale yellow; cilia pale yellow, becoming grey around apex.

Immediately recognisable by the pale yellow hindwings; it also differs from both the other species by the greyish tinge of the forewings, and the small dark spot on inner margin near base.

Sydney and Blackheath (3500 feet), new South Wales; two specimens in October, of which that from the mountains is considerably the larger.

240. *Comps. strophiiella*, n. sp.

Minor, alis ant. ochreo-albidis, punctis disci duobus cum dorso per strigulam connexis, tertio duplici, fasciaque postica saturate fuscis ; post. fuscis ; thorace antice fusco.

♂ ♀. 13-17 mm. Head ochreous-whitish. Palpi ochreous-white, second joint with an oblique dark fuscous median band. Antennæ ochreous-white, annulated with dark fuscous. Thorax ochreous-whitish, anterior margin suffused with dark fuscous. Abdomen ochreous-whitish. Anterior legs dark fuscous, tarsi ringed with ochreous-white ; middle and posterior legs ochreous-whitish, middle tarsi grey towards base of joints. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin almost straight, oblique ; ochreous-whitish ; extreme costal edge dark fuscous near base ; a blackish-fuscous dot in disc before middle, and a second beyond it on fold, connected by a fuscous shade which extends to inner margin ; two others transversely placed and confluent in disc beyond middle ; a dark fuscous fascia from costa at  $\frac{1}{5}$  to before anal angle, dilated below middle ; a row of dark fuscous dots along hindmargin : cilia ochreous-whitish, beneath anal angle grey. Hindwings fuscous-grey, in ♀ somewhat ochreous-tinged towards base ; cilia grey.

This and the following species are very similar ; *C. strophiiella* is characterised by the fuscous hindwings, slightly ochreous-tinged in the ♀ only, the two anterior discal dots less oblique and connected by a streak extending to inner margin, the posterior fascia more remote from hindmargin, and the thorax anteriorly suffused with fuscous.

Sydney, New South Wales ; not uncommon, in October, November, and April.

241. *Comps. charidotis*, n. sp.

Minor, alis ant. ochreo-albidis, punctis disci tribus, tertio duplici, fasciaque antemarginali saturate fuscis ; post. ochreo-fuscis ; thorace ochreo-albido.

♂. 13-14 mm. Head and thorax ochreous-whitish. Palpi ochreous white, second joint with an oblique dark fuscous median band. Antennæ ochreous-white, annulated with dark fuscous. Abdomen whitish-ochreous. Anterior legs dark fuscous, tarsi ringed with ochreous-white; middle and posterior legs ochreous-whitish, middle tarsi grey towards base of joints. Forewings elongate, costa slightly arched, apex round-pointed, hindmargin very obliquely rounded; ochreous-whitish; extreme costal edge dark fuscous at base; sometimes a grey suffusion along inner margin; a black dot in disc before middle, another obliquely beyond it on fold, and two transversely placed and confluent in disc beyond middle; a blackish fascia from costa before apex to before anal angle, dilated below middle: a row of dark fuscous dots on hindmargin: cilia ochreous-whitish, beneath anal angle grey. Hindwings brownish-ochreous or ochreous-fuscous, darker posteriorly; cilia brownish-ochreous.

Narrower-winged than *C. strophiiella*, the two anterior discal dots more oblique than in either of the other species, and unconnected, the posterior fascia more oblique and more approximated to hindmargin, the hindwings with a strong ochreous tinge, and the thorax wholly pale.

Wirrabara Forest, South Australia; four specimens in October from *Eucalyptus*.

### 38. ERIODYTA, Meyr.

Head loosely haired, sidetufts large, meeting above, roughly projecting over forehead. Antennæ moderate, in ♂ moderately ciliated ( $1-1\frac{1}{2}$ ), basal joint moderate, with strong pecten. Palpi moderate, second joint exceeding or hardly reaching base of antennæ, densely scaled, more or less thickened, terminal joint rather shorter than second, recurved. Thorax smooth. Forewings elongate, hindmargin oblique, rounded. Hindwings rather narrower than forewings, elongate-ovate or almost ovate-lanceolate, hindmargin rounded, cilia  $\frac{3}{4}$  to 1. Abdomen moderate. Posterior tibiæ clothed with very long fine hairs. Forewings with vein 7 to hindmargin, 2 almost from angle of cell. Hindwings normal.

This genus cannot be considered satisfactory as it stands, but with the material which I at present possess I cannot improve it. The four last species seem naturally allied together, and have a decided affinity to *Saropta*. The three first are distinctly related to *Philobota*, but have no strong connection with one another. It may be possible eventually to subdivide the group.

- 1a. Head yellow.
- 2a. Forewings white..... ..242. *contentella*.
- 2b. „ yellow .....244. *subpunctella*.
- 1b. „ white
- 2a. Forewings with darker markings.
- 3a. With a sinuate dark fuscous streak .....243. *signophora*.
- 3b. With ochreous markings ... ..246. *leptostola*.
- 2b. „ unicolorous.
- 3a. Forewings white.....247. *hololeuca*
- 3b. „ whitish-ochreous .....245. *abductella*.
- 3c. „ grey irrorated with white.....248. *vernalis*.

242. *Eriod. contentella*, Walk.

(*Oecophora contentella*, Walk., Brit. Mus. Cat. 1031.

Minor, alis ant. niveis, basi fasciisque tribus directis saturate fuscis ; post. albido-griseis.

♂ ♀. 11-14 mm. Head light ochreous-yellow. Palpi white, second joint yellowish-tinged with basal half dark fuscous. Antennæ grey: Thorax white, posterior margin dark fuscous. Abdomen whitish, anal tuft yellowish-tinged. Legs dark fuscous, posterior pair yellowish-whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin obliquely rounded ; snow-white ; four straight direct dark fuscous fasciæ ; first basal, second before middle, third beyond middle, fourth rather broader, irregular, subapical : cilia ochreous-white, basal half fuscous. Hindwings whitish-grey ; cilia grey-whitish, with a grey line.

Somewhat similar in marking to *Philobota herodiella*. The palpi are rather stout, and the second joint does not reach base of antennæ.

Sydney, New South Wales; locally common in October, November, and March.

243. *Eriod. sigmophora*, n. sp.

Media, alis ant. canis, strigula costæ ad basim strigaque quam maxime sinuata e disco in costam ante apicem percurrente saturate fuscis, costa ciliisque ochreo-flavis; post. albido-ochreis, linea antemarginali grisea.

♂. 19 mm. Head white. Palpi white, second joint dark fuscous except at apex. Antennæ whitish-grey, base blackish. Thorax blackish, posterior margin whitish. Abdomen ochreous-yellow. Legs ochreous-yellow, anterior tibiæ blackish above. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin oblique, slightly rounded; white, very faintly ochreous-tinged; a thick black streak along basal fourth of costa, remainder yellow-ochreous; a strong rather irregular dark fuscous S shaped streak, anterior extremity on fold before middle, posterior extremity on costa before apex, first curve nearly touching middle of costa, second curve touching anal angle; hindmargin beyond this whitish-ochreous, with some blackish scales towards apex: cilia ochreous-yellow, tips whitish-yellowish. Hindwings pale whitish-ochreous, with a grey-line before hindmargin, sharply indented inwards beneath costa; cilia whitish-ochreous.

Singularly distinct.

Sydney, New South Wales; I took one fine specimen on a fence in December, and have seen a second.

244. *Eriod. subpunctella*, Walk.

(*Oecophora subpunctella*, Walk., Brit. Mus. Cat.)

Minor, alis ant. flavis, punctis disci tribus minimis saturate fuscis, tertio duplici ac cum angulo anali per strigulam connexo; post. saturate fuscis.

♂ ♂. 15-17 mm. Head, palpi, and thorax yellow; second joint of palpi with base and a subapical spot dark fuscous. Antennæ yellow, obscurely ringed with grey. Abdomen whitish-ochreous. Legs whitish-ochreous, anterior tibiæ and base of tarsal



joints fuscous. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin rather oblique, slightly rounded; yellow; costal edge blackish at base; a very small blackish dot in disc before middle, and a second beyond it on fold; two others transversely placed and confluent in disc beyond middle, connected with a slender cloudy fuscous streak from anal angle: cilia yellow. Hindwings dark fuscous, lighter towards base; cilia whitish ochreous, with a dark fuscous basal line.

Differs from all similarly marked species by the yellow ground-colour.

Sydney, New South Wales; not uncommon, in December and February.

245. *Eriod. abductella*, Walk.

(*Gelechia abductella*, Walk., Brit. Mus. Cat. 650.)

Minor, alis ant. apice acuto, albido-ochreis, dorsum versus vix saturatoribus; post. saturatius griseis, basim versus dilutioribus.

♂ ♀. 14-17 mm. Head white, slightly ochreous-tinged. Palp white, second joint mixed with ochreous externally, apex of terminal joint dark fuscous. Antennæ whitish. Thorax whitish-ochreous. Abdomen ochreous-whitish. Legs ochreous-whitish, anterior pair dark grey above. Forewings elongate, moderate, costa moderately arched, apex acute, hindmargin very obliquely rounded; pale whitish-ochreous, somewhat darker towards inner margin; cilia pale whitish-ochreous. Hindwings rather dark grey, much paler towards base; cilia ochreous-whitish, base more ochreous.

An inconspicuous species, liable to be overlooked.

Sydney, New South Wales; common from October to December.

246. *Eriod. leptostola*, n. sp.

Minor, alis ant. niveis, ochreo-sparsis, strigula ad basim sub-costali, punctis disci tribus, quarto dorsi postico, strigula anguli analis obliqua, lineaque postica ochreis; post. griseis.

♂ ♀. 12-15. mm. Head white. Palpi white, second joint externally suffused with dark fuscous except at base and apex.

Antennæ whitish. Thorax white, slightly mixed with ochreous. Abdomen ochreous-whitish. Anterior legs dark fuscous; middle tibiæ ochreous-whitish, tarsi grey with whitish rings at apex of joints; posterior legs ochreous-whitish. Forewings elongate. costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; white, with irregularly scattered brownish-ochreous scales; costal edge dark fuscous towards base; markings brownish-ochreous; a thick streak beneath costa from base to middle, suffused and indistinct posteriorly; a large dot in disc before middle, another on fold obliquely before it, and a third in disc beyond middle, connected with anal angle by an oblique streak; a small spot on inner margin before anal angle; sometimes a suffused streak along fold, or along middle of inner margin; a streak near and parallel to hindmargin: cilia white, mixed with ochreous. Hindwings grey, much paler towards base; cilia ochreous-whitish, with a cloudy grey line.

Variable in intensity of markings.

Sydney, New South Wales; generally common, in November December, February and March.

247. *Eriod. hololeuca*, n. sp.

Minor, alis ant. elongatis, canis, interdum squamis paucis ochreis; post. griseis.

♂. 14-16 mm. Head, palpi, antennæ, and thorax white. Abdomen ochreous-whitish. Legs white, anterior pair dark fuscous, middle tarsi grey. Forewings elongate, rather narrow, costa moderately arched, apex pointed, hindmargin very oblique hardly rounded; white, sometimes with a few pale ochreous scales: cilia white. Hindwings grey or light grey; cilia ochreous-whitish.

This and the following species have more elongate and narrower wings than the rest.

Brisbane and Toowoomba, Queensland; rather common in September.

248. *Eriod. vernalis*, n. sp.

Minor, alis ant. elongatis, ochreo-griseis, creberrime cano-conspersis ; post. dilute griseis.

♂. 14-16 mm. Head, palpi, antennæ, thorax, abdomen, and legs grey-whitish ; anterior legs dark fuscous. Forewings elongate, narrow, costa moderately arched, apex pointed, hindmargin extremely obliquely rounded ; ochreous-grey, densely irrorated with white : cilia white, irrorated with grey. Hindwings light grey or whitish-grey ; cilia grey-whitish.

One of the very earliest spring insects, easily neglected.

Sydney, New South Wales ; four specimens in August.

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NOTES ON THE GEOLOGY OF THE SOUTHERN PORTION OF THE  
CLARENCE RIVER BASIN.

BY PROFESSOR STEPHENS.

The Delta of the Clarence River, now notable throughout Australia as a district in which the Sugar Cane can be profitably cultivated by free white labour, lies, like all the deltas in New South Wales, entirely inland. The strong current which sweeps along the eastern coast, and maintains by means of its tepid waters a subtropical climate and vegetation as far south as Illawarra, also carries away to the southward and to sea all the mud and fine sediments which are discharged by this and its sister rivers. Only the heavy silicious silt remains behind, which, together with the sands pounded out of the sea cliffs by the unceasing action of the waves, forms at the mouth of every estuary a curving line of dunes, concave to the sea, and resting at each extremity upon headlands of solid rock. The immunity from winter cold and spring frosts which the Clarence enjoys more than any river to the south, and more than most to the north, until the Tropic is

actually reached, depends in part I suppose on its extremely low seaboard, partly on the vast quantities of warm sea water which are drawn in with every tide, and partly upon the free and well-drained character of the sugarlands.

The result of these advantages, the sugar industry of the Clarence, presents a really astonishing spectacle. Industrial activity of any kind, however striking it may be to the visitor, is not indeed a subject for the consideration of this Society. But having been recently enabled to visit the district, and to make the trip from Grafton on the Clarence to Glen Innes on the Table land, and back again, I had an opportunity of making some observations on the Geological structure of that part of the country, which I hope may be worth some attention. There is more repetition in the paper than I could wish ; but it seemed to me while writing that with more condensation I might become less intelligible. "*Brevis esse laboro, obscurus fio.*"

The road from Grafton to Buccarumbi, with which we are principally concerned, runs through a poor country of sandstones and shales, undulating in the valleys, but broken by ranges of mural precipices closely resembling the escarpments common in the Hawkesbury sandstone. The false bedding or oblique stratification so common in the latter series is equally predominant here ; and the rock faces are excavated by atmospheric action into caves or "gibber gunyas" of exactly the same character as those on the shores of Port Jackson or in the gullies of the Blue Mountains. The vegetation is also so similar that it is only by a kind of effort that one remembers that the formation is not the same. A hill beyond the river Orara is capped with quartz boulders and gravel. To this I shall refer in its proper place. Quitting the main basin of the Orara by the line of the Chambigne Creek, and over a range covered with a fine open forest of spotted gum and ironbark, we descend to the OBX Creek over a road metalled with petrified wood. This gully is the most interesting geological feature which we have yet observed. For the right bank of the Clarence receives its waters partly from the coast ranges by the Orara, and partly from the south and west.

The basin of the former is carboniferous—that of the latter Devonian, Silurian, *or older*. Along the boundary runs the OBX, having on its left the rocks of vertical, on its right bank those of horizontal stratification. If we examine the sections displayed upon the right, we shall observe at the basis a conglomerate of small pebbles, over which lies a felspathic looking sandstone. Above this again is seen a bed composed mainly of petrified trees, apparently coniferous, and highly charged with oxide of iron. Above follow shales and sandstones, in which seams of Coal are known to occur. Coal indeed is everywhere indicated in these horizontal beds, and many seams have been proved, as at Rocky Mouth, but as yet without very satisfactory result. Turning to the left or western bank we find the road ascend by a side cutting, displaying those familiar schists and slates which for want of a better name we call Siluro-Devonian. Here and there we observe patches of horizontal conglomerate resting upon their upturned edges, and on the summit we find a massive capping of the same. As we descend, we lose it, though scattered pebbles from that source are still to be seen on the surface.

At Buccarumbi we cross the Nymboi, just below its junction with the Boyd, or Little River, up which we run, through schists, hard slates, and quartzites, to Broadmeadows, where we leave it (in granite) for the Henry or Newton Boyd River, a tributary of the Mann or Mitchell. (Every river here has an *alias* or two.) After crossing the former we strike the right bank of the latter, and keep it more or less until we cross this also just before the ascent to the table land. The road all the way from Broadmeadows winds over a tract of soft and decomposing granite forming a steeply undulating surface enclosed and invaded by impassable ranges of greenstone, or equally forbidding rock. The river bottoms however are floored with extremely hard, that is, undecomposed granite. A spur of this softer granite, the Big Hill, carries the road up 2000 feet higher, to the open granitic downs, black soil flats, and rich agricultural lands formed by the decomposition of volcanic rock, which form the superficial riches of New England.

Returning to the Orara range and taking our stand upon the summit we have immediately beneath our feet the conglomerate mentioned above, a more recent portion of which same formation is the basis of the Clarence Carboniferous series, which extends eastwards without visible break, though enormously eroded, all the way to the Pacific. This capping of the hill rests upon an uneven surface of slates, schists, and quartzites, vertical or nearly so, and extending westwards to the greenstones and granites which form the eastern buttress of the tableland.

The range, as has been already said, forms the division between the basin of the Orara or S.E. tributary of the Clarence, (which rising near the coast runs in a north-easterly direction to join the river above Grafton), and that of the south-western waters, which are gathered from the vast alpine mass rising to the eastward of Armidale, and known in different parts by different names, as Mount Lofty, Macleay Range, Chandler's Peak, &c. It is a spur of the main watershed or Great Divide, starting from Ben Lomond, and separating the upper waters of the Clarence and Manning Rivers. Much of it is laid down in the Geological Map as volcanic; more, I venture to predict, than will be admitted by and by. Its northern slopes are drained by the various torrents which make up the Nymboi, Guy Fawkes and Mitchell Rivers, and pass to the northwards between us and the table land. The Guy Fawkes takes a sudden turn to the west, nearly S. of Newton Boyd, and under the name of Little River or Boyd, joins the Nymboi at Buccarumbi, having been probably been diverted from its original course by the elevation of the Newton Boyd greenstones and granites.

For the whole channel of the Boyd or Little River as we trace it westwards and upwards from Buccarumbi, where it joins the Nymboi, to Broadmeadows, where we leave it for the Henry or Newton Boyd River, is a deep gutter eroded in slates and quartzites, generally of intense hardness, in a direction at right angles to their strike. A similar and parallel channel, about 15 miles to the north carries the waters of the Mitchell to the Nymboi. There is no fault traversing these beds in a direction at right

angles to their strike, which might have been invoked, against all reasonable probability, to explain the direction of the drainage. The harder beds of rock are quite continuous from the north to the south bank; they form projecting spurs on each, which are connected by transverse bars or ridges, forming shelves and rapids in the stream, as they still reluctantly yield to ancient and interminable erosion. The Geological Map here marks an elongated stripe of igneous rock, along which the river makes its way; as if this were a softer material which had been more easily excavated than the rest. But this is evidently an error; and I cannot help suspecting that more of the Green patches in the neighbourhood have in reality no claim to that colour, but rather to Mauve.\* The origin of the mistake in the case of the Little River is not difficult of discovery. For the road along side of it is to a very large extent a ledge or cornice cut out of the solid rock, which is, as has been already observed, of a most refractory character, and would be rated in specifications, tenders, and contracts, as equal to the hardest material. At any rate I found that the name recognised in these localities for the blue flinty quartzite was *Basalt*, and hence, I presume, the error in the Map. If this be the case, it is probable that other "Green" areas in the same Roads-district, will prove to have the same origin†. In reality the whole district from OBX Creek westward as far as Broadmeadows, a few miles from Newton Boyd is of the same formation (Siluro-Devonian ?) and is probably not destitute of fossil remains; though, from the highly metamorphic character of its greater portion, they are not likely to be found easily or frequently. Gold is obtained at many points, and at Dalmorton on the Boyd, a mining township has been established, and some reefs are being worked, with not much noticeable result. In one or two spots I observed small dioritic dykes, and indications of others. But the country as a whole consists of nearly vertical slates and quartzites, with the usual northerly strike.

\* *Green* in this Map signifies Dioritic and Basaltic (Volcanic and Trappean); *Mauve*, Silurian formations.

† I have been informed that the coarse sand which forms by the decomposition of granite is known in N. S. W. Railway contracts as *Gneiss*. Out of this misnomer strange confusion might arise.

