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1904.

VICTORIA.

DEPARTMENT OF MINES.

RECORDS

OF THE

GEOLOGICAL SURVEY OF VICTORIA

(Professor J. W. GREGORY, F.R.S., D.Sc., Director).

Vol. I., Part 3.

ISSUED BY

W. R. ANDERSON, SECRETARY FOR MINES, UNDER THE AUTHORITY OF THE HON. D. McLEOD, M.P., MINISTER OF MINES.

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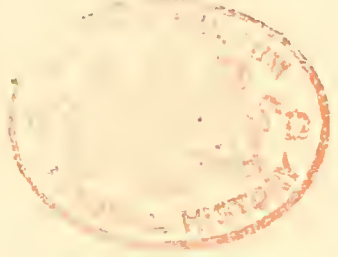

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CONTENTS.

RECORDS OF THE GEOLOGICAL SURVEY OF VICTORIA,

VOL. I., PART 3.

ON A COLLECTION OF JURASSIC PLANTS FROM VICTORIA,

BY

A. C. Seward, F.R.S., University Lecturer in Botany, and Fellow of Emmanuel College, Cambridge.

ERRATA.—On page 184, lines 20 and 21, for "With a few exceptions, where the magnification is mentioned, the figures are reproduced natural size," read "The figures are reproduced *twice* natural size, except Figs. 2*a*, 5*a*, 7*a*, 32 and 44, which are *four* times natural size, and Fig. 45, which is *six* times natural size."
On pages 182, line 5; 188, lines 4 and 6; 190, line 3; 206, line 5 and 210, line 6, for *twice* read *four times*.
On pages 182, line 27 and 210, line 7, for *three* read *six*.

4167.

ON A COLLECTION OF JURASSIC PLANTS FROM VICTORIA.

(*By A. C. Seward, F.R.S., University Lecturer in Botany, and Fellow of Emmanuel College, Cambridge.*)

A.—INTRODUCTORY.

The occurrence of fossil plants in Australia has been well known since early in the nineteenth century, but we are still in want of an exhaustive illustrated account of the palæozoic and mesozoic floras of the Australian continent. As the present paper deals solely with plants of mesozoic age, there is no need to enter into a general consideration of the older vegetation, which does not immediately concern us in the discussion of the younger floras. It is generally recognised that there is a very close agreement between the older coal vegetation of Australia and plants from India and South Africa which occur in beds usually spoken of as permo-carboniferous; and more recently additional information has been obtained from South America as to the occurrence in that region of the same facies of palæozoic vegetation as characterized the Southern Continent of Gondwana Land. Less attention has, however, been given to the description and correlation of the floras of mesozoic age from Australia and South Africa, in which the fern *Glossopteris*, the dominant type in the older vegetation, is either barely represented or entirely absent. It is true that Feistmantel's memoirs have made us familiar with numerous mesozoic plants from the Upper Gondwana beds of India, but further information is needed before we can form a clear idea of the plant-geography and botanical features of India, South Africa, South America, Australia, and other southern regions during the mesozoic era.

The most striking impression received from a recent examination of Australian and South African plants is the close resemblance presented by certain of the mesozoic floras of those regions to well-known European types.

The specimens described in the present contribution to mesozoic botany, which were sent to me from the Department of Mines and Water Supply, Victoria, at the suggestion of Professor J. W. Gregory, were collected from the two coal-fields of South Gippsland and Otway.

The South Gippsland coal-field is situated east of Western Port, and comprises the following among other localities from which plants were obtained :— Kilcunda district (collected by W. H. Ferguson); Kongwak (collected by A. E. Kitson); Jumbunna East (collected by A. E. Kitson); Outtrim (collected by A. E. Kitson); and Welshpool (collected by A. E. Kitson).

The Otway beds occur to the south-west of Port Phillip; the plants were obtained from a small area in the neighbourhood of Apollo Bay by the late V. R. Stirling.

In the following account of the material, a botanical arrangement has been followed, and a list of localities is appended to the description of the several species.

The contributions to Victorian palæobotany, in which the floras are scientifically treated, are few in number, and we are less familiar with the past vegetation of that part of Australia than with the fossil plants of New South Wales and other regions. In his important account of Victorian plants, published in 1874 in the *Prodromus of the Palæontology of Victoria*, McCoy dedicated one of the species (*Zamites Barklyi*) to Sir Henry Barkly, formerly Governor of Victoria, in commemoration of the interest he took in "one of the nicest and most difficult questions of critical palæobotany with which Australian geologists have had to deal."* This question of age as determined by plant evidence led to several controversial articles by McCoy, Clarke, and other writers. At a meeting of the Royal Society of Victoria, on 4th June, 1860, Prof. McCoy "brought forward a new species of *Tæniopteris* from the coal works of the Bass River in support of the oolitic age of certain Victorian coal strata."† The specimen was named *Tæniopteris Daintreei*, after the collector, and described as resembling *T. vittata* of Brongniart. At the next meeting of the Society, a communication was read from Mr. Clarke, in which he expressed scepticism as to the determination of the fern, and protested against the question of age being regarded as settled on the evidence of McCoy's species.‡ To this McCoy replied ;§ but there is no need to follow the controversy further, except to note that in 1861 Clarke‖ referred to McCoy's *Tæniopteris* from Cape Paterson, in Victoria, and repeated his opinion as to the palæozoic age of the rocks. McCoy¶ adhered to his original view, which was apparently shared by Prof. Zigno.**

An examination of numerous specimens of *T. Daintreei* and associated plants from Victoria leads me to the conclusion that McCoy's opinion as to the jurassic age of the flora is probably correct.†† Among the plants sent to me for investigation, no specimens were met with which could be referred to any of the three species of *Zamites* contained in McCoy's list ;‡‡ indeed, with the exception of a single fragment of a frond which I have placed provisionally in the genus *Nilssonia*, no Cycads were recognised.