But to return to the conglomerate at the top of the Orara range. It occupies an ancient river bed, now the summit of a hill more than 900 feet above the sea. It is composed of pebbles large and small, all well rounded, of ellipsoidal shape, and composed of hard slates, &c., without quartz. It contains patches of coarse sandstone, bedded at various angles, and composed of river sand, with few, if any, separate grains of quartz. There can be no doubt as to its fluviatile origin; and it is probable that it represents a somewhat deep portion of the bed, where the shingle might have been consolidated by cement before the waters had deserted that part of their course: for it seems clear that this bed of concrete served to protect the portion of the range immediately beneath it from the waste which the rest has suffered. Again, down the eastern slope of the range we come upon other shelves or patches of the same material, the pebbles diminishing in average size, but otherwise the same, until at last in the bottom of the creek we see it emerging upon the right bank from the loose shingle of the torrent bed, and forming, as has already been said, the basis of the horizontal series. It is not to be supposed that this conglomerate underlies that series throughout. It is clearly, I think, a river shingle, and cannot be supposed to extend very far to the eastward of OBX. Upon what then does it rest, and what is the formation upon which the Clarence River beds have been deposited? The conglomerate showing first as a cap to the range, secondly as a series of shelves upon the western or left hand slope, and finally as the bottom rock of the escarpment on the eastern or right bank, seems to give one half the answer; and the disappearance of the older rocks East of the range, to complete it. I suppose the river which formed the upper conglomerate to have run northwards along a line of fault in the Slates. This line is now marked on the map by the division between the Silurian and Clarence River beds, and on the ground, at least in part, by OBX Creek. I suppose further that the lowering of the river was mainly due, not to erosion, which could have had comparatively little effect upon a bottom so well protected by deep shingle, but by the gradual descent of the whole country



to the East of the fault. This would by slow degrees leave the left bank as a steep slope overhanging the river, capped with the oldest shingle, and stepped by the latter and lower drift in shelves as described; until at last the downward movement of the seaward side was arrested, and the bottom conglomerate began to be formed. It would seem that at this period the landscape east of the Orara range was something like what it is now, a somewhat rugged but undulating surface extending to the sea, with its coast ranges more elevated than those inland; but that it differed from the present in being formed of slates, of less hardness perhaps, and less vertical, but still of no other formation than those to the westward. The sliding movement of one side of the fault against the other gradually ceased, eased possibly by the formation of a parallel fault or set of faults near or beyond the sea margin. The existence of this second fault is supported by much probable evidence drawn from the character of the coast, and the eastward limitation of the Clarence Basin. Without at present entering into details I should refer, as an illustration, to the double line of fault which almost certainly exists in the Waianamata District, but affecting the older rocks only; one line along, or a little to the west of, the channel of the Nepean; the other, some distance to the East of the Coast. The first is partially masked by the overlying Hawkesbury sandstone; the second concealed by the sea.

At any rate there must have been such a cessation of opposite movements as I have described. For thereafter we can trace no elevation of the one side concurrent with subsidence of the other, but both portions move together, whether upwards or downwards.

And so, after an indefinite period of rest, (or perhaps of rising) the whole district began again to subside. Great lakes were gradually formed and great rivers still carrying down the debris of the wasting continent, filled up the hollows with beds of sand or mud, interspersed with drifted logs and the vegetation from their banks.

The ancient surface sank the faster under this accumulation, which by degrees obliterated every salient feature, burying all

under vast accumulations of sediment, not less probably than a thousand feet in thickness, and with a surface but little raised above the sea. Meanwhile the lower beds of this formation were becoming hardened and consolidated, the sands into sandstones, muds into shales, and the debris of swamp vegetation and timber into coal. These are the Clarence River Coal measures, which have as yet escaped any thorough investigation. The fossils which have been determined are few. Our President says of the whole series "In the Clarence River district we have certain Coal bearing strata, the relative position of which has not yet been definitely ascertained. They consist of a great thickness of conglomerates sandstones and shales. The seams of Coal as yet discovered on them are of no value, but it is not unlikely that seams of good quality will be found in the lower portion of the series. No *Glossopteris* has been found in these beds, but as they contain the *Teniopteris Daintreei*, *Alethopteris australis*, and *Thinnfeldia*, they may be newer than the Wianamatta beds, and of the same age—Jurassic—as the Victorian Coal series, of which *Teniopteris Daintreei* is a characteristic fossil."\*

The Rev. J. E. Tenison-Woods in his paper on the Fossil Flora of the Australian Coal measures apparently identifies these Clarence River beds with the Ipswich Coal measures at Moreton Bay.†

The quarries now worked at both North and South Heads for the supply of stone for training walls, breakwater, &c., in the improvement of the entrance, yield large quantities of carbonaceous fossils, such as whole trees straight in the trunk, and branching radially like Pines, long straight leaves resembling those of Palms or of the Pandanus when split, other leaves and branching stems, shapeless lumps of carbonaceous matter,—and stems of Palm trees or Pandanus, rugose on the outside and crushed into flattened cylinders owing to the softness of the internal structure. Besides these, specimens of actually petrified wood are frequent; and in one block I clearly saw a portion of a shell evidently belonging to the

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\* Mineral Products of N.S.W. 1882.

† Proceedings Linn. Soc. N.S.W., 1883, p. 54.

Unionidæ. I confess that the inspection of these rocks leads me to guess at a more recent date for the formation than has been proposed. But two or three hours are quite inadequate for reasonable examination of so large a mass of fossils. Two or three months would hardly be enough.

It is not improbable however that these rocks upon the coast line are the very uppermost beds of the series, and pass into quite a different era from those inland.

However this may be, it is certain that after a very long period of subsidence, covering possibly, as hinted above, more than one geological period, a reverse action commenced, and the whole basin began to be eroded by the rivers which had filled it, and by the rainfall which as century after century rolled past, and the land rose more and more, found higher and higher elevations to work upon. So by degrees and at last the surface was carved into the familiar hill and dale, cliff and gully, which result from the erosion of horizontally stratified rocks of different degrees of hardness.

At some period during this emergence, and before the present river system was elaborated a river now represented by the Orara flowed from the south over a bed of quartz boulders and gravel. These remain here or there, as in the older or upper drift on the Orara range, as a capping to the hilltops which were originally the valley bottoms along which the river ran. The boulders are large enough to suggest floating ice as an aid in their transport. But I do not know that the hypothesis is required. They must indeed have travelled a very considerable distance, from the head of the Bellinger at least, and are not particularly well rounded. Still as we cannot even guess what fall the stream which conveyed them had from its source to their resting place, it is premature to appeal to Ice.

An example of this boulder or gravel bed may be seen on the W. side of the river on the top of the ridge as you pass upwards towards the west. These two drifts mark not exactly but roughly the beginning and the end of the Clarence River series.

Meanwhile an abundant rainfall continued to erode the eminences as the rivers deepened these channels, and the spoils of

both were borne to the ocean by the main artery, the present Clarence. For the water courses were now determined, and the great river now swept into the sea somewhere near its present mouth. But the relative levels of land and water were very different. It is likely enough that the river was swift and turbid, with a rocky bed, and a rocky sea shore on which to disembogue. The miserable eminences of rock which now break the level of the sea coast dunes were then high crags, hundreds of feet above the water, and connected by rocky ranges, which are now reefs, at almost an equal elevation. Somewhere under the sand hills which now impound the inland waters there was a deep valley or pass through which the river sped in its outward course. But the river bed of that time must lie not less than five hundred feet below the level of the present. For another oscillation had yet to take its turn. The land once more began to sink, the currents to slacken, channels to shoal, rivers to spread, swamps to form, forests to be flooded, to die, and be buried as they lay in the accumulation of sediment. In short the present period of subsidence had begun. This action is still continuing, and, if it be directly connected with the submergence of the N. E. Coast, and the growth of the Barrier reef, is likely to go on, at whatever time it may have commenced, to far remote eras of Geological time. That alluvium is still accumulating upon the surface is obvious. For the river banks are considerably higher than the ground behind, which falls away into swamps, salt marshes, and lakes; and this elevation of the banks is of course due to the deposit of detritus in inundations. Twenty years ago, when a wall of rich tropical jungle rose directly from the waters edge, the turbid waters were strained of their sediment, by filtering through the matted underbrush and forest rubbish which then covered the ground, so that the ultimate overflow into the back lands consisted of comparatively clear water. Hence while the river was continually though slowly rising, by the increment which each flood contributed so as to embank it with natural levées, these back lands were kept more nearly at their original

level, which therefore was year by year becoming more and more depressed in relation to the river. The balance was from time to time restored by a higher flood than usual, which found its way in volume over the natural levées, formed broad sheets of water in the lower grounds, and either changed the course of the river as a whole, or at least put the lower grounds in the way of reclamation by subsidence of mud.

Since the shores have been denuded of their forest, the floodwaters naturally flow more rapidly outwards to right and left of the channel, and carry the sediment with which they are loaded into the lower grounds, where it is now chiefly deposited. Hence we may expect an increase of relative elevation, which, though small for each year, is continuous, and may perhaps be of considerable importance in another half century. The process described above may be seen in every stage; the wide and deep lake which has never received its proportionate share of alluvium; the "broad water" or huge expansion of the river over a formerly separated swamp, where the process of deposition is going on continuously during every hour of every tide; the dismal grey *Casuarina* marsh, where the ground has not yet been raised above the influence of the salt water; the green freshwater swamps, with their innumerable creeks and lagoons; the low moist rich meadows; and finally the fertile and well drained sugar or corn land. Thus on a small scale, and with a different flora, the Clarence is even now repeating the grand natural processes to which modern civilisation owes the fuel which is its power. And, as we have seen, a similar chain of circumstances led ages ago in the same district, to the deposit of sands and muds, and of the waste and decomposing matter of ferns, palms, pandanus, and pine trees which we recognise as the Clarence River Coal measures.

Again, the hills, whether isolated or as spurs from the main range, rise abruptly every where from the level; showing that the subaerial erosion, the debris produced by which tends to fill in and obliterate the angle between the horizontal ground and the hill slope, is more than counterbalanced by the accumulations of sediment from flood waters. These are all proofs of increasing

deposits, which would permanently raise the land, were their work not counteracted by equivalent subsidence of the foundation. For there is nowhere any sign of real elevation. The coast line within which the rocks of the Clarence basin were deposited has disappeared, and its position can only be conjecturally determined by careful examination of the palæozoic<sup>3</sup> and igneous rocks which appear to the North and South of the entrance. But not only has this ancient barrier vanished, but the overlying horizontal beds also, which now, in miserable fragments, form the outworks of the land, are disappearing in their turn, partly by subsidence, partly by marine erosion, and in large measure under the exigencies of great engineering works. A few inconspicuous headlands are united by long ranges of sandhills, based in some places on rocky reefs, but, in others, filling the deep valleys through which the ancient water courses made their way to the sea. It is by rocks that once were summits of ranges, and not over the filled up channels of the drainage of tertiary times, that the present river makes to the sea. Through shifting sands currents traverse widely, shifting their course without warning or apparent reason. But where there is a rock at their level, they can only shift back and forward from it. Consequently the channel obtains a certain degree of permanence, although at the point where the accumulation of sand is shallowest, and a long way from the ancient channel, which had been eroded before to the commencement of the present period of subsidence.

It may be worth noting that in the course of the dredging operations which are being carried on at Lawrence, the "shacklebone" of a large whale, together with other portions of the skeleton, were met with at a depth of only two feet or so in the sandy drift. (The "shacklebone" is composed of the flattened cervical vertebræ, which are confluent in the true whales.) It may be presumed that the unfortunate animal had found its way into the river but was unable to find its way out, and had so died of hunger. The body must have finally grounded after long drifting by wind and tide somewhere near the place where the relics were discovered. For the bones which I examined, were

quite recent ; and it must be many a thousand years since whales could have maintained themselves upon that ground. It is hardly necessary to add that no marine beds of any kind have been met with in sinking wells or the like through the alluvium, which is probably fluviatile to the very bottom, and there rests on an irregular surface of hill and dale, formed by the long and deeply eroded Coal bearing rocks. These again, in all probability rest, as has been shown, on a similarly eroded surface of Silurian or even older Slates, and these, as the Hindoo Cosmogony has it, upon the fundamental Tortoise.

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#### DIMENSIONS OF SOME GIGANTIC LAND TORTOISES.

BY J. C. COX, M.D., &c.

We have in Sydney two large specimens of a Gigantic Land Tortoise. One is the property of Alexander McDonald, Esq., of Adelaide Cottage, Potts' Point, and is named "Rotumah," from the fact of his having been presented to the owner by the Chief of Rotumah. This specimen is a male.

The second is owned by Dr. Manning at Gladesville, a female.

Porter in 1813, was the first who published any record of these huge Land Tortoises, which he found from 3 to 400lbs. in weight at the Galapagos Islands. I am not at all sure as to what species these two Tortoises belong, but they are supposed to come from Galapagos Archipelago. Darwin saw two there which he says must have weighed at least two hundred pounds each.

There is a large specimen of this Tortoise at Ceylon, whose great size was considered sufficient by the inhabitants to demand a Royal Inspection—First, by the Duke of Edinburgh while on a cruise in H.M.S. Galatea, and subsequently by H. R. H. the Prince of Wales, when he landed at Ceylon on his way to India. This tortoise weighed 224lbs., but some notion of the enormous Tortoise in the possession of Mr. McDonald may be found when I mention that its weight is no less than 642lbs.

Subjoined is a record of the measurements of Mr. McDonald's Tortoise and those of the Ceylon and Gladesville specimens. The specimen at Gladesville far exceeds that of the Ceylon specimen, but

does not come up to that of Mr. McDonald's, though the difference in sex may in some way account for this. There is a specimen of a huge Tortoise in the British Museum from the Aldabra Island, which weighed 870lbs., and is called *Testudo Elephantina*. Many of this latter species have been exported to the Seychelles, where they thrive well.

	ROTUMAH. Adelaide Cottage.	GIGANTIC TORTOISE. Ceylon.	GLADESVILLE. Tortoise.
Length of nose to tail...	6ft. 2in.	5ft. 3in.	5ft. 10½in. no tail.
Ditto shell.....	4ft. 7½in.	4ft. 7in.	4ft.
Across ditto.....	5ft. 10½in.	4ft. 3in.	5ft.
Girth .....	8ft. 3in.		6ft. 7½in.
Height lying down.....	2ft. 2¼in.		
Ditto standing up ...	3ft. 1in.	2ft. 3in.	
Length under shell .....	3ft.		2ft 4½in.
Front leg under knee... 1ft. 7½in.			
Ditto round elbow .	2ft. 1½in.		1ft. 5in.
Ditto round foot....	1ft. 1in.		
Hindleg, instep... ..	1ft. 9½in.		
Round head.....	1ft. 7in.		1ft. 3in.
<i>Weight</i> ... 5 cwt., 2 qrs. and 26lbs.		2 cwt. 2 qrs.	

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NOTES AND EXHIBITS.

The following communication from Baron von Müller on the Orthography of the name of Linnaeus was read.

As a Society, bearing the great name of Linnaeus, must be particularly interested in the exact manner in which that name should be written, a translation is herewith offered from a letter by the celebrated Algologist, Professor Dr. J. Agardh, of Lund, to Baron Von Müller, on this subject, concerning which, after some recent writings of the latter, a controversy had arisen.

“You desire to know how the name of Linné has been written with us. In olden times it was customary in Sweden, that University Students chose a particular name, and to this often added the Latin syllable -us. Especially among Divines were such names very usual; thus we have had Archbishop Rydelling,



Benzelius, and many others ; in this manner the name of Linné was Carl Linnaeus ; and so did he write it himself in all his publications, (whether Latin or Swedish) till he became ennobled. In former times it was here also very customary that whosoever was thus honoured, adopted a new name ; and it was on this occasion that Linnaeus altered his name to Linné, writing either Carl Linné or Carl von Linné, or in his subsequent Latin works, Carolus a Linné, (vide *Dissertatio de coloniis plantarum* (1768), *Planta Aphyleia* (1776), and some other writings) ; but he wrote also Carolus Linné (*Dissertatio de Erica* 1770), and Carolus von Linné (*Dissertatio de Cimicifuga* (1774), *Plantæ Surinamenses* (1775). Whether it was Linné himself or the then King (Gustav III.), who put the name into a French form, I must leave undecided." It may be added, that in Germany and Denmark, the name of the great Reformer in Natural History, is also usually written Linné.

Mr. Macleay read the following note :—The October number of the *Annals and Magazine of Natural History*, contains an article on a case of commensalism of a *Caranx* and a *Crambessa*, written by M. Godefroy Lunel, and translated by W. S. Dallas, F.L.S. In this Paper M. Lunel speaks of the commensalism of Fishes and Medusæ as something doubtful and unknown, but the following extract from the report of the Royal Commission on the Fisheries of New South Wales, written nearly four years ago, will show that the fact was well known to the Commissioners. Alluding to the Yellow-tail "*Trachurus trachurus*" it says :—"The very young fry have a most extraordinary and ingenious way of providing for their safety and nutrition at the same time ; they take up their quarters inside the umbrella of the large Medusæ, where they are safe from their enemies, and are, without any exertion on their part, supplied with the minute organisms which constitute their food, by the constant current kept up by the action of the curtain-like *cilia* of the animal."

Mr. Macleay exhibited a specimen of the very remarkable and rare Fish *Siphonognathus argyrophanes* of Richardson. Four

specimens were received lately by the Australian Museum from South Australia.

Also, a fine impression of a fossil plant in Hawkesbury sandstone, from a quarry near Hunter's Hill. Mr. Wilkinson considered it to be a species of *Thinnfeldia*—one of the characteristic fossils of the Hawkesbury series.

Dr. Cox exhibited a collection made by Mr. B. Hinde, of H.M.S. "Diamond," on the S.E. coast of New Guinea. Among the specimens were :—1. A spear-charm in the form of a beautifully carved toy-shield,  $4\frac{1}{2}$  inches by  $1\frac{1}{4}$ , made from one valve of some very woody seedpod. 2. A bunch of fish hooks made from Acacia spines. 3. A belt beaten out from the fibre of the Sago palm, stained yellow and black. 4. A spear with a loop of cane projecting about a foot in advance of its point, and a piece of bamboo, about 9 inches long, and decorated with feathers. The latter is carried in the mouth of the warrior who is pursuing his enemy with the looped spear. When he succeeds in passing the loop over his victim's head, he keeps him at bay by the point, and splitting with his teeth a splinter from the piece of bamboo, thus obtains a *knife* with a sharp serrated edge, with which he then cuts the throat of the captive.

The President exhibited a very large specimen of *Echinus*, obtained by Mr. H. T. Wilkinson, J.P., from Lord Howe Island. It is one of the two edible species found at the island.

Mr. Alexander Morton exhibited :—1. A dance-shield, inlaid with shell and decorated with stained grass. 2. Two elaborately carved food bowls, and a number of batons representing birds and fishes, similarly inlaid. 3. Native combs. 4. Two wooden idols, forming posts of houses ; one, a man carrying a child, the other, a woman. 5. A small covering worn by women after marriage. 6. A massive armband, cut from the *Tridacna* shell, weighing about a pound, and worn above the elbow. All from the islands of St. Christoval and Ugi, Solomon Group.

## ANNUAL GENERAL MEETING.

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30TH JANUARY, 1884.

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The President, C. S. Wilkinson, F.G.S., F.L.S., etc., in the Chair.

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### PRESIDENT'S ADDRESS.

Our Society has now completed its ninth year, and I am happy to congratulate the members upon its vigorous growth. The healthy vitality of the Society is not to be gauged by the number of its members, but by the nature of the scientific work that is being accomplished.

Australasia, of which New South Wales auspiciously occupies nearly the central position, offers one of the most interesting, fruitful, and unique regions of the globe, for a Society such as this which has been founded "for the Cultivation and Study of the Science of Natural History." Here then we are privileged to enter upon a vast and almost new field for investigation. A considerable amount of work has already been done in it, but just as in ascending a lofty hill we obtain a more and more extensive view of the country near us and beyond, so what has hitherto been achieved has not only laid down the base lines for further scientific exploration, but has also stimulated our interest, for it has revealed how practically unlimited is the field that awaits the research of the naturalist—research that will prove of great value not only to science, but also to this country in particular, in aiding in the development of its natural resources.

For instance it is only two months ago, that at our November Meeting, the Hon. William Macleay, whose papers on Ichthyology

published by this Society, form a standard work of reference, (and for whose valuable work *Catalogue of Australian Fishes*, we are happy to congratulate him upon having been awarded a Gold Medal at the recent International Fisheries Exhibition in London), in a paper on some results of Trawl Fishing outside Port Jackson at depths of from 22 to 55 fathoms, stated—"Looked at as a whole, I consider the results of the trawling experiment as decidedly promising. The existence of a true skate so near us and in such apparent quantity is of itself a valuable discovery; the abundance of the John Dorey is also important, for it has hitherto been considered rare, and for its quality as a food fish it is unrivalled in the world. Thus the first attempt at deep water trawling in New South Wales, whether looked upon as successful or unsuccessful proves one thing incontestably, and that is that we know very little indeed of the inhabitants of our seas excepting those which are mere surface animals." Then again, though the literature of the botany of Australia is perhaps more complete than that of any other branch of Natural History, we are aware that there is a large extent of this Continent which has not yet been botanically examined. The Rev. Dr. Woolls, D.D., F.L.S., in his paper on the Plants of New South Wales, says, "The publication of the *Flora Australiensis* through the joint labours of Mr. G. Bentham, C.M.G., F.R.S., and Baron F. von Müller, K.C.M.G., etc., has formed, as it were, an era in the botany of New South Wales. Though the subject is by no means exhausted that great work will be regarded as the basis of all future treatises on the Flora of Australia, and as the grand outline is being gradually filled up with descriptions of new plants from different parts of the Continent, it will be seen that the general arrangement of the volumes, as well as the classification of orders, genera, and species, reflects the greatest credit on the distinguished authors. Much, however, remains to be done. Since the appearance of the first volume in 1863, some five or six hundred new species of Australian plants have been discovered, and these, together with the enumeration of the Cryptogamous orders recently elaborated in the

*Fragmenta Phytographice Australice* by Baron von Müller, must in the course of time appear in supplementary volumes to the *Flora Australiensis*. From the sources, however, now before the public, some estimate can be formed of the species indigenous to the colony, and of the range to which they are limited. With regard to the latter, careful observation is still required in all parts of Australia, for plants, which, a few years since, were supposed to belong to adjacent colonies are now found to be common to New South Wales." With such acknowledgment in regard to the work that yet remains to be done, even in those lines of research in which so much has been accomplished, we are naturally led to take cognizance of the efforts of the Society in furtherance of its object. And in so doing we cannot but be gratified with the progress made at this early stage of the Society's existence. A perusal of the eight Volumes of our Proceedings will show that those subjects to which attention has been chiefly directed, are Conchology, Ornithology, Botany, Ichthyology, Geology and Entomology.

In Conchology upwards of 64 papers have been contributed. The first paper read before the Society was entitled, "Descriptions of fourteen new species of Shells." By John Brazier, C.M.Z.S., etc., who has contributed numerous similar descriptive papers. The following are the authors upon this and the other subjects named—Dr. James C. Cox, F.L.S., Rev. J. Tenison-Woods, F.L.S., Prof. Ralph Tate, James Hobson, Dr. R. B. Read, C. R. Rossiter, Professor F. W. Hutton, F.R.S.

#### ORNITHOLOGY.

Mr. E. P. Ramsay, F.L.S., George Masters, K. H. Bennett, Prof. F. W. Hutton, F.R.S., Charles W. De Vis, B.A., Comte de Castelnau.

#### BOTANY.

Rev. W. Woolls, Ph. D., F.L.S., F. M. Bailey, F.L.S., Rev. J. E. Tenison-Woods, F.L.S., Edwin Haviland, Rev. C. Kalchbrenner, Rev. B. Scortechini, L.L.B., Baron Ferd. von Müller, C.M.G., M.D., Ph. D., F.R.S., F.L.S., etc., Hon. James Norton, M.L.C., K. H. Bennett, William Mitten, A.L.S., P. A. O'Shanesy, F.L.S.

## ICHTHYOLOGY.

Hon. William Macleay, F.L.S., E. P. Ramsay, F.L.S., Comte de Castelnau, Charles W. De Vis, B.A., Baron Miklouho-Maclay, Dr. H. G. Alleyne.

## GEOLOGY.

Rev. J. E. Tenison-Woods, F.L.S., Charles W. De Vis, B.A., C. S. Wilkinson, F.G.S., Charles Jenkins, L.S., Prof. W. J. Stephens, M.A., Dr. J. C. Cox, F.L.S., E. B. Sanger.

## ENTOMOLOGY.

E. Meyrick, B.A., Hon. W. Macleay, F.L.S., H. H. B. Bradley, H. R. Whittell, Dr. R. B. Read.

## ETHNOLOGY, CŒLEENTERATA, REPTILIA, CRUSTACEA, &amp;c.

Dr. James Cox, F.L.S., C. S. Wilkinson, F.G.S., F.L.S., W. A. Haswell, M.A., B.Sc., Rev. J. E. Tenison-Woods, F.L.S., E. P. Ramsay, F.L.S., Hon. William Macleay, F.L.S., Baron N. de Miklouho-Maclay, J. J. Fletcher, M.A., B.Sc., Charles W. De Vis, B.A., Dr. H. B. Guppy, R.N., Dr. Thomas Dixson, Alex. Morton, Harry Gilliat.

The papers read number 433, contributed by 37 authors of whom 32 are still members of the Society, and though the quantity of work may not be taken as a measure of its value, yet it is specially worthy of mention not only as evidence of the earnest zeal manifested by some of the Members of the Society, but because the papers chiefly contain the results of original research. Work of this character therefore stamps the eight Volumes of the Proceedings already published as indispensable works of reference in regard to future investigation.

Several branches of Natural History have, no doubt, received less attention than others, yet on the whole I think that the Society, so far, has not failed in its object, and that the hope expressed eight years ago by the Founder of the Society, the Hon. William Macleay, in the first Anniversary Address has been realized, viz. :—That a Society entirely devoted to the Cultivation of Natural History might be successfully carried on in Sydney.

The time has not yet arrived for reckoning the harvest, we are as yet reapers in the field. But we are justified and it is our duty on the occasion of our Annual Meeting to night to note the progress made by the Society; and I am happy to state that its position is satisfactory. The list of members now numbers 153 against 132 at the close of 1882, 31 new members having been elected. But it is with feelings of sorrow that we record the loss of seven by death.—Mr. J. J. Galloway, Dr. R. L. Jenkins, Mr. Alfred Sandeman, Hon. E. K. Cox, all of whom were original members, the others were Mr. W. Macdonald, elected in 1876. The Most Rev. Roger Bede Vaughan, Archbishop of Sydney, elected 1877, and the Rev. John Forrest, D.D., elected 1877.

Our Council and Monthly Meetings until July were held, by the permission of the Trustees, in the Board Room of the Free Public Library. Since then the Society has occupied the commodious house in which we are now assembled. For this privilege we are indebted to the Hon. W. Macleay, and the Council at its meeting in August resolved unanimously, "That upon this first meeting in the rooms provided for the Society's use by Mr. Macleay's liberality, the Council place upon record their very sincere sense of the great obligations under which both in this and other respects they have been laid by the thoughtful kindness of that gentleman."

A Draft Bill for the incorporation of the Linnean Society of New South Wales was submitted by the Council and adopted at a Special General Meeting of the Society held on 28th September, 1883. The Bill was introduced in the Legislature by the Hon. W. Bede Dalley, Q.C., Attorney-General; it has passed the third reading, and will probably become law within the next few weeks. The Society will then have a recognised legal status.

In September last Professor Stephens brought forward a motion for the establishment of a Library fund, and by direction of the Council circulars were sent to all the members of the Society, inviting subscriptions towards it, to be devoted entirely to the purchase of useful works of reference on Natural History. In

answer to this circular numerous subscriptions were sent in, and the Council has already obtained many necessary and standard works.

Since the last Annual General Meeting in January, 1883, 377 additions have been made to the Library. In no previous year of the Society's existence has such a number of donations been received. Early in February the Smithsonian Institution generously presented a number of its "Contributions to Knowledge," and "Miscellaneous Collections;" and the Imperial Academy of Science of St. Petersburg sent 17 volumes of its publications. Later in the year, the Imperial Zoological and Botanical Society of Vienna forwarded a nearly complete set (35 volumes) of its well-known "Verhandlungen;" the Entomological Society of London, unsolicited, replaced the volumes of its Transactions, which were lost in the Garden Palace fire; Dr. James Cox presented a large collection of Natural History publications; and Professor W. J. Stephens 21 volumes of Dr. Petermann's "Geographische Mittheilungen." Many other valuable works were received from the Hon. William Macleay, Hon. P. G. King, and others; and every month during the year we have been indebted to a large number of Societies and individuals for works which will prove of the greatest service to the working members of the Society. Besides the above, Mr. Henry Deane, M.A., A.M.I.C.E., has lent a complete set of the Palæontographical Society's Proceedings, 30 volumes of the Proceedings of the Zoological Society of London, 18 volumes of the Journal of the Royal Microscopical Society, and several other works.

You will be glad to hear from the Honorary Treasurer, the Hon. James Norton, M.L.C., that the Council will commence the business of the new year with a balance in hand of £179 12s. 1d.

The following is a list of the Papers read at the Monthly Meetings during the year 1883:—

1. "On a new form of Mullet from New Guinea." By William Macleay, F.L.S., &c.

2. "On the Anatomy of the Urogenital Organs in Females of certain species of Kangaroo" (No. 2). By J. J. Fletcher, M.A., B.Sc.



3. "On the remains of an extinct Marsupial." By Charles W. De Vis, B.A.
4. "Contributions to the Zoology of New Guinea," Part VII. By E. P. Ramsay, F.L.S.
5. "On a new species of Tree Kangaroo from New Guinea." By the same author.
6. "On some habits of *Pelopæus latus* and a species of *Larrada*." By H. R. Whittell.
7. "On the voracity of a species of *Heterostoma*." By the same author.
8. "On the Coal Flora of Australia." By the Rev. J. E. Tenison-Woods, F.L.S., F.G.S.
9. "Further contributions to the Flora of Queensland." By the Rev. B. Scortechini, F.L.S.
10. "Descriptions of two new Fungi." By the Rev. Carl Kalchbrenner.
11. "Notes on the Fructification of the Bunya-Bunya in Sydney." By the Hon. James Norton, M.L.C.
12. "Descriptions of some new Fishes from Port Jackson." By E. P. Ramsay, F.L.S.
13. "Notes on the Tuena Gold-Reefs." By F. Ratte, Mining Engineer. (Read by the President.)
14. "Occasional Notes on Plants indigenous in the immediate neighbourhood of Sydney," No. 3. By Edwin Haviland.
15. "On tooth-marked bones of extinct Marsupials." By Chas. W. De Vis, B.A.
16. "On *Brachalletes Palmeri*, an extinct Marsupial." By the same author.
17. "On the habits of the 'Mallee Hen' (*Leipoa Ocellata*)." By K. H. Bennett.
18. "Notes on a collection of Fishes from the Burdekin and Mary Rivers, Queensland." By William Macleay, F.L.S., &c.
19. "Notes on a viviparous Lizard." By J. J. Fletcher, M.A., B.Sc.
20. "Notes on a method of obtaining water from Eucalyptus roots, as practised by the natives of the country between the Lachlan and Darling Rivers." By K. H. Bennett.

21. "Notes on a lower jaw of *Palorchestes Azael*." By Chas. W. De Vis, B.A.
22. "Synonymy of Australian and Polynesian Land and Marine Mollusca." By John Brazier, C.M.Z.S., &c.
23. "On some Mesozoic Fossils from Central Australia." By the Rev. J. E. Tenison-Woods, F.G.S., F.L.S.
24. "Contribution to a knowledge of the fishes of New Guinea." No. 4. By William Macleay, F.L.S.
25. "A second half-century of Plants new to South Queensland." By the Rev. B. Scortechini, F.L.S.
26. "Descriptions of new genera and species of Fishes." By Chas. W. de Vis, B.A.
27. "A fourth paper on Plants indigenous in the immediate neighbourhood of Sydney." By E. Haviland.
28. "Localities of some species of Polynesian recent Mollusca." By John Brazier, C.M.Z.S.
29. "On the Myology of the Frilled Lizard," (*Chlamydosaurus Kingii*). By Chas. W. De Vis, B.A.
30. "Descriptions of Australian Microlepidoptera," No. 9. By E. Meyrick, B.A.
31. "Some remarks on the action of Tannin on Infusoria." By Harry Gilliat.
32. "On a fossil Calvaria." By Chas. W. De Vis, B.A.
33. "Remarks upon the skull of an Australian aboriginal from the Lachlan District." By Baron N. de Miklouho-Maclay.
34. "On a very dolichocephalic skull of an Australian aboriginal." By the same author.
35. "On a fossil humerus." By Chas. W. De Vis, B.A.
36. "Notices of some undescribed species of Coleoptera from the Brisbane Museum." By William Macleay, F.L.S., &c.
37. "Occasional Notes on Plants indigenous to the immediate neighbourhood of Sydney," No. 5. By Edward Haviland.
38. "Notes on the temperature of the body of the *Echidna hystrix*." By Baron N. de Miklouho-Maclay.
39. "On the Plagiostomata of the Pacific," Part II. By Baron N. de Miklouho-Maclay and William Macleay, F.L.S., &c.

40. "Notes on some Reptiles from the Herbert River, Queensland." By William Macleay, F.L.S., &c.

41. "Notes on some customs of the aboriginal tribes of the Albert District, New South Wales." By C. S. Wilkinson, F.G.S., F.L.S., President.

42. "On the Brain of Grey's Whale (*Kogia Greyi*.)" By William A. Haswell, M.A., B.Sc.

43. "On a New Genus of Fishes from Port Jackson." By William Macleay, F.L.S., &c.

44. "Some Fishes of New Britain and the adjoining islands." By Chas. W. De Vis, B.A.

45. "Some results of Trawl fishing outside Port Jackson." By William Macleay, F.L.S., &c.

46. "On the localities of some Plants from the southern parts of New South Wales." By Baron Ferd. von Mueller, K.C.M.G., F.R.S., &c.

47. "Descriptions of Australian Microlepidoptera," No. 10. By E. Meyrick, B.A.

48. "Notes on the Geology of the Southern Portion of the Clarence River Basin." By Professor Stephens, M.A.

49. "Dimensions of some gigantic Land Tortoises." By J. C. Cox, M.D., F.L.S., &c.

The proceedings of the Society during the year have been published with their customary regularity. This gratifying result is due almost entirely to the untiring energy of the Honorary Secretaries, the Hon. W. Macleay and Professor Stephens, to whom we also owe the printed Monthly Abstract of Proceedings, by which, within two days after each meeting, the members receive a brief but accurate account of all that transpires.

Another part—Part 8—of *Australian Orchids*, by R. D. Fitzgerald, F.L.S., has just been issued from the Government Printing Office. In Part 7, which completes the first volume, there is a Synopsis of the 29 genera and 104 species described, giving in tabulated form, the authorities for the nomenclature, localities, and the characters of the orchids; to this is added a Synopsis of distribution. In this beautifully illustrated work the marvellous

arrangements for the fertilization of the flowers, by insects and other agents, are described ; and it is interesting to know that out of the 104 species above-mentioned, 93 are fertilized by insects, the remainder being self-fertilized.

I am glad to see that this subject has also been taken up by another of our members, Mr. E. Haviland, who has contributed several papers, giving the result of his observations upon certain plants indigenous to the immediate neighbourhood of Sydney. When the processes have been discovered by which the varied, beautiful and to us useful forms of plant life are developed, who shall say what benefits may not result in the production of improved varieties of fodder plants, cereals, fruits, and flowers, when these processes, which are now dependent upon the instincts of insects, &c., shall have been directed by the intelligence of man. What has already been accomplished in this direction warrants the belief that this is one of the most important subjects that can engage the attention of Naturalists.

An English translation by D'Arcy W. Thompson, B.A., of Professor Hermann Müller's great work on the *Fertilization of Flowers*, has been published during the past year. The value of this translation is perhaps enhanced from the fact that the systematic part of the book, which is arranged on Endlicher's system in the German edition, has been re-arranged according to Bentham and Hooker's *Genera Plantarum*. In reference to cross-fertilization Professor Müller says :—“The good effect of cross-fertilization may be recognized, not only in the structure of insect-fertilized flowers, but also in the water-fertilized and the wind-fertilized plants which preceded them. . . . Insects in cross-fertilizing flowers endow them with an offspring which in the struggle for existence vanquish those individuals of the same species which are the offspring of self-fertilization. The insects must therefore operate by selection in the same way as do unscientific cultivators among men, who preserve the most pleasing or most useful specimens, and reject or neglect the others. In both cases selection in course of time brings those variations to perfection which correspond to the tastes or to the needs of the selective agent. Different groups of insects, according to their

sense of taste or colour, the length of their tongues, their way of movement and their dexterity, have produced various odours, colours, and forms of flowers; and insects and flowers have progressed together towards perfection. . . . The forms, colours, and odours of the flowers in a particular region must depend in the closest manner upon the insect fauna of the region, and especially upon the relative abundance in it of the various classes of insects."

I am informed by Dr. J. C. Cox, President of the Fisheries Commission, that soon after the 15th August, 1882, the Commission wrote to the Trustees of the Australian Museum, asking them to co-operate in preparing a collection of fish fauna for the Fisheries Exhibition intended to be held in London. A large number of exhibits were collected and prepared, but with the exception of one case of exhibits, which were at Mr. Macleay's Museum, all were destroyed with the Garden Palace. The Commissioners then commenced *de novo*, and got together a collection of fishes of all kinds, tinned fish and oysters, smoked fish, and fish products as oils, &c.; a fresh set of paintings of fish were also prepared, together with fishing nets and models of boats.

The Australian Museum also prepared a very large and comprehensive collection of food fishes, &c., in spirits and stuffed; also exhibits of seals and dugong.

The Curator, Mr. E. P. Ramsay, was appointed by the Government to proceed to London to take charge of and arrange the New South Wales Courts; and we must congratulate him upon the result of his efforts; for the exhibits of fish fauna in the New South Wales Court obtained a larger percentage of first and second class awards than those of any other Court, viz.:—13 gold, 10 silver, and three bronze medals, and one diploma of merit.

During Mr. Ramsay's absence Mr. W. A. Haswell, M.A., B.Sc., has been the Acting Curator of the Australian Museum. Besides numerous additions to the collections the following publications have been issued from this institution:—*Catalogue of Library*; *Catalogue of the Hydroid Zoophytes*, by W. M. Bale;

*Catalogue of the collections of Fossils ; and Guide to the contents of the Museum*, which specially points out the arrangements of the different collections.

A question of great importance, and one which this Society must regard with interest, is the sudden spread of Rabbits which have now infected nearly one third of the colony, chiefly in the south-western districts. This immigration is an alarming one, for it is stated that a single pair of rabbits, if they and their progeny were let alone by their enemies, would in the course of three years multiply to more than 3,000,000. In view of the importance and urgency of this matter the Parliament last year passed a measure—“*The Rabbit Nuisance Act, 1883*”—to deal with it in an effective manner.

This Act has now been in force for about seven months, and is working well ; but through the shearing intervening, and the prevalence of drought in a good many of the infested districts, the work of extermination has not progressed so rapidly as it would otherwise have done ; although it is believed that the spread of the pest has to a large extent been checked.

You will be pleased to hear that since the destruction of the Mining and Geological Museum in the Garden Palace fire, a splendid collection of rocks, minerals, and fossils has been brought together, thanks to the energy of the officers of the Department of Mines and the practical sympathy of many private persons. The specimens have been labelled by Mr. J. E. Carne, the Curator, and will at once be available for public display as soon as the Museum accommodation has been provided. From this collection two fine series of specimens, illustrating the mineral resources of New South Wales, have been arranged and sent to the Amsterdam and Calcutta Exhibitions, and these cannot fail to show to the world the varied nature of our mineral wealth.