An important work by Feistmantel, originally published in the *Palæontographica*,§§ appeared as a translation in the *Memoirs of the Geological Survey of New South Wales* in 1890.‖‖ In this memoir, jurassic plant-beds are mentioned from the following districts :—Coleraine, Cape Otway, Western Port, Cape Paterson, and Bellarine. Feistmantel correlates the Victorian strata with the Clarence River series of New South Wales. A note is added by Wilkinson in reference to Feistmantel's statement to the effect that the Clarence River beds are overlain by rocks identical with the Hawkesbury series, which has been shown by animal evidence to be triassic, and it is suggested that the Victorian beds with *Tæniopteris Daintreei* and *Alethopteris australis* may also be triassic.¶¶

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* McCoy (74), p. 33.
† McCoy (60) ; *Proc. Roy. Soc. Victoria*, V., p. x.
‡ Clarke (60) ; *Proc. Roy. Soc. Victoria*, V., p. 89.
§ McCoy (60) ; *ibid.*, p. 96.
‖ Clarke (61) ; *Proc. Roy. Soc. Victoria*, VI., p. 32.
¶ McCoy (61) ; *ibid.*, p. 42.
** Zigno (60).
†† See also Dun (98).
‡‡ McCoy (74).
§§ Feistmantel (79).
‖‖ Feistmantel (90).
¶¶ *Ibid.*, p. 41.

It is possible that the Victorian plants may belong to a flora slightly more recent than rhaetic in age; the botanical evidence is not in accordance with the opinion that the strata belong to the triassic system, but points clearly to jurassic horizon.

In 1883, J. E. Tenison-Woods* gave a sketch of previous work on Australian fossil floras, and added descriptions of several hitherto unrecorded species. This author states that no rhaetic or lower lias plants are known from Victoria or Tasmania, but he speaks of jurassic species from four regions in Victoria:—Wannon and Glenelg; Cape Otway; Cape Paterson to Traralgon and Latrobe Valley; and Welshpool. Tenison-Woods mentions the following Victorian species, which he refers to a flora of jurassic age:—†

Phyllotheca concinna, Tenison-Woods (?).
Podozamites Barklyi, McCoy.
P. longifolius, McCoy.
P. ellipticus, McCoy.
Tæniopteris Daintreei McCoy.
Alethopteris australis (Mor.)
Sphenopteris sp.

The only two forms included in this list that are represented in the collection forwarded to me are *Tænopteris Daintreei* and *Alethopteris australis* (=*Cladophlebis denticulata*, var. *australis*). Messrs. Jack and Etheridge, in their *Geology of Queensland and New Guinea*,‡ adopt the term trias-jura for the Ipswich and Burrum series of Queensland, and in the article "Australia," in one of the recently published supplementary volumes of the *Encyclopædia Britannica*, the writer adds that "certain beds in Victoria, about Cape Paterson, Barrabool Hills, and a series known as the Bellarine beds . . . . may belong to this series [trias-jura]."

Mr. Stirling's Reports on the Victorian Coal-fields contain a few notes on some of the fossil plants obtained from the Gippsland carbonaceous area; these are in part supplied by Sir F. McCoy, and in part written by the author of the Reports. The conclusion drawn from the plant-evidence is that the Gippsland strata are clearly of jurassic age.§ In these reports the plants are not fully discussed, and it is impossible in some cases to form a clear idea from the drawings as to the nature of the material.

The species mentioned in Stirling's reports with their localities and photographic reproductions are given in the following list:—

Podozamites Barklyi, McCoy. Bellarine, Kilcunda, Griffith's Point, Albert River. Stirling (99), Pl. 5, Figs. 3 and 4. *P. ellipticus*, McCoy. Bellarine, Kilcunda. *P. longifolius*, McCoy. Bellarine, Calignee.	Not represented in the collection described in these pages.

* Tenison-Woods (83).
† *Ibid.*, p. 55.
‡ Jack and Etheridge (92).
§ Stirling (92), (93), (95), (99).

Baiera australis, McCoy. Korumburra, Burne's Creek, Callignee. Stirling (92), Pl. 1, Fig. 2; (99), Pl. 1, Fig. 3.	The specimens so named are probably specifically identical with those represented in Figs. 36, 37 of the present paper.
B. subgracilis, McCoy. Korumburra, Albert River, Burne's Creek. Stirling (92), Pl. 2, Fig. 13; (99), Pl. 1, Figs. 4–7.	A larger form than any of the specimens of Ginkgoales included in the collection which I have examined. This may be compared with an imperfect leaf figured by Shirley* as *Ginkgo* sp., and with *Salisburia Hobartensis* of Johnston.† It is however possible that the specimen shown in Fig. 35 may represent a fragment of this type of leaf.
B. robusta, McCoy. Korumburra, Burne's Creek.	In the absence of a full description or figure, it is impossible to express an opinion on this form.
Albertia australis, McCoy. Jeetho Valley, Albert River, Burne's Creek. Stirling (92), Pl. 1, Fig. 1; (99), Pl. 4, Fig. 7.	The specimens represented in Stirling's figures may be correctly referred to this genus, but without seeing the material I must leave the determination as doubtful.
Sphenopteris Warragulensis, McCoy. South Warragul, Jeetho, Whitelaw, Korumburra. Stirling (92), Pl. 1, Fig. 6; Pl. 2, Fig. 3; (99), Pl. 4, Figs. 1–6.	Some of the fertile fragments shown in Stirling's figures appear to be identical with those represented in my Figs. 6–9, but it is not improbable that some of the specimens belong to a distinct type.
S. ampla, McCoy. Whitelaw. Stirling (92), Pl. 1, Fig. 7; Pl. 2, Fig. 9; (99), Pl. 3, Figs. 1, 2, 5, 6.	The figured specimens agree closely with the specimens that I have referred to this species.
S. crassinervis, McCoy. Callignee, Burne's Creek, Korumburra, Albert River. Stirling (99), Pl. 2, Fig. 6; Pl. 3, Figs. 3, 4, 7.	Possibly identical with *S. ampla*.
S. Fosteri, Stir. Stirling (99), Pl. 3, Fig. 17. *S. Travisi*, Stir. Stirling (99), Pl. 3, Fig. 18.	Single fragments of similar form to *Coniopteris hymenophylloides*.

* Shirley (97), Pl. V.
† Johnston (88), Pl. XXVIII., Fig. 2.

Eremopteris Warragulensis, McCoy.	As no figure or description is given of this species it is impossible to express any opinion as to affinity.
Alethopteris (*Pecopteris*) *australis*, Morris. Bellarine, Jumbunna. Stirling (99), Pl. 2, Fig. 3.	Morris's species is shown in Figs. 25–27 of the present paper; the same form has been figured also by McCoy, Shirley, and other writers.
Tæniopteris Daintreei, McCoy. Mirboo South, Jeetho, Whitelaw, South Warragul, Cape Paterson, Barrabool Hills, Wannon, Callignee, Burne's Creek, &c. Stirling (99), Pl. 1, Fig. 2; Pl. 2, Figs. 4, 7; Pl. 2A.	The type represented in my Figs. 18–22. The specimen figured by Stirling (99), Pl. 2., Fig. 4 as showing sori is too imperfect to afford any satisfactory evidence of the affinity of the species.
T. Carruthersi, Tenison-Woods. San Remo, Jeetho Valley, Burne's Creek, &c. Stirling (99), Pl. 1, Figs. 1 and 2.	Tenison-Woods includes under this name specimens from Tivoli, Queensland, but gives no figure. Stirling's figures agree closely with the type of frond which I have referred to *T. Daintreei*, var. *major*, and probably represent the same type.
Sagenopteris Carruthersi, Woods. Griffith's Point, Western Port. Stirling (99), Pl. 5, Figs. 1, 2.	Too fragmentary to determine.
Brachyphyllum Gippslandicum, McCoy. Albert River, Burne's Creek, and Jeetho River. Stirling (99), Pl. 3, Figs. 10–14.	Fragments of doubtful affinity.
Palissya australis, McCoy. Albert River, Burne's Creek. Stirling (99), Pl. 3, Figs. 8, 9.	Probably identical with the specimen referred to below as *Taxites* sp.

The following is the list of Victorian plants described in the following pages :—

Bryophyta	..	Marchantites sp.
Equisetales	..	Equisetites sp. Fig. 1.
Lycopodiales	..	Lycopodites Victoriæ, sp. nov. Figs. 2–4.
Filicales	..	Adiantites lindsayoides, sp. nov. Fig. 5.
		Coniopteris hymenophylloides, Brongn., var. Australica. Figs. 6–9.
		Sphenopteris ampla, McCoy. Figs. 10–16.
		Sphenopteris sp. Fig. 17.
		Tæniopteris Daintreei, McCoy. Figs. 18–22.
		Tæniopteris Daintreei, McCoy, var. major. Figs. 23, 24.

Filicales	..	.. Cladophlebis denticulata, Brongn., var. australis. Figs. 25–27. Thinnfeldia McCoyi, sp. nov. Fig. 28. Thinnfeldia sp. Fig. 29. Rhizomopteris Etheridgei, sp. nov. Figs. 30–34.
Ginkgoales	..	.. Ginkgo sp. Fig. 35. Baiera australis, McCoy. Figs. 36, 37. Baiera delicatula, sp. nov. Fig. 38. Female flowers? Figs. 39, 40.
Cycadophyta	..	.. Nilssonia sp. Fig. 41.
Coniferales	..	.. Araucarites (sp. A). Fig. 42. Araucarites (sp. B). Fig. 43. Cf. Brachyphyllum sp. Fig. 44. Taxites sp. Fragment of a conifer. Fig. 45.
Gymnospermæ		.. Carpolithes (sp. A). Fig. 46. Carpolithes (sp. B).
Planta incertae sedis		.. Fig. 47.

B.—DESCRIPTION OF SPECIMENS.

CLASS BRYOPHYTA.

Marchantites sp.

Specimen 191 (Allotment 32A, parish of Kongwak). An impression of a dichotomously branched plant bearing a resemblance to the thallus of a *Marchantites;* but it is too small and indistinct to refer to a specific type.*

Locality: Allotment 32A, parish of Kongwak, S. Gippsland.

CLASS EQUISETALES.

GENUS EQUISETITES, STERNBERG.

Equisetites sp. (Nodal Diaphragms).

Fig. 1.

The Victorian plants submitted to me for examination do not include any specimens that can be referred with confidence to the Equisetales. The specimen (204) shown in Fig. 1 represents two imperfectly preserved discs about 8 mm. in diameter, traversed by ribs radiating from near the centre to the uneven periphery; the actual centre is occupied by a slightly raised and partly carbonaceous patch. The discs are obviously incomplete, and the relative position of the two fragments shown in the drawing is no doubt an accident of preservation. An accurate diagnosis or determination of this fragment is impossible, but the most likely comparison that occurs to one is with the diaphragms of Equisetaceous stems, such as frequently occur on the inferior oolite shales of England and elsewhere, squeezed out from the branches of *Equisetites columnaris.*† A plant figured by Etheridge in Volume IV. of the *Records of the Geological Survey of New South Wales* as *Phyllotheca* from the

* Cf. *Marchantites Zeilleri*; Seward (94), Pl. I., Fig. 3.

† Seward (00), pp. 57, 62, Pl. XIX., Figs. 4 and 5. See also Andrae, (55).

Newcastle beds of Shepherd's Hill, Newcastle, bears circular, expanded leaf-sheaths similar to that shown in Fig. 1 ; but the difference in geological horizon renders identity very unlikely.

The Victorian fossil may be described, with some hesitation, as isolated nodal diaphragms of an Equisetaceous stem, similar to those described from European jurassic rocks.