Recently the Department of Mines has issued a Geological Map of part of the Forest Gold Field, by Mr. H. Y. L. Brown. The main features shown are volcanic flows over granite, metamorphic, Devonian, and Silurian limestones ; but in some of

the old valleys and beneath the basalt, occur the Tertiary gold-bearing drifts, and this map, with its accompanying sections, is of special interest as showing the large extent of auriferous country covered by the basalt and which has not yet been prospected.

The inauguration of a system of Technical Education by the Hon. G. H. Reid, M.P., Minister for Public Instruction, is one of the most important events of the past year. A Technical College has for the last four years been successfully conducted by the Committee of the Sydney School of Arts, but this has now been transferred to the Board of Technical Education recently appointed by the Government. A glance at the curriculum issued by the Board will show that the industrial classes have now the means placed within their reach for learning "the science and principles underlying their handicrafts." Instruction has been provided for in several branches of natural history science—botany, geology, &c., and thus this Society cannot but feel a direct interest in a movement which has for its object the application of the principles of science to the industrial arts. Science lectures are to be delivered in the principal towns throughout the colony, which may be the means of calling out the latent abilities of many young persons who may render great service to their country.

The Technological, Industrial and Sanitary Museum of New South Wales, which has been arranged by the energetic Curator, Mr. J. H. Maiden, under the direction of Sir Alfred Roberts, Professor Liversidge, and Mr. Robert Hunt, was opened to the public for the first time in December last. The object of this Museum is to exhibit "typical collections of all materials of economic value belonging to the animal, vegetable and mineral kingdoms, from the raw material through the various stages of manufacture to the final product of finished article ready for use." In connection with the above-mentioned system of Technical Education, this institution must prove of great public utility.

A successful effort has been made during the past year to establish a Geographical Society of Australia, with its headquarters in Sydney, and branches of equal rank in the other colonies. This

young association, of which Professor W. J. Stephens, M.A., is the Vice-President, has already placed itself in communication with the principal Geographical Societies in the old world, and has received gratifying assurances of goodwill and offers of assistance. The question of the exploration of New Guinea, which was proposed as a special object for the operations of the Society, has been placed in abeyance for the present. There can, however, be no doubt that Geographical science will receive valuable acquisitions from the establishment of such a centre of research in this still but partially explored region.

The Zoological Society of Sydney has already achieved very considerable success. Their funds are rapidly augmenting, their grounds and accommodation much increased, and the nucleus of a very valuable and instructive collection of examples of all branches of the animal kingdom has been already formed. Their gardens have become a place of popular resort, and the vigour of the administration promises a great future.

The University of Sydney, which has from the first recognised the importance of Scientific teaching, so far as Chemistry and Physics are involved, and has also introduced the study of Physical Geography and Geology, in accordance with the terms of the late Captain Hovell's bequest, has also, two years ago, added two new schools of Medicine and Science. It has been decided that the first year of the undergraduates course shall be devoted to Arts, whatever be the ultimate destination of his studies, so that the special schools would not commence work before the beginning of the second academical year. And though as yet the numbers are inconsiderable, there is much ground for congratulation as to the steps already secured, and for hope of increased progress in the future. Chemistry and Physics are included in the Arts course of the first year, but Biological studies are deferred to the second. Mr. Macleay has, as usual, offered liberal assistance to the study of Biological Science. He offers each year two Exhibitions of £60 each, tenable for three years, to such aspirants to scientific distinction as shall pass the matriculation examination and satisfy the following conditions:—



1st. They must be *bona fide* residents in the country. 2nd. They must show that they require some extraneous aid in order to live in Sydney and attend the regular lectures. 3rd. They must undertake to complete, to the best of their power, the three year's course, and so proceed to their degree; and that Geology and Biological Science shall form an essential portion of their studies for the degree. These exhibitions are tenable by persons of either sex.

The following Papers were read before the Royal Society of New South Wales during the session of 1883 :—

May 2—President's Address. By Chr. Rolleston, C.M.G.

June 6—On the Aborigines inhabiting the great Lacustrine and Riverine Depression of the Lower Murray, Lower Murrumbidgee, Lower Lachlan, and Lower Darling. By Peter Beveridge.

July 4—On the Waianamatta Shales. By the Rev. J. E. Tenison-Woods, F.G.S., F.L.S., &c.

July 4—Further remarks on Australian Strophalosia, and description of a new species of Aucella from the Cretaceous Rocks of North-east Australia. By Robert Etheridge, junr., F.G.S.

August 1—On Plants used by the Natives of North Queensland, Flinders and Mitchell Rivers, for food, medicine, &c. By Edward Palmer, M.L.A. (Queensland).

September 5—Notes on the genus *Macrozamia*, with descriptions of some new species. By Charles Moore, F.L.S., V.P.

September 5—A list of Double Stars. By H. C. Russell, B.A., F.R.A.S.

September 5—Some facts connected with Irrigation. By H. C. Russell, B.A., F.R.A.S.

September 5—On the discolouration of white bricks made from certain clays in the neighbourhood of Sydney. By E. H. Rennie, B.A., D.Sc.

October 3—On the Roots of the Sugar-Cane. By Henry Ling Roth, F.M.S., F.S.S.

November 7—On Irrigation in Upper India. By H. G. McKinney, M.E., A.M.I.C.E.

November 7—On Tanks and Wells of New South Wales. Water Supply and Irrigation. By A. Pepys Wood.

December 5—Additions to the Census of the Genera of Plants hitherto known as indigenous to Australia. By Baron Ferd. von Müller, K.C.M.G., M.D., Ph.D., F.R.S., &c.

The Royal Society offers its Medal and a money prize of £25 for the best communication (provided it be of sufficient merit) containing the results of original research or observation, upon each of the following subjects :—

*Series III.—To be sent in not later than September 30th, 1884:*

No. 9.—Origin and mode of occurrence of gold-bearing veins and of the associated minerals.

10.—Influence of the Australian climate in producing modifications of diseases.

11.—On the Infusoria peculiar to Australia.

12.—On Water Supply in the *interior* of New South Wales.

The Honorary Secretaries state that the Society is fully sensible that the money value of the prize will not repay an investigator for the expenditure of his time and labour, but it is hoped that the honour will be regarded as a sufficient inducement and reward.

With reference to the progress of science in Victoria, Mr. R. L. J. Ellery, F.R.S., Government Astronomer, in his Presidential Address, delivered in September, on the occasion of the commemoration of the 25th session of the Royal Society of Victoria, states “that the several national scientific and technical departments have been in active operation during the year, and with them, as with ourselves, satisfactory progress is manifested. There is an undoubted and general increase in the desire for knowledge in the various pure and applied sciences, and especially as applied to technical training and to the daily requirements of life. Some new Societies for the prosecution of study and research, more especially in natural science, have come into existence in the provinces, and the older societies and schools are increasing in their good influence and usefulness. The School of Technology and Museums, presided over by our talented

member, Mr. Cosmo Newbery, continue doing good work in our midst. The collections of the Industrial and Technological Museum have been largely increased during the past year by the additions of specimens in each section and several new divisions have been formed. It may be mentioned that the knowledge derived from the museum collection of Indian timber has led to the opening of a new trade between this colony and India. Our National Museum already shows signs of being cramped for room, and the Director, Professor McCoy, during the past year, has directed his attention to additions of such classes as occupy small space, and has therefore devoted his work chiefly to the zoological and geographical classification of insects, and in filling up gaps in the collection of shells." Mr. Ellery then refers at some length to "one or two interesting astronomical events. First, the apparition in September of the Great Comet of 1882, then the transit of Venus in December, and subsequently the determination by telegraph of the differences of longitude between Singapore and Port Darwin, and then between Port Darwin, Adelaide, Melbourne and Sydney."

Mr. R. A. F. Murray, Government Geologist of Victoria, has been surveying the country about Rodborough, which is interesting, as containing the northern continuation of the combined Creswick, Kingston, Smeaton and Clunes auriferous lead-systems.

The deep borings for Coal at Port Arlington, Colac, or Coleraine have not been successful in striking a payable seam of coal; but in the eastern mesozoic area a seam up to 2 feet 8 inches thick of first-class coal has been opened, and Mr. Murray considers that it extends for many square miles.

Dr. P. H. Macgillivray, of Sandhurst, has been adding largely to our knowledge of living *Polyzoa*, and has described and illustrated a large number of new species in papers read before the Royal Society.

One of the most indefatigable scientific workers in Australia, is Mr. A. W. Howitt, F.G.S., Police Magistrate of Sale, Victoria. Mr. Howitt has been steadily working out the Geology and Mineralogy of his large district, and has published several papers

in that department, including microscopical examinations of the igneous rocks. He has also been investigating the habits and beliefs of various tribes of Australian aborigines, and several interesting contributions of his have been published in London by the Anthropological Institute.

The second decade of Observations upon New Vegetable Fossils of the auriferous drifts, has been lately issued by the Victorian Government. This is a valuable addition to the former work of Baron Ferd. von Müller, C.M.G., M.D., Ph. D., F.R.S., F.L.S., etc., Government Botanist, who has done so much towards the elucidation of the Tertiary flora. I am informed that the ninth and tenth decades of the *Eucalyptographia* have been completed by this distinguished botanist, who has also written a supplement to his *Systematic Census of Australian Plants*. It is gratifying to know that *the Select Plants for Industrial Culture and Naturalization*, of which work the Government of New South Wales brought out an enlarged edition in 1881, is passing now for the sixth time in the English language through the Press by the generous interest of Mr. G. Davis, the celebrated scientific publisher of Detroit, Michigan. As a manual for the acclimatization of plants, the work has been translated and slightly altered by Prof. Charl Nandin of Antibes, a member of the Institute of France; Spanish and Portuguese translations are also in progress, for which the Baron has furnished some addenda. The Members of the Society will be glad to learn that the publication on *Papuan Plants* will be continued during the present year as new material has been forwarded to the Baron. The twelfth Volume of the "*Fragmenta*," is now in progress.

In a letter which I have lately received Baron von Müller makes the following remarks regarding this Society, which with your permission I will read: "The Members of the Linnean Society of New South Wales, will be sad to learn that the venerable George Bentham, who spent a large portion of his valuable time for seventeen years on the elaboration of the *Flora Australiensis*, is by the infirmities concomitant to his high age, prevented from continuing his great labours, which early last year with the

completion of his and Sir Joseph Hooker's *Genera Plantarum* drew to a close. In a letter written in November last to me, he sketched with a few words his brilliant career, which passage I beg to copy with a hope that you will insert it in your Annual Presidential Address, especially as Bentham was for a series of years President of the parent Linnean Society, and I would simultaneously suggest that the Linnean Society of New South Wales may elect this illustrious man, who has done so much for the advancement of the Phytography of your colony, an Honorary Member.

Nov, 1883.

“ ‘ My principal object in now writing to you is to say, that this is—I fear—the *last* letter you can receive from me. For the last six months I have been quite disabled from continuing my botanical pursuits and correspondence, and I now see that I can never hope to resume them.

“ ‘ I first began collecting and forming my herbarium in 1818 ; my first botanical work of any importance was my ‘ Catalogue des plantes des Pyrenees et du Bas Languedoc,’ published in 1826 ; but I had already written on other subjects, and from 1823 to 1828 I published more on classification, on logic, law, etc., than on Botany. From 1828 to 1833 I endeavoured to keep up Botany as well as Law, which I had adopted as a profession. In 1833 I finally gave up Law, and devoted myself thenceforward exclusively to Botany. In 1854 I gave over my Botanical Library and Herbarium to Kew, and for the next 28 years went daily down there (from London) to work, devoting to it six or eight hours a day, five or six days in the week, steadily and continuously, with the sole interruption of an occasional Summer vacation of a few weeks. After however the tedious winter of 1882—1883 I broke down in my 83rd year, and have done nothing since May last. I had however finished my share of the ‘ Genera Plantarum,’ of which you will have received the latest part from Sir Joseph Hooker;—and I have now only, in taking leave of you, to thank you for all the pleasure I have had in my correspondence with you.

Ever yours sincerely

(Signed) GEORGE BENTHAM.’

“ The Linnean Society of New South Wales will doubtless wish with me, that the sad presentiments of this great man will not be fulfilled, and that from his unrivalled experience and ardour in the promotion of Phytography we shall benefit until he reaches a Chevreulian age.”

We have to congratulate the Royal Society of Queensland upon its inauguration. This Society has been incorporated with the Philosophical Society, which dates its existence from the time when Queensland became a separate province, and which, as the President, the Hon. A. C. Gregory, in his inaugural address delivered on the 8th of the present month, justly remarks, can point to the Queensland Museum as chiefly the result of its labours. I need hardly remind you that it is to the Curator of this successful and popular institution, Mr. Charles W. De Vis, B.A., that we are indebted for several valuable papers read before our Society.

During the year an instructive and valuable work of reference, entitled *A synopsis of the Queensland Flora*, has been published in Brisbane: the author is Mr. Frederick Manson Bailey, F.L.S., Colonial Botanist. A statement of the Fossil Flora of Queensland, by the Rev. J. G. Tenison-Woods, is appended. The arrangement of the work is based upon that of Bentham and Hooker's *Genera Plantarum* and Baron von Müller's *Fragmenta Phytographiæ Australis*.

Mr. R. L. Jack, the Government Geologist of Queensland, has just completed a survey of the Hodgkinson Gold-Fields. Below the water line the reefs here contain a complex mixture of copper and iron pyrites, zinc-blende, galena, &c., which renders the gold difficult of extraction. Consequently some of the companies (like the New Reform Mine at Lucknow, and the Mitchell's Creek Mine near Bathurst), send their stone to England for treatment. In one of the mines he has discovered the *Lepidodendron nothum*, which species occurs in the Star, Mount Wyatt, and other beds along with Upper Devonian or Lower Carboniferous fossils, but does not range so high as the marine beds at the base of the Coal Measures. Also at the Hodgkinson are coarse conglomerates, with pebbles of limestone, containing fossil corals, probably of Upper Silurian species. These facts are very interesting as being the counterpart of what obtains in New South Wales.

The Government Geologist of South Australia, Mr. Y. L. Brown, who was formerly a Member of the Geological Survey of New South Wales, has during the year made an exploration of the eastern portion of the interior of that colony, and his published report with Map and Sections, furnishes some interesting and important information. The objects of this journey were to ascertain the extension from New South Wales into South Australia of the gold-bearing rocks of Mount Brown, and the Cretaceous formation in which Artesian and other water has been found. The extension of the Cretaceous and Tertiary area into this colony from New South Wales and Queensland, was proved along a distance of 225 miles of boundary of the former, and 300 miles of that of the latter colony.

The southerly extension of this great Cretaceous area is limited by the primary rocks which continue in a westerly direction from the Barrier Range in New South Wales. Artesian Wells have been obtained in the Cretaceous formation, and the numerous conical mounds which have been formed by mud springs still flowing as well as by others now extinct, are evidences of natural Artesian Springs. In places these mounds are so numerous as to give the country the appearance of a deserted diggings. The Flinders and other ranges lying to the south of the plain and sandhill country, act as a dam to prevent the subterranean water from reaching the sea ; this gives rise to the natural Artesian Springs, such as Mulligan, Blanchewater, etc. The natural Artesian Wells show that in those localities water will rise to the surface when the water-bearing strata has been pierced.

One of the most marked features of the Cretaceous country are the peculiar sandhills. As to the origin of the sandhills, Mr. Brown says—"I have reason to believe that in many cases, particularly in those of the isolated ridges and mounds traversing the stony desert at long distances apart, the sand has been derived from an underground source through the pressure of subterranean water. There was in all probability an outlet at one time connecting the old Cretaceous sea which occupied the centre of Australia with the ocean. If we suppose a sudden or gradual closing

up of this outlet to have taken place, through the subsidence of the land, or any other cause, the water not having any vent to escape by, would accumulate in the porous strata until under sufficient pressure to force its way to the surface along cracks or through holes caused by such pressure, and bring with it the sand, in a similar manner to the present mud and sand springs. The eruption of sand in large quantities would cause a subsidence of the surrounding area, whereof there is evidence in the valleys of the Cooper and Diamantina, and thus have created the great lakes into which these rivers now flow. About 35 miles south-east of Clifton Hill Station, on the Diamantina, there are two parallel red sand ridges traversing a stony plain in a north-north-westerly direction; the plain is covered with a pavement-like coating of flinty quartzite stones. On the east side blocks and boulders of the same rock are scattered about, amongst which are numerous low circular mounds of white clayey sand, the centres of which are formed of blocks of stones piled up, which are encircled by other smaller blocks, and these by scattered stones, the whole bearing the appearance of having been erupted by springs from below. At numerous other places similar appearances present themselves; mounds of sand, gravel, and clay, and scattered stones occurring on the surface of many of the plains and flat areas, the presence of which it is difficult to account for in any other way, as there are no rocks at a higher level in the neighbourhood from which the sand or gravel could have been washed."

As tending to support Mr. Brown's theory I may mention, that great quantities of sand were forced up with the water in the tubes of the artesian bore at Wee Wattah on the Killara Run in the Darling District.

The deep bore which is now being put down in the Cretaceous area to the north of the "Government Gums," by Mr. J. W. Jones, Head of the Water Conservation Department, S.A., has reached to a depth of 1,100 feet in Cretaceous or Jurassic strata without striking water. This is remarkable and shows how great is the depth of this basin. In another locality good water has been found in the Miocene Tertiary formation.



In the early part of the year the Hon. J. L. Parsons, Minister for the Northern Territory, accompanied by Professor Ralph Tate, F.G.S., and others, paid an official visit to the Territory. Mr. Parsons considers that Port Darwin will be the key to the whole of Northern Australia. It contains agricultural lands which, though of limited extent, are suited for the growth of sugarcane, maize, rice, and other tropical plants. And in the interior are extensive pasture-lands.

Professor Tate, in his official report, points out that the rice plant is indigenous to the Northern Territory, as are also the Tamarind and one other useful plant, the *Tacca pinnatifida*, from the tubers of which the main supply of Fiji arrowroot is prepared. He further mentions "that tropical South Australia has been truly said to be a land of grasses; the number of known species is about 130, and of these he collected over 50, between the Adelaide River and Pine Creek. But only some four or five are constituents of the grass plains and adjacent hill slopes. Some flats are almost exclusively occupied with *Anthistiria*, or with *Andropogon triticeus*, or with another congeneric species, whilst not infrequently the three are found in company. The two latter grasses acquire on the flats a height of from 6 to 8 feet, and exceptionally attain to 14 feet; but on dry hill slopes the same species dwindle down to 2 feet or less. The exuberant growth of grasses in the plains of the basin of the Northern Rivers should be capable of keeping alive large herds of cattle.

"The character of the landscape, as far as it depends upon trees, shrubs, and grasses, presents along the whole route very little variation; and it is only by the margins of some of the sluggish water-courses that the vegetation assumes a tropical aspect.

"In the jungles, always of limited area, such as at Famine Bay, near Palmerston, at Rum Jungle, at the Stapleton, and those on the margins of some of the tributaries of the McKinlay River, there abound bamboos, reaching to 40 feet and 60 feet high, screw-pines, umbrageous fig trees, tall eucalyptus, and the paper-bark melaleuca or tea-tree, amongst which climb certain convolvulaceæ, true vines, sarsaparilla vine, &c. The rest of the

country is grassy and lightly timbered. The flats, the soil of which is a stiff clay, have much grass and little timber; the slopes of the hills are covered with a pisolitic iron, quartz sand, gravel; and as we recede from the swampy ground the grass becomes shorter and scantier, and the trees closer and smaller

“The timber is of a scrubby kind, the chief constituents being two or three eucalypti (*E. clavigera*, &c.), Ironwood (*Erythrophloeum Labouchei*), and *Grevillea-chrysodendron*. There is a general absence of shrubs; and the grasses, which make up the rest of the landscape, if we except the grotesque anthills, which almost equal in height the trees amongst which they occur, are comprised of about 3 species.”