Locality : Allotment 33D, parish of Kongwak, S. Gippsland.
Specimen 204 is the reverse of 203. (Fig. 1).

CLASS LYCOPODIALES.

GENUS LYCOPODITES, BRONGNIART.

Lycopodites Victoriæ, sp. nov.

Figs. 2–4.

The definition of *Lycopodites falcatus*, L. and H.,* might be quoted as applying equally well to the specimens from Victoria, but the more delicate nature and smaller size of the Australian form seem to render advisable the use of a distinct name. In dealing with these fragments which show no trace of reproductive organs it is impossible to speak with confidence as to specific difference when size is the chief distinguishing feature, but, as a matter of convenience, I have suggested the designation *Lycopodites Victoriæ.*

The fragments shown in Figs. 2 and 3 (Specimens 68, 207) are portions of a plant characterized by its repeatedly forked shoots bearing two rows of laterally disposed leaves arranged in one plane ; the short and broad leaves appear to be of delicate texture, the lower margin is strongly convex with an upward-directed apex, the upper margin is almost straight or slightly concave ; the lamina shows no trace of veins.

Fig. 2 (68). This specimen, 1.8 cm. in length, and 2.1 cm. in breadth, shows very clearly the arrangement and form (Fig. 2a) of the leaves, the largest of which have a length of 2 mm.

Fig. 3 (207, Welshpool). A less perfect specimen in which the forking of the branches is well illustrated.

Fig. 4 (207) represents more clearly the dichotomous habit of the plant. Among fossil forms this species approaches most nearly to *Lycopodites falcatus*, the range of which has recently been extended to Bornholm.† A species from the Rajmahal series of India described by Oldham and Morris as *Araucarites* (?) *gracilis*‡ agrees closely with the Victorian specimens, but in size the Indian plant is nearer to the English species *Lycopodites falcatus.* The Rajmahal specimens should undoubtedly be referred to *Lycopodites* and not to *Araucarites* ; they may indeed be identical with *L. falcatus.*§ Among recent plants, certain species of *Selaginella* are practically identical. As regards habit and leaf-form, with *Lycopodites Victoriæ*, but in the fossil fragments no trace of two kinds of leaves has been detected.

Locality : Welshpool, S. Gippsland.

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* Lindley and Hutton (31), Pl. LXI.
† Möller (02), Pl. VI., Fig. 21.
‡ Oldham and Morris (63), Pl. XXXIII., Figs. 1 and 2 ; Pl. XXXV., Figs. 1 and 2.
§ Seward (00), p. 70.

CLASS FILICALES.

Family Polypodiaceæ.

GENUS ADIANTITES, GOEPPERT.

The genus *Adiantites* is usually applied to ferns from devonian and carboniferous rocks of which the pinnules are characterized by a narrow wedge-shaped base and a triangular or oval form. In speaking of this genus Zeiller* states that no fertile specimens have been found. We may apply this generic term to the specimen represented in Fig. 5, using the name in a wide sense as denoting a resemblance, as regards the form of the segments, to recent species of both *Adiantum* and *Lindsaya*. Some authors use Schimper's genus *Adiantides*† instead of *Adiantites*.

Adiantites Lindsayoides, sp. nov.

Figs. 5, 5a.

The specimen (73) (allotment 62, parish of Jumbunna) on which this species is founded is shown in Fig. 5 ; it consists of a slender axis, 5 cm. long, bearing obcuneate pinnules with very clearly preserved dichotomous veins and marginal sori. No individual sporangia can be recognised, but the distal edge of the pinnules appears to be folded over as an indusium covering a marginal row of sporangia represented by carbonaceous patches. (Fig. 5a).

The recent genera with which the fossil may be compared are *Adiantum* and *Lindsaya ;* on the whole certain species of the latter genus exhibit the closest resemblance. In *Lindsaya* the sori are marginal, circular, or linear, and the edge of the fertile segments is more or less modified as an indusium.

The fossil pinnules do not show any distinct or well-defined sori, but, so far as it is possible to judge, the sporangia appear to be arranged as a fairly continuous marginal series. (Fig. 5a). *Lindsaya stricta*, Dry., of tropical America, and *L. flabellulata*, Dry., occurring in Northern India, the Malay region, Northern Australia, and elsewhere, differ but slightly from *Adiantites Lindsayoides*. Such species of *Adiantum* as *A. hispidulum*, Sw., and *A. flabellatum*, L., also agree fairly closely with the fossil form, but in *Adiantum* the sori are usually separate and not continuous as in *Lindsaya*.

Localities.—Allotment 62, parish of Jumbunna ; allotment 39c, Jumbunna East.

Other Specimens.—140 (allotment 39c, Jumbunna East) is a much less perfect example of the same type.

Family Cyatheaceæ.

GENUS CONIOPTERIS, BRONGNIART.

This generic name has been employed for certain mesozoic ferns which agree with recent Dicksonieæ in the form of the sori, and in the habit of the fronds occupy a more or less intermediate position between *Pecopteris* and *Sphenopteris*.‡ The reason for employing this term in preference to such generic titles as *Dicksonia* and *Thyrsopteris*, which have frequently been used for jurassic species on insufficient grounds, is that we avoid the implication of an identity with recent types, which cannot in the majority of cases be proved.

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* Zeiller (00), p. 102.
† *e.g.*, Kidston (89), p. 421.
‡ Seward (00), p. 98.

There can be little or no doubt that many of the forms referred to *Coniopteris* are true members of the Cyatheaceæ, but without more abundant evidence than is usually available, it would be rash to employ the name of a recent genus.

Among existing ferns the differences between Polypodiaceæ and Dicksonieæ are not always well defined, and when our knowledge of the fossils is based on imperfect material and without the aid of internal structure, it is advisable to avoid the use of a name which implies a generic identity which cannot be demonstrated.

Coniopteris hymenophylloides, Brongn., var. australica.

Figs. 6–9.

1828. *Sphenopteris hymenophylloides*, Brongniart.
Hist. veg. foss., p. 189, pl. LVI., Fig. 4.
Pecopteris Murrayana, *ibid.*, p. 358, Pl. CXXVI., Fig. 5.
1829. *Sphenopteris stipata*, Phillips, Geol. Yorks., p. 147, Pl. x., Fig. 8.
S. muscoides, *ibid.*, p. 153, Pl. x., Fig. 10.
1835. *Sphenopteris arguta*, Lindley and Hutton, Foss. Flor., Pl. clxviii.
Tympanophora simplex, *ibid.*, Pl. clxx., A.
T. racemosa, *ibid.*, Pl. clxx., B.
1836. *Hymenophyllites Phillipsii*, Göppert, Foss. Farrn., p. 256.
1838. *Sphenopteris hymenophylloides*, Sternberg, Flor. Vorwelt, p. 60.
Polystichites Murrayana, *ibid.*, p. 117.
1850. *Hymenophyllites Phillipsii*, Unger, Gen. spec. plant. foss., p. 129.
1851. *Sphenopteris nephrocarpa*, Bunbury, Quart. Journ. Geol. Soc., Vol. vii., p. 179, Pl. xii., Figs. 1*a* and 1*b*.
1856. *Hymenophyllites Phillipsii*, Zigno, Flor. foss. Oolit., Vol. 1, p. 90.
H. Murrayana, *ibid.*, p. 92.
1863. Cf. *Sphenopteris Bunburyanus*, Oldham and Morris, Pal. Ind., Pl. xxxii., p. 54.
Cf. *Pecopteris lobata* (*pars*), *ibid.*, Pl. xxix., p. 52.
1873. *Sphenopteris Pellati*, Saporta, Pal. Franc., Vol. 1, p. 278; Pl. xxxi., Fig. 1.
1876. *Thyrsopteris Murrayana*, Heer, Flor. foss. Arct., Vol. iv. (2), p. 30, Pl. 1, Fig. 4; Pl. ii., Figs. 1–4; Pl. viii., Fig. 11*b*.
Thyrsopteris Maakiana, *ibid.*, p. 31, Pl. 1, Figs. 1–3, 5, 6.
1878. *Thyrsopteris Murrayana*, *ibid.*, Vol. v. (2), p. 1. Pl. 1, Fig. 6.
Dicksonites clavipes, *ibid.*, p. 33, Pl. ii., Fig. 7.
1880. *Thyrsopteris Maakiana*, Nathorst, Berättelse, p. 38.
Dicksonia nephrocarpa, *ibid.*, p. 56.
1892. *Thyrsopteris Murrayana*, Raciborski, Flor. Krak., p. 130, Pl. x., Figs. 15 and 16; Pl. 12, Figs. 17–21.
Dicksonia Heerii, *ibid.*, p. 174, Pl. 10, Figs. 5–14.
D. Zarecznyi, *ibid.* (*pars*), p. 175, Pl. 12, Figs. 8, 9, 11, and 12.
Thyrsopteris (*Sphenopteris*) *Murrayana*, Fox-Strangways, p. 136.
Sphenopteris affinis, *ibid.*, p. 134.
S. dissocialis, *ibid.*, p. 135.
Dicksonia (*Sphenopteris*) *hymenophylloides*, *ibid.*, p. 130.
D. (*S.*) *nephrocarpa*, *ibid.*
Sphenopteris muscoides, *ibid.*, p. 135.

The species *Coniopteris hymenophylloides*, founded by Brongniart under the name *Sphenopteris hymenophylloides*, had a wide geographical distribution during the jurassic period; it is recorded from England, France, Portugal, Poland, Bornholm, Italy, the Arctic regions, North America, Japan, China, and India. The material from the English plant-beds of the Yorkshire coast is especially rich, and it is on this that the following diagnosis is based :—

Frond tripinnate; pinnæ linear acuminate, attached to the rachis at a wide angle; the pinnules vary considerably in size and shape, in some forms they have a few broad and rounded lobes, and in others the lamina is deeply dissected into narrow linear segments. The fertile pinnules bear the sori at the ends of the veins; the lamina is usually much reduced, and in extreme cases the fertile segments agree closely with those of *Thyrsopteris elegans*, Kze., or *Dicksonia Bertevana*, Hook. The sori are partly enclosed in a cup-shaped indusium; the sporangia appear to have an oblique annulus of the cyatheaceous type. The two lowest pinnules of the pinna are often characterized by their unusual shape, the lower half of each pinnule consisting of long spreading and irregular *aphlebia*-like lobes.

Venation and form of the frond of the *Sphenopteris* type.

The specimens from Victoria agree so closely with English examples that to distinguish the two forms by a different specific designation would be to allow a wide geographical separation to outweigh other and more important considerations. I am unable to recognize any essential differences between the Australian and European types; the latter are much more abundantly represented and exhibit a wider range as regards the form of the pinnules. The fertile pinnæ of the European fern are often characterized by a considerable reduction in the lamina, but in this respect there is not a little variation; in the Victorian specimens the fertile pinnæ are practically identical with the sterile, except in the occurrence of sori at the tips of the lobes.

The occasional occurrence in the English specimens of long *aphlebia*-like lobes at the base of the pinnæ* is a feature which is not shown in the Australian fern, but this may be due to lack of material. We may describe the Australian type as apparently specifically identical with the European *Coniopteris hymenophylloides*, but characterized by a greater resemblance between sterile and fertile pinnules, and, perhaps, by the absence of the peculiar modified pinnules at the base of the pinnæ.

These slight differences, though probably of no essential importance, together with the fact of the wide separation in space between northern Europe and Victoria, render it advisable to add the term *australica* as a distinguishing designation for the Southern type.