Regarding the metalliferous country, Professor Tate describes it as consisting of metamorphic rocks, in the midst of which occur granite, diorite, and porphyritic felstones. This tract comprises an area of 7,800 square miles, the boundaries of which are defined by the desert sandstone, which forms bold escarpments about 600 feet high, and which is the northern edge of the great plateau of Central Australia. Rich gold-bearing quartz reefs occur in the metamorphic rocks, and the alluvium in the neighbouring gullies has been found to be rich in gold. Ores of tin, copper, lead, and iron have been proved in several localities. Professor Tate is, however, of opinion, that these mineral riches will not be profitably worked by European labour, but that their development must be left to the cheaper and more acclimatised labour of the Asiatic tribes under the management of Europeans.

In New Zealand considerable activity has, as usual, been manifested in matters of Science, chiefly by Dr. Hector, C.M.G., F.R.S.; Professor Julius von Haast, F.R.S.; Professor Hutton, F.G.S.; Professor G. Ulrich, F.G.S.; Professor Parker and others. Their labours are chiefly made known in the *Transactions of the New Zealand Institute*, *The New Zealand Science Journal*, and in the publications of the Colonial Museum and Geological Survey Department; one of the latter, which may be mentioned as of general interest, is a third edition of the *Handbook of New*

*Zealand*, by Dr. Hector, Director of the Geological Survey. In this instructive little work have been collated from the records of the various Government departments and other sources of authority, the most important facts relating to the national history and progress of New Zealand, as well as to its natural history and rich resources.

The disastrous earthquake of Ischia in July last, by which over 4,000 human lives were destroyed, was followed by the still more terrible calamity in the Straits of Sunda in August. The sudden volcanic eruption in the Island of Krakatoa situated in these Straits, produced the enormous tidal waves which overwhelmed a large area of the Western Coast of Java, totally destroying the town of Anjer and many villages, and causing the loss of over 70,000 human beings. This eruption may truly be recorded, not only as a most important event of the year, but also as one of the most remarkable volcanic eruptions on record.

The following is a vivid description of it by Captain W. J. Watson, of the British ship "Charles Bal," who safely navigated his vessel through the Straits during the volcanic outbursts.

"On the 26th August, 1883 at noon wind W.S.W., weather fine, the Island of Krakatoa to the N.E. of us, but only a small portion of the N. E. point, close to the water, showing. Rest of the island covered with a dense black cloud; at 2.30 p.m. noticed some agitation about the point of Krakatoa; clouds or something being propelled from the N.E. point with great velocity; at 3.30 we heard above us and about the island a strange sound, as of a mighty crackling fire, or the discharge of heavy artillery at second intervals of time; at 4.15 p.m., Krakatoa N.  $\frac{1}{2}$  E. 10 miles distant observed a repetition of that noted at 2.30, only much more furious and alarming, the matter, whatever it was, being propelled with amazing velocity to the N.E. To us it looked like blinding rain, and had the appearance of a furious squall of ashen hue. At once shortened sail to topsails and foresail; at 5 the roaring noise continued and increasing, wind moderate from the S.S.W., darkness spread over the sky, and a hail of pumice stone fell on us,

many pieces of considerable size and quite warm ; had to cover up the skylights to save the glass, while feet and head had to be protected with boots and South-westers. About 6 the fall of larger stones ceased but there continued a steady fall of a smaller kind, most blinding to the eyes, and covering the decks to three or four inches very speedily, while an intense blackness covered the sky and land, and sea ; sailed on our course until we got what we thought was a sight of Fourth Point light, then brought ship to the wind, S.W., as we could not see any distance and we knew not what might be in the Straits the night being a fearful one ; the blinding fall of sand and stones, the intense blackness above and around us, broken only by the incessant glare of varied kinds of lightning, and the continued explosive roars of Krakatoa, made our situation a truly awful one.

“ At 11 p.m. having stood off from the Java shore, wind strong from the S.W., the island, W.N.W. eleven miles distant, became more visible, chains of fire appearing to ascend and descend between the sky and it ; while on the S.W. end there seemed to be a continued roll of balls of white fire ; the wind though strong was hot and choking, sulphureous with a smell as of burning cinders ; some of the pieces falling on us being like iron cinders, and the lead from a bottom of thirty fathoms came up quite warm.

“ From midnight to 4 a.m., 27th, wind strong but very unsteady between S.S.W. and W.S.W. the same impenetrable darkness continuing, the roaring of Krakatoa less continuous, but more explosive in sound, the sky one second intense blackness the next a blaze of fire, mast heads and yard arms studded with corposants, and a peculiar pinky flame coming from clouds which seemed to touch the mast heads and yard arms ; at 6 a.m. being able to make out the Java shore set sail, passing Fourth Point light house at 8, hoisted our signal letters but got no answer. 8.30 passed Anjer, name still hoisted, close enough in to make out the houses but could see no movement of any kind ; in fact through the whole Straits we have not seen a single moving thing of any kind on sea or land ; at 10.15 a.m. passed the Button Island to  $\frac{1}{2}$  to  $\frac{3}{4}$  mile off, sea like glass round it, weather much finer looking and

no ash or cinders falling ; wind to S.E, light. At 11.15 there was a fearful explosion in the direction of Krakatoa, now over thirty miles distant ; we saw a wave rush right on to the Button Island, apparently sweeping right over the South part and rising half way up the North and East sides. This we saw repeated twice, but the helmsman says he saw it once before we looked ; the same wave seemed also to run on to the Java shore ; at the same time the sky rapidly covered in, the wind came strong from the S.W. by S. ; by 11.30 we were enclosed in a darkness that might almost be felt, and at the same time commenced a downpour of mud, sand and I know not what, ship going N.E. by N. seven knots per hour under three lower topsails ; put out the side light, placed two men on the look-out forward, while mate and second mate looked out on either quarter, and one man employed in washing the mud off binnacle glass ; we had seen two vessels to the North and N.W. of us before the sky closed in, adding much to the anxiety of our position.

“ At noon the darkness was so intense that we had to grope our way about the decks, and although speaking to each other on the poop, yet could not see each other ; this horrible state and downpour of mud, &c., &c., continued until 1.30, the roarings of the volcano, and lightnings being something fearful. By 2 p.m. we could see some of the yards aloft and the fall of mud ceased ; by 5 p.m. the horizon shewed out in the North and N.E., and we saw West Island bearing E. and N. just visible ; up to midnight the sky hung dark and heavy, a little sand falling at times, the roarings of the volcano very distinct, although in sight of the North Watcher and fully sixty five or seventy miles off it.

“ Such a darkness and time of it in general few would conceive, and many, I dare say, would disbelieve ; the ship from truck to water line, is as if cemented, spars, sails, blocks, ropes in a terrible mess, but thank God, nobody hurt or ship damaged ; on the other hand how fares it with Anjer, Merak, and other villages on the Java coast !”

As to what happened on the land, I will not venture to add to the graphic description by the Rev. J. E. Tenison-Woods, F.G.S.,

who a few days after the occurrence was fortunate enough to visit and make a personal examination of the scene of disaster, which has been already published in the *Sydney Morning Herald*.

This and other similar convulsions probably originate from the generation of molten matter, gases and steam within the great lines of fracture produced by the contraction of the earth's mass consequent upon its cooling. The volcanic cones mark the position of weak points of resistance upon these shrinkage lines, and give way when the expansive forces of the heated matters becomes excessive. It is not improbable that the outbursts may be accelerated by atmospheric changes ; for instance when the barometer is low, indicating less atmospheric pressure over the volcanic region ; or when as Mr. H. C. Russell, our Government Astronomer, pointed out in a letter to the *Sydney Morning Herald* of 3rd September last, a sudden increase of temperature may affect the earth as it did this year about the period of the meteor shower in August ; for a sudden change in surface temperature must affect the strain under which the earth's surface exists.

The numerous earthquakes and remarkable tidal phenomena observed throughout Australasia at the time and subsequent to the great eruption at Sunda, were no doubt movements sympathetic with that eruption ; for fractures due to shrinkage or expansion in one part of the earth's mass must affect other parts, but the effects would not be simultaneous, as some of the different rock formations owing to their structures would resist the strain longer than others and thus earthquake movements might be felt at various intervals in different localities.

Evidences of fracture in the rocks are frequent in almost all the geological formations : I have counted over 30 dislocations in the Wianamatta beds which are exposed in the railway cuttings between Sydney and Parramatta.

Victoria, especially in the south-western portion, was in the later Tertiary times, the scene of great volcanic activity. No less than 79 extinct points of eruption occur there. Some of these which I have examined are cone-shaped hills, with crater basins, and are built up of basaltic lava, scoria, and ashes. The

Anakies, near Geelong, are three such crater hills, and huge boulders of granite are mingled with the volcanic ashes; one of these boulders is from 10 to 15 feet in diameter. Near the crater of another volcano I have seen fragments of Miocene limestone, containing fossil shells, enclosed in the lava, showing that the latter has come up through the Miocene beds; and under the basalt plains in the same locality occur horizontally stratified beds of volcanic ash, such as we may imagine have lately been deposited in the Straits of Sunda.

In New South Wales volcanic rocks occur, more or less, on almost every part of the Great Dividing Range, both along its summit and upon its eastern and western slopes; but with the exception of Mount Table Top, near Kiandra, the Canoblas, near Orange, and perhaps one or two conical hills in New England, no true crater-hills have been observed. The basaltic lava, in nearly all instances, has welled up through numerous fissure-vents and overflowed from them.

I have before remarked that the researches of this Society are not only of direct scientific value, but will also aid in the development of the economic resources of the colony, or rather, as I should say, of Australasia; for though our home is in New South Wales, and therefore New South Wales will be more immediately benefited, yet the influence of the Society must reach beyond the territorial lines which politically divide the great and naturally united field every part of which must claim our attention. The site of our homestead, being a very central one, has been well selected. Several widely separated portions of Australasia possess rich local resources capable of supporting populous communities, but in no portion do there occur in such abundance and variety the natural elements for the building up of a prosperous nation, as in this central portion of Eastern Australia.

Here within a comparatively small area are included the principal physical features of the Continent; and when we mention that the land features are very varied, a corresponding variety in the climate, the geology, and the fauna and flora may be inferred. And when we also enter the ocean upon our list, and

consider the remarkable contour of its bed, and the great depths which the soundings have shown to exist at no great distance from our shores, we may also infer what marvellous variety there must be in our marine fauna and flora.

In contemplating this rich field, the interest of the naturalist increases almost to excitement when he remembers that both upon the land and in the ocean exist very ancient forms of life linking the present with the distant past; for he here feels himself to be in a region where geological changes have not been so complete as in many other portions of the globe, and that therefore the law which has regulated the gradual out-growth of the present from the past may be studied here perhaps with greater advantage than elsewhere.

My predecessors in the Presidential office to which you have done me the honor of election, have addressed you upon several of the subjects just alluded to; and as they have referred to the practical issue attending the work of this Society in connection with certain industries, I beg that I may be permitted to add a few observations bearing more particularly upon a subject of great scientific and national interest, I mean Economic Geology.

As I shall have to make reference to the different geological formations, I will here mention them in their relative order of superposition.

Recent  
 Pleistocene  
 Pliocene  
 Miocene  
 Eocene  
 Cretaceous  
 Clarence series (Jurassic?)  
 Wianamatta series } (Triassic?)  
 Hawkesbury series }  
 Upper Coal Measures (Permian)?  
 Lower Coal Measures (Carboniferous)  
 Devonian  
 Silurian

Basalt, Diorite, Serpentine, Porphyry and Granite.



The five last named rocks, though placed as the lowest in position, and often found as such, are all younger than the lowest of the above-mentioned sedimentary rocks. At all events we have as yet no evidence to the contrary; for wherever the boundaries of the Silurian and granites are well indicated, the latter are observed to be metamorphosed beds of the former; and where the metamorphism has been so great as to have produced semi-fluid conditions, the granites are seen as intrusive masses penetrating the Silurian rocks. I have seen in New England instances of metamorphic granites and porphyries in which the lines of stratification of the original sedimentary formation have not been obliterated; and also, in the same locality, splendid sections shewing intrusive dykes and masses of these rocks. The diorites in like manner have penetrated the Carboniferous rocks; and some of the basalts have in places burst through and overflowed all the formations older than the Pleistocene.

The connection of the older igneous rocks with the sedimentary formations which have been affected by them has had an important influence upon the occurrence of some of our economic minerals. Thus some of the richest deposits occur only where the Silurian and Devonian formations have been disturbed by intrusions of diorite; and the bismuth lodes, also many of the tin lodes, traverse the granite near its junction with the slates; I shall again make reference to these further on.

#### COAL.

New South Wales is rich in coal, shale, gold, tin, copper, iron and antimony, but of these coal, the value of the annual productions of which now exceeds that of any of the others, may justly be considered of the greatest national importance, and in its development lies the establishment and success of various commercial industries. Fortunately our coal deposits are very extensive and are available in widely separated localities both upon the seaboard and inland. Sydney is situated almost in the centre of a great coal basin, the eastern half of which long ago sunk down and disappeared beneath the ocean, the present coast marking the line of fault. But we can well excuse this fault, for

it has allowed the great water-way of the world access to the rich mineral portion of this territory ; and the coal in the remaining half of the broken basin will more than suffice for the needs of many generations.

The Northern, Western, and Southern Coal Fields have been so named from their position in reference to Sydney. The Northern Coal Field includes the seams which are worked in the Newcastle, Maitland, and Greta districts. In the two latter districts the coal seams are in *Glossopteris* beds, the Lower Coal Measures, which rest upon and are overlaid by strata containing marine fauna of Carboniferous age. In the Newcastle district the seams of coal occur in a higher series of plant-bearing strata, about 500 ft. thick and quite devoid of marine fossils. This series is called the Upper Coal Measures, and has been provisionally referred to the Permian period. It includes upwards of six seams of coal, several of which have been worked ; but the lowest of them is the principal seam which is from 8 to 15 ft. thick, and it is from this that fully one-half of the coal raised in the colony is obtained. The coal is of a bright bituminous character, quick-lighting and suitable for steam, gas, smelting, and household purposes. The same Coal Measures extend for a considerable distance in a southerly direction, and some of the seams not only crop out at the surface on the shores of Lake Macquarie, but also inland they have been proved at various depths by Diamond rock-drill borings.

The Western Coal Field may be said to include the country stretching from the eastern to the western margin of the Blue Mountains. The formations of this elevated tract consist of the Coal Measures overlaid originally by horizontal beds, about 1000ft. thick, of Hawkesbury sandstone. Denudation has here and there cut right through this great sandstone formation, and in places into and through the underlying Coal Measures. In the sides of some of the deep valleys thus formed coal seams crop out at different levels. The principal Colliery Companies have been working the lowest seam at Lithgow where it is 10ft. thick, and near Wallerawang where it is of less thickness ; but recently one of the upper seams containing coal of excellent quality has been

opened at the Katoomba Colliery, and another Colliery near Mount Victoria is soon to commence work. Mining enterprise is also being directed to the coal seams in the vicinity of the new Railway line near Capertee. The Western coal is of a splinty character and contains less volatile hydro-carbons and a higher percentage of ash than that of Newcastle; nevertheless it is a good coal for housework, steam and gas purposes, and will be especially valuable for iron and copper smelting and other industries which are destined to be largely developed in this district.

Petroleum oil cannel coal or "Kerosene Shale" has been found in seams of irregular extent and thickness in various parts of the Western Coal Field, at Hartley Vale, Katoomba, Bathgate, Capertee etc., as well as at Greta and Colley Creek in the Northern, and at Wollongong and Berrima in the Southern Coal Field. At Hartley Vale where it has been extensively mined for some years, the seam is from 3 to 5 feet thick, and occurs in the Coal Measures at about 60ft. above their base, or 40 ft. above the main coal seam. This so-called Kerosene shale yields up to 180 gallons of crude oil, or 18,000 cubic feet of gas per ton with an illuminating power equal to 40 candles. For mixing with coal in order to increase the illuminating power of ordinary coal gas, this cannel coal is fast becoming largely employed here and in other countries. A seam 18 inches to 2 ft. thick and similar in quality to that of Hartley Vale, is worked at Joadja Creek, near Berrima; and at America Creek, near Wollongong, another seam for some time afforded material for the manufacture of kerosene oil, when the cannel coal suddenly changed into bituminous coal.

In the Southern Coal Field several seams of coal are known; one of them, near Jamberoo, is over 25ft. thick; but hitherto they have only been worked where they crop out on the side of the coast range facing the ocean from Coal Cliff to Mount Kembla. The uppermost seam is the principal one, and is from 4 to 8 ft. thick. The coal is bituminous, free burning, and is largely used for steam and other purposes. At Berrima and Bundanoon, on the Great Southern Railway, coal is now being raised from a seam which occurs at the top of the Coal

Measures; the Hawkesbury formation here rests directly upon it. Near Mittagong and Jamberoo the bituminous coal seams have in places been changed into anthracite, owing to the intrusion of igneous rocks which took place after the deposition of the Wianamatta series, for at Mittagong masses of trachyte have upheaved and penetrated not only the Coal Measures, but also the Hawkesbury and Wianamatta series. Some good sections showing intrusive dykes of trachyte may be seen in the railway cuttings near Mittagong.

From the Hunter River District the Coal Measures have been traced westerly to Dubbo; thence they extend in a north-easterly direction, as a belt about 45 miles wide, as far as the Queensland border. A large area of coal bearing strata occurs in the Clarence and Richmond District, but the formation is newer than that of the above-mentioned Coal fields, and as yet no workable coal seams have been found in it. Some time ago Mr. Geological Surveyor, E. F. Pittman, made a report upon some of the coal seams and gold bearing portions of this district; and at our last monthly meeting, Professor Stephens read an instructive paper, giving a further description of the geology and physical features of the Clarence coal basin, and the eastern slopes of the great Dividing Range.

Very full information regarding the composition of the New South Wales Coals, with analyses, &c., is given in a report by Mr. W. A. Dixon, F.C.S., F.I.C., and also in the *Minerals of New South Wales*, by Professor Liversidge, F.R.S., published in the *Mineral Products of New South Wales*, by the Department of Mines. In the Annual Reports of this Department are published the reports of the Examiner of Coal Fields, Mr. John Mackenzie, F.G.S., giving statistics of the mines, together with diagrammatic sections of the Coal Measures and of the seams worked.

The Coal measures are estimated to occupy an area of about 23,950 square miles.

There is reason to believe that the coal seams which are now worked in the Northern, Western, and Southern Coal Fields, underlie within a workable depth an area of 3,328 square

miles: this being so, it will be interesting to know that they contain, after deducting one half of the total contents of of the seams for waste, etc.; about 14,370,000,000 tons of coal, which, at the present annual rate of production of about 2,500,000 tons, would last for over 5,000 years. This estimate does not include the other good seams within the same area which are not at present worked. And when we consider that in the remaining area of the Coal Measures coal seams are known to occur, but have not yet been proved, we may rest assured of the stability of this great source of national wealth.

#### GOLD.

Though coal has now taken, and is destined to hold, the foremost place of importance in the mineral productions of New South Wales, yet it is to the indigenous gold that the colony is indebted for the real commencement of its present tide of prosperity. The sudden increase in population consequent upon the earlier gold discoveries, gave a great impetus to the growth of the industries of the colony, and led to the development of other great mineral resources.

During the last three or four years the value of the production of gold has even fallen below that of tin, but this is due to the heavy yield from the easily worked shallow stanniferous deposits which must soon diminish. There is little doubt but that gold will recover and maintain the second place in the scale of the value of our mineral products. From a careful consideration of the auriferous localities and what they have yielded, I do not think that the yield is ever likely again to fall much, if at all, below its present limits; for there are now no exceptionally rich alluvial deposits being worked, and the yield from quartz mining is steadily increasing and will probably continue to do so. So that without reckoning upon fresh alluvial discoveries, which from time to time are sure to be made in the large scope of country that has yet to be prospected, we may regard the present rate of production as permanent.