Various species of *Sphenopteris* have been described from Australian localities by Morris, McCoy, and other authors, but as the fragments are usually small and sterile it is difficult to decide as to their identity with *Coniopteris hymenophylloides*. Morris's species, *S. lobifolia*,† from the Newcastle beds is of similar habit to *C. hymenophylloides*. McCoy's, *S. hastata*,‡ represents a frond comparable with the Victorian fern, and can hardly be distinguished from *S. germanus* of the same author. These two species of McCoy may be

* Seward (00), Pl. XXI., Figs. 1–4.
† Morris (45), p. 246, Pl. vii., Fig. 3.
‡ McCoy (47), p. 149, Pl. x., Fig. 1.

identical with Morris's, *S. lobifolia*. The fragments figured by Tenison-Woods as *Sphenopteris flabellifolia*, var. *erecta*,† are too small to determine, but they may be identical with the Victorian type. Shirley's species, *Sphenopteris lacunosa*,‡ so named from the occurrence of apparent holes in the pinnules, which no doubt represent sori, is probably a distinct form. Some of the specimens of fertile pinnæ of a fern reproduced in Stirling's Reports as *Sphenopteris Warragulensis*§ may be specifically identical with those described below.

Fig. 6 (1, Allotment 65, parish of Jumbunna).—Part of fertile pinnæ 5.5 cm. long; a few faint impressions of individual sporangia were detected showing traces of radially disposed dark lines, which, no doubt, mark the position of the thick-walled cells of the annulus.

Fig. 7 (28, Allotment 65, parish of Jumbunna).—Similar to Fig. 6; the enlarged pinnule (Fig. 7a) shows the marginal occurrence of the oval or circular sori, but it is impossible to recognise details of sporangial structure.

Fig. 8 (13, Allotment 65, parish of Jumbunna).—Portion of a frond showing the tripinnate habit. compare with the English specimen represented in Volume I. of the Jurassic Flora, Pl. XX., Fig. 2,‖ and with the plant figured by Möller as *Dicksonia Pingelii* from Bornholm.¶

Fig. 9 (223, Outtrim Railway Cutting).—Part of a pinna in which the ultimate segments are of a narrower type than those shown in Figs. 6–8. This bears a resemblance to a fragment named by Stirling *Sphenopteris Travisi*.**

Localities.—Allotment 65, parish of Jumbunna; allotment 32A, Kongwak; Outtrim Railway Cutting; allotment 53, Jumbunna East; allotment 20, Jumbunna East.

Other Specimens.—3, 4, 6, 7, 10, 14, 15, and 26, allotment 65, Jumbunna East; 31, allotment 53, Jumbunna East; 172, allotment 20, Jumbunna East; and two doubtful specimens, 195, allotment 32A, Kongwak; 206, Railway Cutting, Outtrim.

Filicales of uncertain Position.

genus sphenopteris, brongniart.

Sphenopteris ampla, McCoy.

Figs. 10–16.

1892. *Sphenopteris ampla*, McCoy, in Stirling's Report, p. 11, Pl. 1., Fig. 7.
1899. *S. ampla*, Stirling's Report, p. 4, Pl. 3, Figs. 1, 2, 5, 6.

The species may be defined as follows :—

Frond bipinnate, of the *Sphenopteris* type of venation; the ultimate segments vary in form and breadth, some are elongate-oval with a serrate margin, while others, in the apical region of the frond, and in the distal portions of pinnæ are long and narrow with acutely pointed serration. The material is too meagre to admit of a fuller diagnosis.

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† Tenison-Woods (83), p. 94, Pl. II., Fig. 2.
‡ Shirley (98), p. 19, Pl. XV., Fig. 1.
§ Stirling (92), p. 11, Pl. 1, Fig. 6; (99), Pl. 4.
‖ Seward (00).
¶ Möller (02), Pl. I., Fig. 2.
** Stirling (99), Pl.3, Fig. 17.

The fern fragments figured by Oldham and Morris from the Rajmahal Hills as *Sphenopteris* (?) *Hislopi* bear a close resemblance to several specimens from Victoria. The Australian and Indian plants may well be identical; the greater abundance of the Victorian material enables us to recognise certain features which are not shown in the Rajmahal specimens, but it is by no means certain that the differences are of sufficient importance to justify specific separation. I have, however, adopted the name applied by McCoy to specimens figured by Stirling, which are, in all probability, specifically identical with those described below. Specimens like that shown in Fig. 15 represent the tips of pinnæ—portions of fronds not found in the Indian material; the ultimate segment in the Victorian examples have rather more acute apices than those figured by Oldham and Morris. The plant referred by Shirley* to *Sphenopteris superba* bears a fairly close resemblance to specimens of *S. ampla* like that represented in Fig. 15. Some of the specimens figured by Fontaine from the Potomac beds of North America as species of *Thinnfeldia*† appear to be very similar to the Victorian fragments.

It is difficult to decide as to the best course to adopt in regard to nomenclature in the present instance; to apply the term *Sphenopteris Hislopi* to the Victorian fern would, perhaps, be over rash, but while accepting McCoy's name, I would emphasize the very close agreement between *Sphenopteris ampla* and the Indian fern *S. Hislopi*.

Ettingshausen's genus *Thinnfeldia* might be applied to the specimens represented in Figs. 10–16; but the characteristic forked pinnæ of such a species as *T. odontopteroides*, Morr.,‡ from the Stormberg beds of South Africa are not represented in *Sphenopteris ampla*, the branching of which appears to have been that of a bipinnate or tripinnate fern frond.

Fig. 10 (103, Allotment 39c, Jumbunna East).—A fragment 4 cm. in length exhibiting very clearly the *Sphenopteris* type of venation. The imperfect apical portion bears a close resemblance to the tips of the pinnæ represented in Fig. 15. Compare Stirling's Pl. 3, Fig. 6.§

Fig. 11 (F, Allotment 65, Jumbunna).—An imperfect specimen showing portions of two pinnæ with ovate segments, very similar to that figured by Stirling.‖

Fig. 12 (D, Allotment 65, Jumbunna).—The lower pinnæ agree closely with those of Fig. 15, while the terminal lobes may be compared with those of Fig. 10.

Fig. 13 (79, Allotment 32a, Kongwak).—A very indistinct specimen, but probably a larger form of *Sphenopteris ampla*.

Fig. 14 (76, allotment 62, Jumbunna).—A terminal fragment with obscure venation.

Fig. 15 (9, allotment 65, Jumbunna).—Portions of two pinnæ showing acute segments and indistinct veins.

Fig. 16 (75, allotment 62, Jumbunna).—The apex of a frond; the linear terminal portion is of the same form as the pinnæ represented in Fig. 15.

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* Shirley (98), Pl. IV.
† Fontaine (89), Pls. 36, 37.
‡ Feistmantel (89), Pl. I.
§ Stirling (99).
‖ Stirling (99), Pl. 3, Fig. 17.

Localities.—Lance Creek, Baregowa, allotment 65, parish of Jumbunna; allotment 32A, parish of Kongwak; allotment 39C, Jumbunna East; allotment 55, Jumbunna; allotment 49, Jumbunna; allotment 48, Jumbunna East; Scott Creek, allotment 62, Jumbunna; allotment 20, Jumbunna East; Rainbow Creek, Moyarra, allotment 50, Jumbunna East; McKenzie's coal seam, allotment 53A, Jumbunna; allotment 20, Jumbunna East; Kilcunda; allotment 30, Jumbunna East; Foster River, allotment 29A, Jumbunna East.

Other Specimens.—18, allotment 65, Jumbunna; 35, allotment 55, Jumbunna; 47, allotments 29 and 51, Jumbunna (51 with *Tæniopteris Daintreei*); 74 and 78, allotment 62, Jumbunna; 80, 81, 82, 83 (the reverse of 9—Fig. 15), 86, and 88, allotment 48, Jumbunna East; 92 and 95, allotment 62, Jumbunna; 100, 101, 102, 104, 106, 107, 108, 109, 110, 111, and 112, allotment 39C, Jumbunna East; 115 and 116, allotment 20, Jumbunna East; 128 and 130, allotment 50, Jumbunna East (venation of 130 very clear); 136, 137, 138, and 139, allotment 39C, Jumbunna East (139 intermediate between Figs. 10 and 15), 153, and 164, allotment 53A, Jumbunna; 173, allotment 20, Jumbunna East; 181, allotment 32A, Kongwak; 197, Kilcunda; 215, allotment 39C, Jumbunna East; 221, allotment 30, Jumbunna East.

Sphenopteris (?) sp.

Fig. 17.

The fragment represented in Fig. 17 (170), allotment 20, Jumbunna East, is, no doubt, identical with the unnamed form figured by Stirling in his Pl. I., Fig. 5;* it may be compared also with *Trichomanites laxum* and *T. spinifolium* of Tenison-Woods.† The available material is too fragmentary and imperfect to enable one to attempt a diagnosis sufficient to justify the institution of a new specific name. Possibly the name *Eremopteris Warragulensis*, McCoy, mentioned by Stirling, may have been applied by McCoy to the fragments represented in the figure (Pl. I., Fig. 5) already referred to, but this is not stated in Stirling's notes on the fossil plants.

Locality.—Allotment 20, Jumbunna East, South Gippsland.

GENUS TÆNIOPTERIS, BRONGNIART.‡

The leaves which it is customary to include in this genus are in the majority of cases considered to be simple fronds of ferns, which, in the absence of sori or individual sporangia, it is impossible to assign to a particular family. We cannot always be sure whether the leaves were borne as simple fronds or as pinnæ of compound fronds; but in some cases, *e.g.*, *Tæniopteris vittata*, Brongn., the axis of the frond is prolonged beyond the base of the lamina as a petiole which must have been borne directly on the stem. In the case of pinnate fronds with simple pinnæ it would be rash to attempt to discriminate between ferns and cycads, as the class to which the leaves should be referred, without

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* Stirling (92).

† Tenison-Woods (83), Pl. III., Fig. 7; Pl. X., Fig. 2.

‡ Dun (98) has given an interesting account of this type of fern as represented in Australian rocks.

the evidence of reproductive organs. The pinnæ of the recent South African cycad, *Stangeria paradoxa*, agree in venation characters and form with *Tæniopteris* and in a fossil state they could hardly be distinguished from fern fronds.

As regards the *Tæniopteris* leaves from Victoria, the balance of evidence is in favour of regarding them as the simple fronds of a fern, but unfortunately no satisfactory fertile specimens have been found, and therefore the systematic position of the plant must remain unsettled.

Tæniopteris Daintreei, McCoy.

Figs. 18–22.

1850. *Tæniopteris spatulata*, McClelland, Rep. Geol. Surv. India, p. 53, Pl. XVI., Fig. 1.

1860. *Tæniopteris Daintreei*, McCoy, Trans. Roy. Soc. Vict., vol. v., p. 97.

1863. *Stangerites spatulata*, Oldham and Morris, *Foss. Flor. Gond.*, p. 34, Pl. VI., Figs. 1–6.

S. spatulata, var. *multinervis*, *ibid.*, p. 34, Pl. VI., Fig. 7.

1867. *Tæniopteris spathulata*, Schenk, *Foss. Flor. Grenzsck*, p. 101.

1869. *Angiopteridium spathulatum*, Schimper, *Trait. Pal. Veg.*, vol. I., p. 605.

1874. *Tæniopteris Daintreei*, McCoy, *Pal. Vict.*, p. 15, Pl. XIV., Figs. 1 and 2.

1877. *Angiopteridium spathulatum*, Feistmantel, *Foss. Flor. Gond.* (77[1]), p. 45.

A. McClellandi, *ibid.*, Pl. XLVI., Fig. 6.

1877. *A. spathulatum*, Feistmantel, *Foss. Flor. Gond.* (77[2]), Pl. I., Figs. 6B, 7B.

1878. *Tæniopteris Daintreei*, Etheridge, *Cat. Austrl. Foss.*, p. 100.