The occurrence of gold was recorded by Mr. Surveyor McBrien in 1823, by Count Strzelecki in 1839, and by the Rev.

W. B. Clarke in 1841; but in 1851 the prospecting operations of Hargraves drew public attention to it, and since then, up to the 1st of January, 1883, according to the Annual Report for 1882 by Mr. Harrie Wood, Under Secretary for Mines, gold to the value of £34,870,378 has been raised; the value of the production for 1882 being £526,521.

The yield of gold for 1852 was greater than that of any subsequent year: this was due to the fact that the miners naturally first gave their attention to the shallow deposits in the beds and in the banks of the creeks; thence the gold was gradually traced into deeper ground and consequently became more difficult of extraction. In some places it was found in the surface soil upon the sides of hills, and in working this "surfacing," as it is called, the gold was followed up either to the outcrop of a quartz reef whence it was originally derived, or into a very waterworn gravelly drift. This drift, now situated upon the side of the valley and several hundreds of feet above the level of the present watercourse, marks the depth of the valley at the time of the deposition of the drift. And just as we should expect, seeing that the valley has been gradually deepened by the erosive action of rain water coursing down it during many ages, we find at various levels similar old watercourse gravels, some of which have been protected by coverings of basalt rock which in a molten state issued from some volcanic vent, and, pouring down into the valley, buried in its progress the then bed of the watercourse.

In cases where the valley had been partly filled with basalt the rain water flowing over it found it an easier matter to cut a new drainage channel along the edge of the basalt than through it; and so the new channel has often a very different direction to the old one. Intelligent prospectors becoming acquainted with these facts take these narrow tracts of basalt as their guide in selecting sites for shafts for prospecting the old water-course, or "deep lead." Many of the "deep leads" have proved richer than the more recent river beds, because they contain the heavy gold that had been as it were naturally ground-slued

out of the enormous amount of rock that had been broken up and removed during the erosion of the broader part of the valley, whereas the rich contents of the lead having been protected from redistribution into the new and perhaps deeper channel, the latter contains only the quantity of gold derived from the disintegration of the smaller bulk of rock represented by the narrow dimensions of the bottom of the valley. This subaerial denudation has continued from the early Tertiary period to the present day, and we find here and there upon the furrowed slopes of the Great Dividing Range remnants of the fluvial deposits which accumulated at various times during that long period. Besides the metallic substances derived from the denuded formations, these accumulations, consisting of pebbles, sand, mud and clay, contain vestiges of the animal and vegetable forms which successively lived upon this ancient land, and from which the existing fauna and flora have been developed. Thus in the Pleistocene deposits we have bones of some of the existing species of animals mingled with those of the extinct gigantic *diprotodon*, *macropus*, *megalania*, etc., for the description of which we are chiefly indebted to Sir Richard Owen. In the Pliocene occur fossil fruits, described by Baron Von Mueller, and leaves and stems of trees, with a fresh water *unio*, which has been described by Mr. R. Etheridge, junr. F.G.S.; and in the lower Miocene or Eocene, we have abundance of fossil leaves, some of which have lately been examined by Baron von Ettingshausen, who has given the following interesting particulars in the *Geological Magazine* for April 1883:—

The fossil plants collected by Mr. J. K. Hume from Dalton, and sent by Mr. C. S. Wilkinson, Government Geologist of New South Wales, to Mr. Robert Etheridge, junior, at the British Museum, "belong to 27 species, 21 genera, and 17 families. The species I have under examination are all new; of the genera only two (*Ficonium* and *Pomaderrites*) are new, whilst the others occur both in the Tertiary formation of Europe (19), North America and North Asia (13), Java (4), Sumatra (3), and Borneo (3). Only six of the genera are contained in the living flora of

Australia, and of these only two belong to the numerous genera which characterise this flora. . . . I find that the Tertiary flora of Australia is far more nearly allied to the Tertiary floras of other Continents than to the living flora of Australia. It seems, therefore, that the numerous forms which characterise the latter have been developed out of Pliocene or Post Tertiary forms of plants till now unknown to us. The recent flora of Australia contains also genera which characterise other floras, but not the Australian. It was till now enigmatical how they came to form part of this recent flora, as the species are endemic and have not wandered; for instance, the species of the European and North American genus *Fagus*, of the Asiatic genera *Tabernæmontana* and *Elaeocarpus*, &c. As some of them now have been discovered in the Australian Tertiary, for instance the above-named, there is no doubt they passed over into the living flora from the Tertiary."

To return to the auriferous drifts. Water-worn or "alluvial" gold occurs in formations older than the Tertiary. Some of the gold-bearing gravels of the Mount Brown diggings are believed to be of Cretaceous age. In the Gulgong district the Coal Measures conglomerates, where they rest upon the upturned beds of Silurian schists containing quartz reefs, have been mined for gold, and nuggets up to 5ozs. in weight were obtained. This is the oldest formation in which *waterworn* gold has yet been found. Of course the gold bearing drifts vary considerably in richness according to the nature of the auriferous formations from which they have been derived, and the amount of concentration or natural ground-sluing to which the disintegrated rocks have been subjected. The deep leads at the Parkes, Forbes, Temora and Gulgong diggings were very rich in places; thus in a claim near Gulgong as much as 35 ozs. of gold have been washed from one tin-dishful of dirt; and from another claim on the same lead, seven miners in three years obtained, clear of all expenses, gold to value of £28,000. But, as you might expect, it is only near the reefs or sources of the gold that the leads have been so rich. This fact has often led to the discovery of the original matrices of the gold, and these have generally



proved to be quartz reefs traversing Silurian, Devonian and Carboniferous strata, as well as diorite, porphyry, serpentine and granite.

At Young, Araluen, and in some other gold fields, the alluvial gold has evidently been derived not only from the quartz reefs in the granite, but also from the granite itself; these granites are always hornblendic.

Thus the precious metal occurs in different formations, and it is often associated with one or more of the following minerals—iron pyrites, copper pyrites, galena, mispickel, stibnite, blende, native arsenic, native bismuth, molybdenite, silver ores, limonite, calcite, chlorite, muscovite, etc. Some of these show that gold has been in solution in the meteoric waters at various times. I have in my possession some stalactites of limonite showing layers of gold in the concentric rings of the iron ore. The abundance of the above-mentioned minerals, especially the sulphides, in the quartz reefs renders the gold somewhat difficult of extraction, and it is believed that when less costly methods of treatment than those at present in use are introduced, many reefs now lying idle will be profitably worked. The deepest quartz mine in New South Wales is the Great Victoria Mine at Adelong: the reef traverses metamorphic granite and has been followed almost vertically to a depth of 1050 feet. Hydraulic sluicing appliances have been introduced to work the extensive Tertiary drifts in the Kiandra mountains. There are so many interesting features connected with the occurrence of gold that to describe them would require more space than I now have at my disposal. I must, therefore, pass on to a brief notice of our other mineral resources.

#### TIN.

Tin mining is one of the established industries of New South Wales. You may form an idea of its importance when I tell you that the value of the annual production for 1882 amounted to £842,131. The principal tin mines are in the Vegetable Creek and Inverell 'districts on the western slopes of New England, but the ore has also been found on the eastern slopes

to the northward of Glen Innes and Tenterfield. It also occurs in the Tumut and Adelong and Jingellic districts, as well as at Mount Brown and in other parts of the colony. But nearly all the ore hitherto raised has come from the New England mines. This tin-field is so extensive that it will probably become one of the most important in the world. The stream tin ore is obtained from alluvial deposits which are of similar origin and belong to the same Recent and Tertiary periods as the gold drifts which I have already described; and in the tin-bearing deep leads, which are from 50 to 200 feet deep, we also find numerous impressions of fossil leaves beautifully preserved, together with casts of *unio* shells and fossil insects, specimens of the latter, which are the second discovered in the colony, were exhibited at our August meeting.

The shallow deposits which have been so productive, are rapidly becoming exhausted; yet they still give employment to several thousands of miners who are principally Chinese.

The deep leads are being traced into deep and wet ground, so that costly machinery is necessary for the proper working of them.

With but little exception, the ore which has been sent to market has been stream tin; but lately considerable attention has been paid to the development of some of the numerous lodes which have been discovered.

The lodes are very variable in their modes of occurrence: sometimes the ore is found as thin veins of pure *cassiterite*; at others it occurs in quartz reefs, or as irregular masses in felspar, or in separate coarse grains disseminated through porphyritic granite. Some of the so-called lodes exhibit all these various features. The principal formations traversed by the tin lodes, are granite, porphyry, and metamorphic slates, sandstones and conglomerates probably of Siluro-Devonian age. The minerals associated with the tin ore are, pyrites, mispickel, blende, wolfram, tourmaline, fluor spar, bismuth, chlorite, etc. My colleague, Mr. T. W. Edgeworth David, B.A., F.G.S., is now engaged upon a Geological Survey of this tin field, and I anticipate that the result of his labours will prove of great economic and scientific value.

## COPPER.

The Copper Mining industry of New South Wales has already attained an important position. The value of the Copper produced in 1882 was £324,727, bringing the total production up to £3,538,285.

The largest mine in the Colony is the Great Cobar, which is distant 497 miles west of Sydney. The lode traverses Silurian schists, and is variable in width up to 70 feet or more. It has been worked to a depth of 324 feet. The ores consist of yellow and gray sulphides, red oxide, and green and blue carbonates, with some native copper. Some very fine specimens of fibrous malachite have been obtained. The out-put from the mine for 1882 produced 1805 tons of fine copper valued at £126,350.

In the same district, but nearer to the Great Western Railway, is the Nymagee Copper mine, where a rich lode from 2 to 30 feet wide also occurs in the Silurian formation. The returns from the mine for the year 1882 gave 1444 tons of fine copper valued at £80,000.

About 60 miles to the east, and 90 miles to the south of Cobar, are situated respectively the Girilambone mine and the Mount Hope mine which are being developed. Five other copper lodes in the Cobar district have been lately taken up. The out-put of copper from the Beranga Copper mine, near Rockley, for 1882 was 465 tons, and from the Frogmore mine 118 tons. Other lodes have been worked at Peelwood, Cadia, Tamworth, and in numerous other widely separated portions of the Colony; but chiefly owing to the difficulties of transit, and the low market value of the metal, as well as to other causes, they have not been extensively worked. We have therefore evidence of the great extent of our copper resources.

## SILVER.

Silver mining in New South Wales is still in its infancy, owing to the fact that until lately proper appliances for the treatment of the argentiferous ores had not been introduced: and it is only at the Boorook mines, through the enterprise of Messrs Hall and

Davey, that such appliances have been employed. From these mines about 65,000 ounces of silver were obtained last year, the average yield of the ore being at the rate of about 110 ounces of silver per ton of ore, taken from various depths to 145 feet. The lodes, which are from 4 to 9 feet wide, traversing Devonian shales and belts of felspar porphyry, consist of quartz with blue clay, containing pyrites, galena, blende, gold, and sulphide and chloride of silver.

From the Sunny Corner mine, Mitchell's Creek, argentiferous sulphides are being worked and shipped to England for treatment.

Other silver bearing lodes have been tested in the Hartley, Macleay, Yass, Bega, and other districts, with as yet unsatisfactory results; but the recent discoveries at Thackaringa and Silverton, in the Albert district, are of a most promising character. Here ferruginous galena lodes, yielding rich specimens of chloride of silver, have been found in places within a tract of country 30 miles long and 15 miles wide. The lodes strike about north and south, and vary in width up to 4 feet: the formation of the country is mica schist with granite, and porphyry.

#### IRON.

Another of our great sources of future wealth which is also in its infantile stage of development is iron mining. With our rapid national progress our demands for iron and steel are greatly increasing; but while other more easily developed industries chiefly engage, as they now do, the attention of the present scanty population of the Colony, and thereby keep up the price of labour, the growth of this particular industry must necessarily be slow. Nevertheless it is satisfactory to know that we possess inexhaustible supplies of the raw material—iron ores, coal, limestone, and manganese—and that these are readily available whenever circumstances admit of their being more profitably worked. Near Mittagong and Berrima extensive deposits of rich limonite occur in the midst of a coal field, but the attempt to work them at Fitzroy proved a failure. Since then the Eskbank Iron Company have established smelting works

with rolling mills at Lithgow. During 1882 the Company made 4,320 tons of pig iron, 2,139 tons of finished iron, and 1,016 tons of castings, the total valued at £37,224.

The iron ores available at Lithgow consist chiefly of limonite, occurring as thin irregular bands of rich quality, interstratified with the Coal Measures, and more siliceous ores in shale beds and veins in the overlying Hawkesbury series; limonite and magnetite with garnet iron ore in lodes and irregular patches near Wallerawang; and large patches of rich limonite and magnetite in the Blayney district. In many other parts of the Colony rich iron ore deposits also occur.

#### ANTIMONY.

The principal antimony lodes which have been mined upon, are those in the Macleay and Armidale districts; but owing to the irregular thickness of the lodes, from thin veins to bunches of ore of considerable size, and the low price of the metal, they are not much worked. Ore to the value of £16,732 was raised in 1882. The lodes near the Macleay River occur in Devonian strata, while those of Hillgrove, near Armidale, traverse both sedimentary rocks and granite. Here they are more or less rich in gold, and one of them is now being worked for that metal. The ores consist of stibnite and cervantite. Other lodes have been found near Solferino and in the Cudgegong district.

#### LEAD.

Ores of Lead occur sparingly in most of the auriferous quartz veins throughout the Colony, and in some considerable quantity in veins in the Yass, Mylora, Mitchell's Creek, Peelwood, and Bombala districts; but hitherto they have not been profitably worked.

Argentiferous galena lodes are now being prospected near Thackaringa and Umberumberka.

Zinc blende is also of frequent occurrence, but not in payable quantity.

#### BISMUTH.

Quartz reefs containing native bismuth, with sulphide, carbonate, and oxide of bismuth, have been discovered and partly worked

near Glen Innes and at Silent Grove in New England. The quartz veins are really pipe-veins of very irregular thickness, and the bismuth ores occur in them in nests, or in joint-fissures, and associated with arsenical pyrites, molybdenite, wolfram tin and gold. As yet the ore has only been treated by inefficient washing methods, but if smelting appliances were to be introduced, I am of opinion that these reefs would be largely worked.

#### COBALT AND MANGANESE.

Rich manganese ores with traces of cobalt are found in considerable quantity in the Bendemeer district, and ferromanganese near Bathurst and Goulburn. These deposits will be of future commercial value. Manganese ore containing 4 per cent of cobalt occurs at Bungonia, and it has lately been taken up to work for cobalt.

#### CHROMITE.

Chromic iron associated with serpentine occurs in some abundance near Tamworth and Grafton. There is no local demand for it at present, and it is doubtful if the price of the ore in Europe would cover the cost of raising and shipment.

#### MERCURY.

The occurrence of cinnabar near Cudgegong has been known for some years, but the prospecting operations have not yet proved it payable.

#### DIAMONDS.

Upwards of 10,000 diamonds are stated to have been found in the Colony. These were chiefly obtained from the Tertiary alluvial drifts in the Bingera and Cudgegong districts about the year 1873. Mr. D. Dougherty, who was Manager of the Gwydir Diamond Mining Company, informed me that in 67 working days, 1540 diamonds were obtained, and that the yield from the washing of 33 loads of drift was 619 diamonds, from 19 loads, 322 diamonds, and the prospecting of 151 loads from 24 different places produced 104 diamonds, which were nearly all of small size and averaging about one carat grain each, and

of light straw and pale greenish colour. Diamonds have been found in other parts of the Colony, the largest on record weighed about  $5\frac{2}{3}$  carats.

Mining specially for diamonds has been given up for some years past; but quite recently attention has again been given to the deposits near Bingera.

#### ASBESTOS.

This mineral is found in various localities, especially in the Bathurst and Gundagai district; in the latter, at Jones Creek, about 12 tons of it valued at £323 have been raised. The veins are very irregular in thickness and have not yet been thoroughly prospected. Some of the asbestos obtained is of excellent quality, being in long and flexible fibres, but the most of it is short in the fibre and would probably answer for the manufacture of paint.

#### SLATES AND FLAGGING.

Roofing slates and slate flagging of good quality are obtained from the quarries at Milla Murra near Bathurst, also near Gundagai and Goulburn.

Splendid sandstone flagging is quarried near Orange, Burrowa, and at Buckingbong near Narrandera.

#### BUILDING STONES.

Sydney is specially favoured with a very fine building stone which is quarried from the beds of sandstone of the Hawkesbury formation which underlies the City. This great sandstone formation extends for many miles to the North, West, and South from Sydney. The stone is of a light sepia brown colour, sometimes white, and samples of it from Pymont of which the Sydney Post Office is built, have withstood a test of 200 tons pressure.

Excellent sandstone is obtained from the Coal Measures, and from the Devonian beds in various parts of the Colony.

Granite is available in many districts. The gray granite of which the large polished pillars in the Post Office and other public edifices, and the large pedestal for the Queen's Statue



near Hyde Park, are composed, comes from Moruya. A more beautiful granite containing large crystals of Adularia Felspar is quarried at Montague Island.

Marble occurs in large masses near Wallerawang, Blayney, Marulan, Mudgee, Wellington, Kempsey, Tamworth, and in other localities. It varies in colour from white, grey, and red to black, and has been chiefly quarried for flooring-tiles and mantlepieces.

The Wianamatta shales and the shale beds in the Hawkesbury series and in the Coal Measures, afford good material in great abundance for almost all kinds of brick and pottery making.

#### INFUSORIAL EARTH.

A large deposit of infusorial earth of Tertiary age occurs near Barraba; and another deposit of better quality has been found by Mr. W. L. Gipps near the Warrumbungle Mountains. This earth is not of local commercial value at present, but will probably be in demand in the future for employment in the manufacture of explosives.

#### ARTESIAN WELLS.

Another of our natural resources, and one which will prove of immense benefit to a large portion of this colony and of the adjoining colonies of Queensland and South Australia, is artesian water. In January 1881 I had the pleasure of communicating to this Society some particulars kindly given to me by one of our members, Mr. H. A. Gilliat, Government Inspector of Tanks, regarding the discovery by Mr. David Brown, Manager of the Killarah Station, of several artesian springs at Wee Wattah and Mulyeo. Soon after this Mr. David Wilson obtained a large supply of good water by sinking and boring to great depths upon several portions of the Dunlop Run in the same Darling River District. And recently the Government boring party, in charge of Mr. H. Ford, sent out by the Hon. the Minister for Mines to put down a series of bores across the dry country in the north-west portion of the colony, has struck a supply of fresh water which flows from the pipes at a height of



10 feet above the surface. In this instance and at Dunlop the water-bearing strata belong to the Cretaceous formation; and the Pleistocene "Mud Springs," in which the Killarah bores were put down, are doubtless natural artesian springs issuing from fissures in the underlying Cretaceous formation. This water-bearing formation, as shown on the Geological map of N. S. Wales, occupies an area of about 32,000 square miles; and as it forms excellent pasturage country, which is naturally deficient in permanent surface water, the value of the available underground supply cannot be overestimated.

I have given you only a brief account of the economic mineral resources of New South Wales. I would like to have also made reference to those of the other Australian colonies, for they are all naturally united to us, though not at present politically so; but further elaboration of the subject would exceed the bounds of a short address. What I have said, however, is I think sufficient to show that in coal, gold, tin and copper, we have already inexhaustible sources of wealth and industry; and that in some of the other minerals mentioned, especially iron ores, we possess undoubted abundance of material for future development; while the extent and value of the others have not yet been proved. And more than this, there are extensive sources of underground water supply which when made available will immensely increase the value of a large extent of the more purely pastoral portion of the territory. With evidence of such material wealth who can say to what degree of national prosperity this country may not attain. Perceiving this, what a field for future usefulness lies open for investigation by not only one, but many scientific Societies. And herein lies our own responsibility, for our Society, as a Society devoted to Natural Science investigation, should have great influence in directing the public mind, particularly in reference to scientific discoveries. I am aware that such work involves the exercise of much individual self-denial and laborious research; indeed some of the works recorded in the proceedings of the Society exemplify this. But the natural laws of development show that in the survival of the fittest in the

struggle for existence self-interest and self-preservation, and not self-sacrifice, have been the guiding principles by which animated beings have arrived at their present state of perfection. Yet how is it that man exercises the principle of self-sacrifice, which is universally acknowledged to be the most noble trait of character, and which is apparently quite opposed to that of natural growth? Clearly, if he acknowledge only the natural life, is he not thus acting against his own interests? Why, then, has this new principle been implanted in his nature by the Creator, if it has not reference to the development from the natural into a higher and Divine life? If it has, then by the exercise of it our labours bear the stamp of a high purpose. And working with this noble aim we shall realise the fulfilment of the time, now rapidly dawning, when "*truth shall spring out of the earth and righteousness shall look down from Heaven.*"

Tennyson, in portraying man's natural state, says of him—

And he, shall he  
 Man, her last work, who seem'd so fair,  
 Such splendid purpose in his eyes.  
 . . . . .  
 Who loved, who suffer'd countless ills,  
 Who battled for the True, the Just,  
 Be blown about the desert dust,  
 Or seal'd within the iron hills?  
 No more? A monster then, a dream,  
 A discord.

It was moved by the Hon. P. G. King, M.L.C., seconded by Dr. Cox, and carried—"That a vote of thanks should be awarded to the President for his valuable address."

The Treasurer, the Hon. J. Norton, M.L.C., read the balance-sheet, showing a credit balance of £179 12s. 1d. Of this the sum of £60 5s. consisted of subscriptions to the Library Fund.

The Hon. W. Macleay, M.L.C., proposed certain alterations in the rules, increasing the number of Vice-presidents, establishing the Office of Honorary Librarian, and adding one more member to the Council. These proposals were carried unanimously.

The Meeting then proceeded to the election of Officers for the current year, with the following result :—

*President :*

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*Vice-Presidents :*

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H. R. WHITTELL, ESQ.



# INDEX TO VOL. VIII.

	Page		Page
<i>Acacia viscidula</i> ...	244	<i>Atomotricha ommatias</i> ...	325
<i>Acaena sanguitorbae</i> ...	245	<i>Avicula Barklyi</i> ...	240
<i>Acanthophis antarctica</i>	433	<i>Baeckea crenulata</i>	246, 468
<i>Acanthurus Dussumieri</i>	266	<i>densifolia</i> ..	169
<i>glaucopareius</i>	265	<i>Balistes Papuensis</i>	279
<i>zebra</i> ...	447	<i>Batrachus dubius</i>	267
<i>Actinotus Gibbonsii</i> ..	171	<i>punctulatus</i>	177
<i>Adiantum diaphanum</i>	469	<i>Belemnites Australis</i>	236
<i>Egotheles plumifera</i>	21	<i>Belone Krefftii</i> ...	209
<i>Elurædus melanocephalus</i>	25	<i>Bertya rosmarinifolia</i>	174
<i>Eschrichthys Goldiei</i>	5, 270	<i>Blandfordia nobilis</i> ...	469
<i>Albizzia Hendersoni</i>	244	<i>Blechnum serrulatum</i>	469
<i>Alethopteris Australis</i>	111	<i>Blennius periophthalmoides</i>	269
<i>concinna</i>	112	<i>Boronia Barkeriana</i> ...	468
<i>Currani</i>	113	<i>Bossiaea Scortechini</i>	175
<i>Alsophila Leichardtiana</i>	469	<i>Brachalletes Palmeri</i>	190
<i>Ambassia Commersonii</i>	255	<i>Brachycome ciliaris</i> ...	171
<i>Amphiprion arion</i> ...	450	<i>discolor</i>	171
<i>melanopus</i>	271	<i>Stuartii</i>	171
<i>Papuensis</i>	271	<i>Brachyphyllum Australe</i>	159
<i>Amphisile strigata</i> ...	271	<i>crassum</i>	159
<i>Anampses œeruleopunctatus</i>	272	<i>Brachysara sordida</i> ...	325
<i>pterophthalmus</i>	272	<i>Casio chrysozona</i> ...	262
<i>Aneimites iguanensis</i>	95	<i>œeruleaureus</i> ...	262
<i>Angiopteridium ensis</i>	119	<i>lunaris</i> ...	262
<i>Anguilla marginipinnis</i>	210	<i>Calamites radiatus</i> ...	83
<i>Anisopogon avenaceus</i>	469	<i>varians</i> ...	83
<i>Annularia Australis</i>	86	<i>Calanthe veratrifolia</i>	468
<i>Anthias Mortoni</i> ...	253	<i>Callicoma serratifolia</i>	468
<i>Anthropodium laxum</i>	175	<i>Callistemon linearis</i>	468
<i>Antidica barysoma</i> ...	383	<i>pithyoides</i>	170
<i>eriomorpha</i>	382	<i>Callitris Muelleri</i> ...	175
<i>Apogon Buruensis</i>	255	<i>Callyodon Molluccensis</i>	276
<i>macropterus</i>	255	<i>spinidens</i>	276
<i>trimaculatus</i>	256	<i>Calochilus paludosus</i>	468
<i>Apogonichthys Gillii</i>	200	<i>Cancellaria undulata</i>	226
<i>Apocryptes fasciatus</i>	268	<i>Caprimulgus macrourus</i>	28
<i>Araucaria Bidwellii</i>	176	<i>Caranx boops</i> ...	266
<i>Araucarites polycarpa</i>	164	<i>compressus</i> ...	204
<i>Archæopteris Howittii</i>	96	<i>Georgianus</i> ...	204
<i>Wilkinsonii</i>	97	<i>Carenum De Visii</i> ...	412
<i>Argophyllum Lejournanii</i>	246	<i>ianthinum</i>	412
<i>Aristeus Goldiei</i> ...	269	<i>pusillum</i>	412
<i>Arius armiger</i> ...	454	<i>terræ-reginæ</i>	411
<i>Australis</i>	209	<i>Carpophaga poliura</i>	28
<i>latirostris</i>	277	<i>Cassinea denticulata</i>	468
<i>Asperula oligantha</i> ...	252	<i>Castanospora Alphandi</i>	243
<i>Aster ramulssus</i> ..	171	<i>Casuarium Beccarii</i> ...	27
<i>Atherinichthys maculatus</i>	207	<i>Catascopus laticollis</i>	410

	Page		Page
Caulopteris Adamsi	132	Diagramma radja	261
Centropogon robustus	203	unicolor	261
Ceratodus Forsteri	211	Didiscus albiflorus	468
Ceriops Candolleana	247	Diodon hystrix	280
Chaetodon citrinellus	262	Diphucephala cerulea	415
melanotus	262	hirtipennis	415
ornatissimus	262	latipennis	415
plebejus	262	Dracophyllum secundum	468
Chanos salmoneus	210	Drepanornis d'Albertisi	28
Chatoessus elongatus	209	Drosera peltata	246
Erebi	209	Dules Guamensis	257
Chirocentrus dorab	210	Papuensis	257
Chlamydosaurus Kingii	300	Dussumiera acuta	278
Choretrum laterifolium	175	Duymeria nematoptera	272
Chorinemus Lysan	205	Echeneis naucrates	266
Toloo	205	Echidnia hystrix	425
Chrysophrys hasta	203, 265	Eleotris immaculatus	268
Circeoloroma Ajax	26	ophiocephalus	269
Cirrhilabrus Solorensis	272	planiceps	206
Cirrhites arcatus	265	Elops saurus	210
Clupea Sundaica	209	Engraulis Hamiltoni	209
Collyriocincla rufigaster	28	Epacris longiflora	468
Columbella Tayloriana	228	Epilobium tetragonum	250
Comesperma sphaerocarpum	468	Equisetum latum	87
Compsoptropa charidotis	513	rotiferum	80
selenias	512	Equula edentula	205, 266
strophilla	513	Eriodyta abductella	517
Conger marginatus	278	contentella	515
Conus modulosus	441	hololeuca	518
Copidoglanis tandanus	208	leptostola	517
Cordaites Australis	155	sigmophora	516
Coris Papuensis	275	subpunctella	516
variegata	275	vernalis	519
Corvina argentea	204	Erythura trichroa	20
Crossorhinus ornatus	289	Eucalyptus capitellata	170
Cryptostylis erecta	468	leucoxylon	248
Cunninghamites Australis	165	robusta...	248
Cuttsia viburnea	246	Eugenia corynantha	249
Cybiium Commersonii	266	Hodgkinsonia	249
semifasciatum	205	humilampra	249
Cyclopteris cuneata	109	Moorei	249
Cyclostigma Australe	138	oleosa	250
Dactylophora semimaculata	284	Eulechria aceraea	324
Dampiera Brownii	172	aërodes	321
Dendrobium cucumerinum	468	leucophanes	320
Dendrolagus Dorianus	17, 197	ombrophora	322
Dendrophis bilorealis	435	sciophanes	323
Diagramma affine	202	tanyscia	322
hæmatochir	261	Eupetes Ajax	26
labiosum	202	Eurostopodus Astrolabæ	20
Lessonii	260	Eutoma punctipenne	411
pardalis	260	Exocætes arcticeps	278
polytænia	261	longibarbus	454

	Page		Page
Fistularia serrata ...	270	Haloragis alata ...	246
Galium Australe ...	252	tencroides ...	246
Gangamopteris angustifolia ...	127	Hapalotis Papuanus ...	18
Clarkeana ...	127	Harpagie berycidae ...	447
obliqua ...	127	rosea ...	448
spathulata ...	127	Helix Thorpeiana ...	228
Gastrotokeus biaculeatus ..	279	Walleri ...	228
Gelechia lactella ...	328	Heniochus chrysostomus ...	263
Genyrorge Macleyana ...	178	macrolepidotus ...	263
Gerres filamentosus ...	203	Herbertophis plumbeus ...	434
Poeti ...	261	Heterodontus Japonicus ...	428
Girella carbonaria ...	283	Hibbertia fasciculata ...	242
mentalis ...	284	Hieropola jucundella ...	364
Gleichenia dubia ...	130	Hinulia elegans ...	215
lineata ...	130	Holocanthus diacanthus ...	263
Glossopteris ampla ...	124	navarchus ...	263
Browniana ...	122, 126	semicircularis ...	263
Clarkei ...	126	Hovea linearis ...	244
cordata ...	124	Hydrocotyle laxiflora ...	250
elegans ...	125	pedicellosa ...	250
elongata ...	124	tripartita ...	250
linearis ...	123	Hymenophyllum marginatum	469
parallela ...	125	Hypolepis tenuifolia ...	469
præcursor ...	126	Indigofera saxicola ...	244
primæva ...	126	Ioptera aristogona ...	345
reticulata ...	124	Ixora Beckleri ...	252
tæniopteroides ...	125	Jeanpaulia bidens ...	132
Wilkinsoni ...	125	Julis dorsalis ...	274
Glyphidodon amabilis ...	452	Guntheri ...	275
bimaculatus ...	271	Jansenii ...	275
nigrifrons ...	271	Knoxia corymbosa ...	252
pallidus ...	452	Kogia Greyi ...	437
uniocellatus ...	453	Labrichthys dux ...	287
Gobiodon axillaris ...	448	Labroides paradiseus ...	272
flavidus ...	449	Lambertia formosa ...	468
inornatus ...	449	Larrada Australis ...	32
lineatus ...	449	Lates Darwiniensis ...	200
Gobiosoma punctularum ..	449	Leipoa ocellata ...	193
Gobius circumspectus ...	267	Leistarcha iobola ...	326
maculipinnis ...	267	Leistomorpha brontoscopa ...	510
ornatus ...	267	ochrocausta ...	511
Gomphosus tricolor ...	275	Leme mordax ...	286
Goodia latifolia ...	243	Lepidodendron Australe ...	134
Goura d Albertisi ...	26	nothum ...	135
Grammistes orientalis ...	255	veltheimianum ...	135
Grevillea ilicifolia ...	174	Lepidotrigla Mulhali ...	460
linearis ...	468	Leptorrhynchus squamatus ...	172
Hæmodorum teretifolium ...	468	Lethrinus hæmatopterus ...	264
Hakea dactyloides ...	173	Liasis punctulata ...	432
microcarpa ...	173	Linosticha canephora ...	339
Halmaturus dorsalis ...	8	scythropha ...	339
ruficollis ...	7	Liparetrus convexiusculus ...	416
ualabatus ...	8	Locheutis ancyrota ...	343

	Page		Page
Locheutis desmophora ...	343	Nephogenes æthalea ...	380
philochroa ...	342	apora ...	381
Logania floribunda ...	172	egelida ...	374
Loranthus Bidwillii ...	251	ennephela ...	374
Lucina dentata ...	229	fœdatella ...	375
Macarthuria neocambrica ...	250	mathematica ...	375
Machetis aphrobola ...	331	microschema ...	380
Macronemata elaphia ...	346	orescoa ...	376
lopelictes ...	346	philopsamma ...	379
Macrotæniopteris Wianamattæ	118	protorthra ...	378
Macropus major ...	9	Nesiotes purpurascens ...	453
Macropygia Doreya ...	27	Neuropteris Australis ...	100
Malacanthus latovittatus ...	266	gigantea ...	99
Manucodia atra ...	25	Noeggerathiopsis elongata ...	154
Megalops cyprinoides ...	210, 278	media ...	154
Melaleuca armillaris ...	170	prisca ...	154
hypericifolia ...	468	spathulata ...	153
linearifolia ...	468	Notelca linearis ...	173
thymifolia ...	248, 468	Novacula macrolepidota ...	274
Melania acanthica ...	295	pentadactyla ...	274
Melanocharis bicolor ...	24	Odatria ocellata ...	432
Merianopteris major ...	114	Odontopteris microphylla ...	108
Mesoclecta psacasta ...	371	Oecophora sordida ...	325
Mesopriion flavirosea ...	446	Oenochroa endochlora ...	329
marginipinnis ...	254	iobaphes ...	330
sexfasciatus ...	255	lactella ...	328
Metrosideros glomulifera ...	468	Oligorus Macquariensis ...	200
Microglossus aterrimus ...	27	Ophichthys cobra ..	455
Mirbelia reticulata ...	468	naja ...	455
speciosa ...	169	Osphranter robustus ...	7
Modiolaria barbata ..	233	rufus ...	8
Mollugo spergula ...	250	Ostracion Sebæ ...	279
Monacanthus melanocephalus	279	Otidiphaps cervicalis ...	27
monoceros ...	279	Otozamites Mandeslohi ...	151
prionurus ...	279	Palorchestes Azael ...	221
scriptus ...	279	Pamborus viridi-aureus ...	409
Morelia variegata ...	433	Panax sambucifolius ...	251
Mugil compressus ...	269	Paradisea Raggiana ...	26
dobula ...	208	Susannæ ...	21
papillosus ...	270	Passiflora Herbertiana ...	468
Ramsayi ...	208	Patella aculeata ...	224
Waigiensis ...	207	Paxillus hirtulus ...	175
Mulloides flavolineatus ...	263	Pecopteris tenuifolia ...	110
Muræna cancellata ...	278	Pecten psila ...	239
Murænesox cinereus ...	278	Pelopæus lætus ...	29
Myoporum Bateæ ...	468	Penpheris Otaitensis ...	265
Myriophyllum variæfolium ...	247	Percis Coxii ...	179
Myripristis micropthalmus ...	265	Periophthalmus Australis ...	206
Myrsine variabilis ...	421	Persoonia revoluta ..	468
Myrtus Beckleri ...	249	Petalanthes hexastera ...	336
Myzomela eques ...	19	pericylta ...	337
Natica Incei ...	225	sphærophora ...	335
Neosilurus Hyrtlii ...	208	Petrogale penicillata ...	7



	Page		Page
Philobota acropola ...	485	Philobota pulverea ...	509
acutella ...	503	squalidella ...	496
adaptella ...	500	tentatella ..	507
agnesella ...	493	trijugella ...	503
anachorda ...	499	tyroxantha ...	497
ancylotaxa ..	475	xanthiella ...	505
Arabella ...	473	xiphostola ...	482
atmobola ...	486	Philœopola asbolæa ...	349
auriceps ...	478	banausa ...	356
aurinatella ...	504	confusella ...	354
bimaculana ...	506	dinocosma ...	349
biophora ...	474	exarcha ...	357
bracteatella ...	502	helica ...	351
brochosema ...	500	lithoglypta ...	358
calamaca ...	492	melanodelta ...	359
catalampra ...	478	psephophora ..	352
catascia ...	476	semocausta ...	350
chionoptera ...	494	synchyta ...	355
chrysopotama ..	476	turbatella ...	353
crepera ...	484	Phriconyma lucifuga ...	340
cretacea ...	491	Phyllota phylicoides ...	468
crocobapta ...	498	Phyllothea Australis ...	72
crypsichola ...	482	carnosa ...	75
declivis ..	479	concinna ...	75
electrodes... ..	509	Hookeri ...	73
ellenella ...	477	ramosa ...	73
erebodes ...	487	Piloprepes æmulella ...	366
euxantha ...	505	iriodes ...	365
glaucoptera ...	490	Pimelepterus Waigiensis ...	264
hapula ...	489	Pirenopsis costata ...	294
herodiella... ..	489	Pittosporum phillyræoides ...	242
homotona... ..	508	Placocosma anthopetala ...	333
hydara ...	494	hephæstea ...	333
hypocausta ...	481	Plagusia notata ...	288
interlineatella ...	501	Platycephalus Mortoni ...	206
irruptella ...	475	Quoyi ...	267
latifissella ...	480	Semermis ...	285
leucomitra ...	488	PlatyGLOSSUS Geoffroyi ..	274
melanoploca ...	508	guttatus ...	274
melirrhoa ...	498	Hœvenii ...	273
molliculella ...	480	margaritaceus ...	274
monogramma ...	493	melanurus ...	274
monolitha ...	477	modestus ...	273
monophaes ...	504	pœcilus ...	273
nephelarcha ...	483	trimaculatus ...	273
occidua ...	507	Plotosus anguillaris ...	276
orinoma ...	486	Plutella cruciferarum ...	282
partitella ...	491	Podozamites Barkleyi ...	143
pedetes ...	488	ellipticus ...	144
phauloscopha ...	484	lanceolatus ...	145
pretiosella ...	499	longifolius ...	145
productella ...	496	Pœcilodryas albifacies ...	25
pruinosa ...	495	sylvæ ...	19

	Page		Page
<i>Pœcilus lævis</i> ...	414	<i>Serranus Damelii</i> ...	254
<i>Polymeria calycina</i> ...	468	<i>estuarius</i> ...	200
<i>Polynemus specularis</i> ...	285	<i>Howlandi</i> ...	253
<i>tetradactylus</i> ...	203	<i>microdon</i> ...	253
<i>Polypodium confluens</i> ...	469	<i>perguttatus</i> ...	445
<i>Polyporus Pentzkei</i> ...	175	<i>Sittella albifrons</i> ...	24
<i>Polysoma Cunninghamii</i> ...	246	<i>Sphærodon grandoculis</i> ...	264
<i>Pomacentrus niomatus</i> ...	451	<i>Sphenopteris alata</i> ...	89, 90
<i>notatus</i> ...	451	<i>Baileyana</i> ...	93
<i>onyx</i> ...	451	<i>crebra</i> ...	93
<i>trifasciatus</i> ...	452	<i>elongata</i> ...	92
<i>Pomaderris prunifolia</i> ...	169	<i>erecta</i> ...	94
<i>Prostanthera prunelloides</i> ...	468	<i>flabellifolia</i> ...	94
<i>Psammoperca Waigiensis</i> ...	253	<i>flexuosa</i> ...	91
<i>Psettus argenteus</i> ...	266	<i>germana</i> ...	91
<i>Pseudolates cavifrons</i> ...	200	<i>glossophylla</i> ...	94
<i>Pseudoscarus pentazona</i> ...	276	<i>hastata</i> ..	90
<i>Pseudorhombus guttulatus</i> ...	276	<i>iguanensis</i> ...	92
<i>Psilocranium Coxii</i> ...	440	<i>lobifolia</i> ...	88
<i>Pterostylis acuminata</i> ...	468	<i>plumosa</i> ...	91
<i>Ptilophyllum oligoneurum</i> ..	149	<i>Sphyræna Forsteri</i> ...	269
<i>Ptilopus bellus</i> ...	27	<i>strenua</i> ...	287
<i>pulchellus</i> ...	28	<i>Sphyrelata indecorella</i> ...	362
<i>superbus</i> ...	28	<i>melanoleuca</i> ...	363
<i>Pythia Argenville</i> ...	296	<i>ochrophæa</i> ...	361
<i>Quintinia Verdonii</i> ...	246	<i>Stangerites ensis</i> ..	150
<i>Raia Australis</i> ...	461	<i>Stellaria flaccida</i> ...	243
<i>Randia Benthamiana</i> ...	251	<i>Stethojulis albovittata</i> ...	273
<i>dentiflora</i> ...	251	<i>axillaris</i> ...	273
<i>Moorei</i> ...	251	<i>Kalosoma</i> ...	273
<i>Rectes ferruginea</i> ...	26	<i>phekodopleura</i> ...	272
<i>Rhacopteris inæquilatera</i> ...	98	<i>strigiventer</i> ...	273
<i>intermedia</i> ...	98	<i>trilineata</i> ...	272
<i>Römeri</i> ...	98	<i>Synagris furcosus</i> ...	262
<i>septentrionalis</i> ...	98	<i>Synaptura cinerea</i> ...	288
<i>Rhamphomantis Rollesi</i> ...	23	<i>Tæniopteris Carruthersii</i> ...	117
<i>Rhinobatus Thouini</i> ...	280	<i>Daintreei</i> ...	117
<i>Rhizophora mucronata</i> ...	274	<i>Tæniura Mortoni</i> ..	212
<i>Rhynchichthys Novæ-Britanniæ</i> ...	447	<i>Talegallus pyrrhopygius</i> ...	26
<i>Rubus Moorei</i> ...	468	<i>Tapes polita</i> ...	234
<i>Sagenopteris rhoifolia</i> ...	128	<i>Taxites medius</i> ...	160
<i>Tasmanica</i> ...	129	<i>Tetracentrum apogonoides</i> ...	256
<i>Salarias æquipinnis</i> ..	450	<i>Tetraroge vestitus</i> ...	446
<i>griseus</i> ...	450	<i>Tetrodon Bennettii</i> ..	280
<i>Saurida ferox</i> ...	177	<i>insularum</i> ...	456
<i>Scarichthys auritus</i> ...	276	<i>lævigatus</i> ...	211
<i>Scatophagus multifasciatus</i> ...	203	<i>lævis</i> ...	456
<i>Schizæa rupestris</i> ...	469	<i>laterna</i> ...	280
<i>Scolopia Brownii</i> ...	242	<i>reticularis</i> ...	211
<i>Scorpæna cirrhosa</i> ...	265	<i>scleratus</i> ...	280
<i>diabolus</i> ...	265	<i>Valentini</i> ...	280
<i>Sequoiites Australis.</i> :	162	<i>Therapon caudovittatus</i> ...	260
<i>Serranus cruentus</i> ...	446	<i>chalybeus</i> ..	259

## vii.

	Page		Page
Therapon fuliginosus	... 201	Trachypepla protochlora	.. 370
interruptus	... 258	spartodeta	... 369
longulus	... 201	Triacanthus biaculeatus	... 211
nasutus	... 258	Trichomanides laxum	... 95
parviceps	... 201	spinifolium	... 95
percoides	... 201	Trigonia costata	... 239
trimaculatus	... 259	lineata	... 239
truttaceus	... 201	mesembria	... 237
Thinnfeldia media	... 102	nasuta	... 239
Tiaris Boydii	... 432	Trochocopus sanguinolentus	... 287
Tibarisus robustus	... 414	Tropidonotus angusticeps	... 433
Timonius Rumphii	... 252	picturatus	... 433
Trachycephalus Bankiensis	... 456	Trygon sephen	... 212
Trachydosaurus asper	... 387	uarnak	... 212
Trachymene Billardieri	... 251	Tugalia intermedia	... 227
linearis	... 251	Turritella Sophiæ	... 227
Trachypepla anastrella	... 370	Upeneus filamentosus	... 264
aspidephora	... 370	semifasciatus	... 263
conspicua	... 369	Vermicella annulata	... 433
euryleucota	... 369	Vertebraria equiseti	... 80
galaxias	... 369	Towarrensis	... 81
leucoplanetis	... 368	Walchia milneana	... 163
lichenodes	... 370	Weinmannia lachnocarpa	... 246
melanoptila	... 370	Xerotes flexifolia	... 469
nyctopsis	... 369	Zamites epibius	... 143



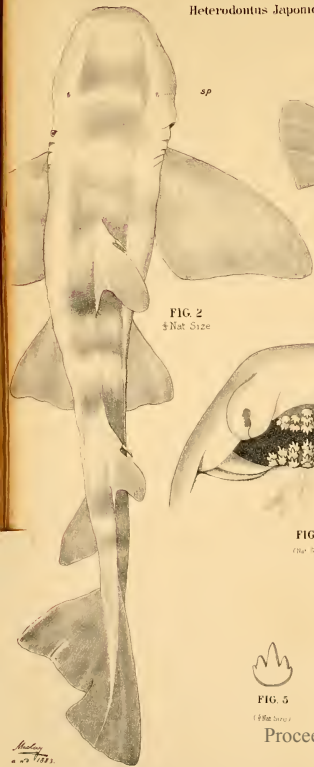


FIG 2  
(Nat Size)

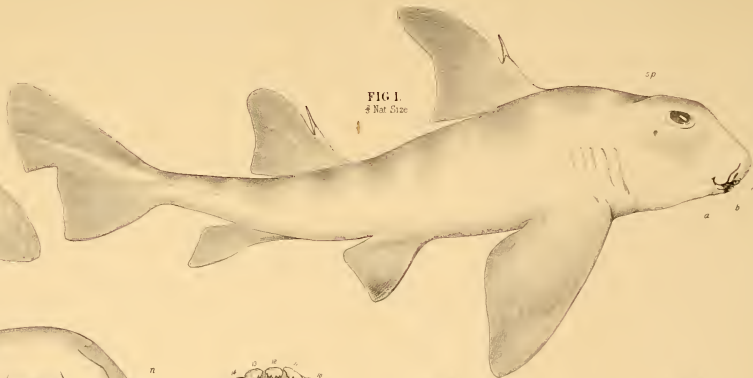


FIG 1  
(Nat Size)



FIG 3  
(Nat Size)

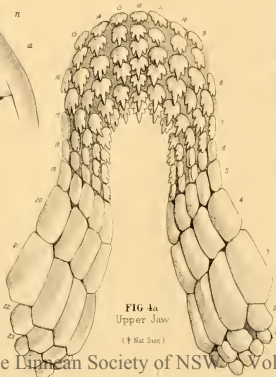


FIG 4a  
Upper Jaw  
(Nat Size)

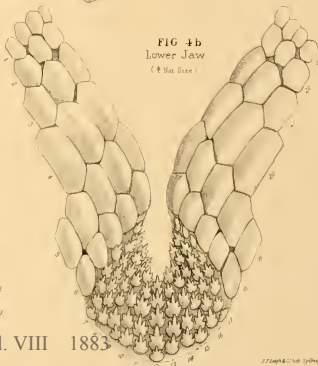
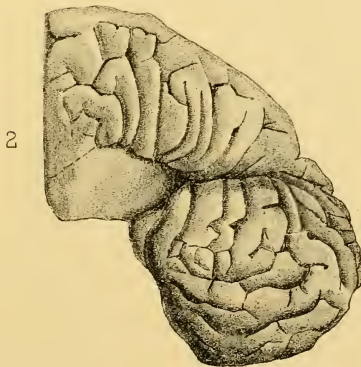
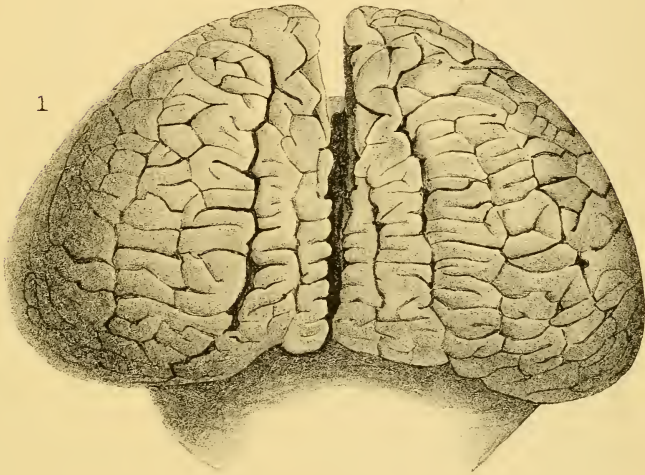
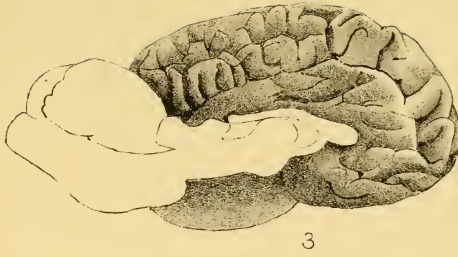


FIG 4b  
Lower Jaw  
(Nat Size)



FIG 5  
(Nat Size)





Brain of Gray's Whale.

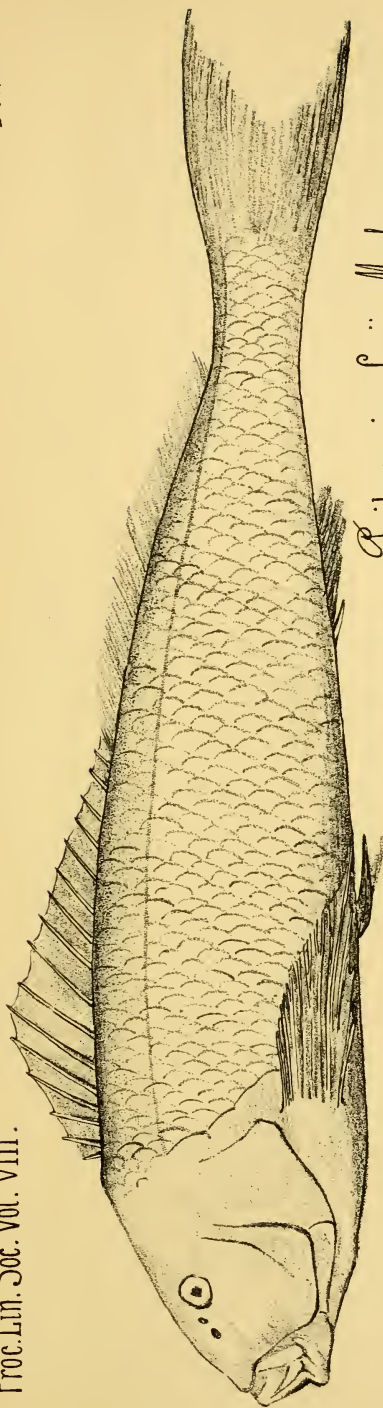
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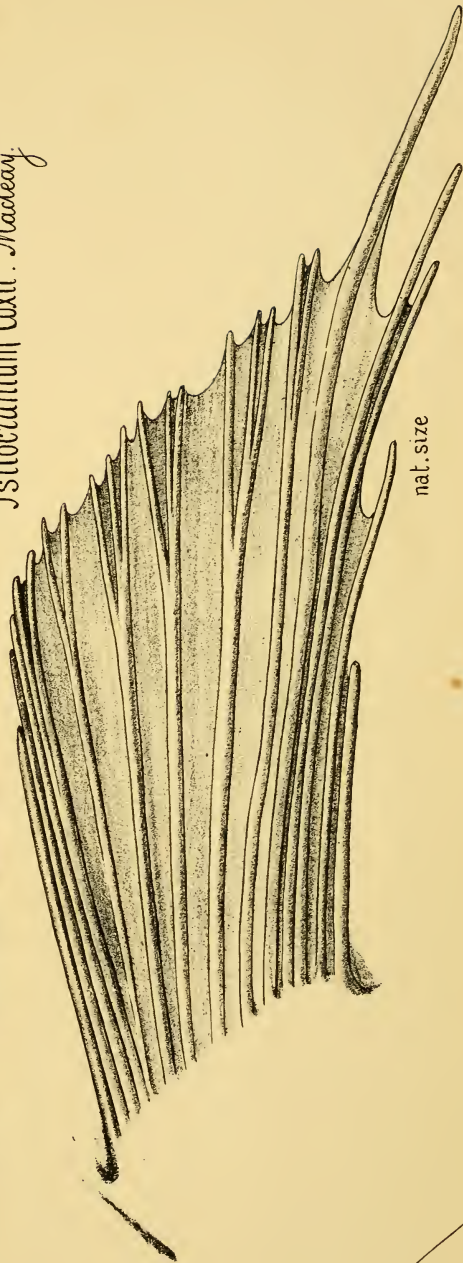
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## CONTENTS OF VOL. VIII., PART I.



	PAGE
On a New Form of Mullet from New Guinea, By WILLIAM MACLEAY, F.L.S., &c. . . . .	2
On the Anatomy of the Uro-genital Organs of the Kangaroo (No. 2). By J. J. FLETCHER, M.A., B.Sc. . . . .	6
On Remains of an Extinct Marsupial. By CHARLES W. DE VIS, B.A.	11
Contributions to the Zoology of New Guinea. By E. P. RAMSAY, F.L.S., &c. Plate 11 . . . . .	15
On Some Habits of <i>Pelopœus lætus</i> and a Species of <i>Larrada</i> . By Mr. H. R. WHITTELL . . . . .	29
On the Voracity of a Species of <i>Heterostema</i> . By Mr. H. R. WHITTELL	33
On the Coal Flora of Australia. By the Rev. J. E. TENISON-WOODS, F.L.S., &c. Plates 1—10A . . . . .	37
Further Contributions to the Flora of Queensland. By the Rev. B. SCORTECHINI, F.L.S. . . . .	168
Description of Two New Fungi. By the Rev. CARL KALCHBRENNER	174
Notes on the Fructification of the <i>Bunya-Bunya</i> in Sydney. By the Hon. JAMES NORTON . . . . .	176
Description of Some New Australian Fishes. By E. P. RAMSAY, F.L.S., &c. . . . .	177
Notes and Exhibits . . . . .	34 and 179

THE  
PROCEEDINGS  
OF THE  
LINNEAN SOCIETY  
OF  
NEW SOUTH WALES,  
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## CONTENTS OF VOL. VIII., PART 2.

	PAGE
Occasional Notes on Plants Indigenous in the Neighbourhood of Sydney. No. 3. By E. HAVILAND, Esq....	182
On Tooth-Marked Bones of Extinct Marsupials. By CHARLES W. DE VIS, B.A.	187
On Brachalletes Palmeri, an Extinct Marsupial. By CHARLES W. DE VIS, B.A.	190
On the Habits of the Mallee Hen, <i>Leipoa Ocellata</i> . By K. H. BENNETT, Esq.	193
Notes on a Collection of Fishes from the Burdekin and Mary Rivers. By WILLIAM MACLEAY, F.L.S., &c....	199
On the Mode of Obtaining Water from Eucalyptus Roots, practised by the Natives in the Interior. By K. H. BENNETT, Esq.	213
Note on a Viviparous Lizard. By J. J. FLETCHER, M.A., B.Sc.	215
Notes on a Lower Jaw of <i>Palorchestes Azael</i> . By CHARLES W. DE VIS, B.A.	221
Synonymy of Australian and Polynesian Land and Marine Mollusca. By JOHN BRAZIER, C.M.Z.S., &c.	224
On some Mesozoic Fossils from Central Australia. With Two Plates. By the Rev. J. E. TENISON-WOODS, F.L.S., &c.	235
A Second Half Century of Plants new to South Queensland. By the Rev. B. SCORTECHINI, F.L.S....	242
Contribution to a Knowledge of the Fishes of New Guinea. No. 4. By WILLIAM MACLEAY, F.L.S., &c....	252
Descriptions of New Genera and Species of Australian Fishes. By CHARLES W. DE VIS, B.A.	283
Occasional Notes on Plants Indigenous in the Neighbourhood of Sydney. No. 4. By E. HAVILAND, Esq.	289
Localities of some Species of Recent Polynesian Mollusca. By JOHN BRAZIER, C.M.Z.S.	294
Notes and Exhibits	197, 217, 280, 296

THE  
PROCEEDINGS  
OF THE  
LINNEAN SOCIETY.  
OF  
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## CONTENTS OF VOL. VIII., PART 3.

---

	PAGE
Myology of <i>Chlamydosaurus Kingii</i> . By CHARLES W. D. VIS, B.A. (Plates 14, 15 and 16) ... ..	300
Descriptions of Australian Micro-Lepidoptera By E. MEYRICK, B.A., Part IX., Oecophoridae ( <i>Continued</i> ) ... ..	320
Some remarks on the action of Tannin on Infusoria. By HARRY GILLIATT, Esq. ... ..	383
On a Fossil Calvaria. By CHARLES W. DE VIS, B.A. (Plate 17) ...	392
Remarks on a Skull of an Aboriginal from the Lachlan district. By N. DE MIKLOUHO-MACLAY (Plate 18) .. ..	395
On a very Dolichocephalic Skull of an Australian Aboriginal. By N. DE MIKLOUHO-MACLAY (Plate 19)... ..	401
On a Fossil Humerus. By CHARLES W. DE VIS., B.A... ..	404
Notes on some undescribed Coleoptera in the Brisbane Museum. By WILLIAM MACLEAY, F.L.S. ... ..	409
Notes and Exhibits ... ..	386, 396, 416

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PROCEEDINGS  
OF THE  
LINNEAN SOCIETY  
OF  
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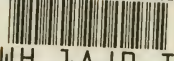
## CONTENTS OF VOL. VIII., PART 4.

	PAGE
Occasional Notes on Plants indigenous in the Neighbourhood of Sydney (No. 5). By E. HAVILAND ... ..	421
Temperature of the body of <i>Echidna hystrix</i> . By N. DE MIKLOUHO-MACLAY ... ..	425
Plagiostomata of the Pacific, Part II. (Plate 20). By N. DE MIKLOUHO-MACLAY and WILLIAM MACLEAY, F.L.S., &c. ..	426
Notes on some Reptiles from the Herbert River. By WILLIAM MACLEAY, F.L.S., &c. ... ..	432
Notes on some Customs of the Aborigines of the Albert District. By C. S. WILKINSON, F.G.S., F.L.S. ... ..	436
On the Brain of Grey's Whale (Plate 21). By WILLIAM A. HASWELL, M.A., B.Sc. ... ..	437
On a new genus of Fishes from Port Jackson (Plate 22). By WILLIAM MACLEAY, F.L.S., &c. ... ..	439
Fishes from the South Sea Islands. By CHARLES W. DE VIS, M.A.	445
Some results of Trawl Fishing outside Port Jackson. By WILLIAM MACLEAY, F.L.S., &c. ... ..	457
The "Barometro Araucano," from the Chiloe Islands. By N. DE MIKLOUHO-MACLAY ... ..	462
Far Southern localities of New South Wales Plants. By Baron Sir F. VON MÜLLER, K.C.M.G., F.R.S., &c. .. ..	467
Descriptions of Australian Micro-Lepidoptera, Part X. By E. MEYRICK, B.A. ... ..	469
Notes on the Geology of the Southern portion of the Clarence River Basin. By Professor STEPHENS, M.A. ... ..	519
Dimensions of some gigantic Land Tortoises. By J. C. COX, M.D., F.L.S. ... ..	531
Notes and Exhibits ... ..	441, 463, 532
President's Annual Address ... ..	536
Office-Bearers and Council for 1884 ... ..	583
Title page, Contents and Index of Vol. VIII.	





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