1879. *A. spathulatum*, Feistmantel, *Foss. Flor. Gond.*, p. 10, Pl. I., Figs. 8–13, 17, 18; Pl. II., Figs. 3, 5, 6; Pl. XV., Fig. 11.

A. McClellandi, *ibid.*, Pl. I., Figs. 14–16; Pl. II., Fig. 4.

1883. *Tæniopteris Daintreei*, Tenison-Woods, *Proc. Linn. Soc. New South Wales*, vol. VIII., p. 117.

1887. *Tæniopteris Daintreei*, Johnston, *Proc. Roy. Soc. Tasmania*, p. 375.

1889. *T. Daintreei*, Feistmantel, *Geol.-Pal. Verhält Süd Afrikas*, Pl. II., Fig. 11.

1890. *T. Daintreei*, Feistmantel, *Mem. Geol. Surv. New South Wales*, p. 114, Pl. XXVII., Figs. 4, 5; Pl. XXVIII., Fig. 6.

1892. *T. Daintreei*, Jack and Etheridge, *Geol. Queensland*, p. 371.

T. Daintreei, Stirling's Report, p. 12, Pl. 2, Figs. 11 and 12.

1898. *T. spatulata*, Shirley, *Queensland Geol. Surv. Bull.* No. 7, p. 23.

1898. *Angiopteridium spathulatum*, Dun, Report Aust. Assoc. Adv. Science, Sydney, p. 390.

1899. *T. Daintreei*, Stirling's Report, p. 3, Pl. 1, Fig. 2; Pl. 2, Figs. 4, 7; Pl. 2A.

Frond simple linear, long and narrow, reaching a length of more than 7cm., and varying in breadth from 1.5mm. to slightly more than 1cm. The apex is either gradually tapered to an acuminate tip or bluntly rounded; towards the petiole the lamina becomes gradually narrower. Midrib stout and

prominent, giving off numerous secondary veins, usually at right angles; these veins are frequently forked close to the midrib, or the branching may occur at varying distances between the midrib and the edge of the leaf. The veins are delicate and numerous, approximately fifteen veins per 5mm. of lamina. Towards the apex of the fronds the secondary veins become oblique, branching at a wide angle from the midrib.

This species is represented by numerous specimens, many of which show the venation characters very clearly. The leaves always occur singly, and afford no indication of having been attached to a pinnate frond; they vary considerably in breadth, and it is impossible to determine where to draw the limit in attempting a diagnosis of the species. It is not improbable that the leaves, which range in breadth from about 1cm. to more than 3cm., may be specifically identical with the narrower type as defined above, but for convenience the wider form may be designated *Tæniopteris Daintreei*, var. *major*. The broader fronds bear a strong likeness to Brongniart's *Tæniopteris vittata*; but, as I have elsewhere urged, an accurate specific separation of the numerous sterile *Tæniopteris* fronds is a hopeless task.*

The narrower form of frond (Figs. 21, 22), as figured also by McCoy and Feistmantel, appears to be a type distinct from European species. The discovery of the specimens named by McCoy *Tæniopteris Daintreei*† led to a lengthy and unnecessarily personal controversy as to the nature of the plant and its value as evidence of geological age. McCoy regarded *Tæniopteris Daintreei* as evidence in favour of a Jurassic horizon for the Cape Paterson beds, Victoria, where the species was found, while Clarke refused to admit that the discovery of *Tæniopteris* was an adverse fact for those who held to a lower horizon.

The numerous narrow fronds figured by Oldham and Morris‡ and afterwards by Feistmantel§ from the Rajmahal series of Bengal and other parts of India as *Stangerites spathulata* and *Angiopteridium spathulatum* are undoubtedly identical with McCoy's species. The species, *Tæniopteris spatulata*, was originally defined by McClelland as follows:—Frond linear, 2 or 3 inches long, narrow at the base, becoming broader towards the apex or subspatulate.‖

Schenk¶ mentions the Indian fern, *Tæniopteris spathulata*, as being near to his *T. Muensteri*, a type which is usually, and no doubt correctly, placed in the Marattiaceæ on evidence furnished by soral characters. The European plant is, I believe, a distinct species, and as yet we have no data which enables us to refer either the Australian or Indian fronds to a particular family of ferns. The Queensland fern figured by Carruthers** as *Tæniopteris Daintreei* is much broader than McCoy's type, and, as several writers have suggested, it is probably a distinct species, identical, as Feistmantel suggested, with a fern from the Stromberg beds which that author named *Tæniopteris Carruthersi*.††

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* Seward (00), p. 158.
† McCoy (60).
‡ Oldham and Morris (63), Pl. VI.
§ Feistmantel (77²), Pl. I; (79), Pls. I., II., XV.
‖ McClelland (50), p. 53.
¶ Schenk (67), p. 101.
** Carruthers (72), Pl. XXVII., Fig. 6.
†† Feistmantel (89), Pl. II.

Since writing the above I find that Mr. Dun,* in an important contribution to our knowledge of *Tæniopteris* has also expressed the view that the Indian type named by McClelland *Angiopteridium spathulatum* is identical with McCoy's species. In referring the Australian fern to the genus *Angiopteridium* Dun adopts a course, for which, in my opinion, we lack the necessary evidence.

Shirley† gives a figure of *Tæniopteris Tenison-Woodsi* and regards the obliquity of the secondary veins as a feature which distinguishes the species from *T. Daintreei*. This author records *T. spathulata*‡ from Denmark Hill, Ipswich, and under the name *T. Etheridgei*§ figures an imperfect frond hardly distinguishable from *T. Tenison-Woodsi*. The specimen of *T. Daintreei* figured by Stirling as exhibiting fructification appears to be too imperfect to afford any evidence of the nature of the sporangia.||

Fig. 18 (128, allotment 50, Jumbunna East).—A slab of sandstone 12 cm. by 14 cm. with numerous leaves of *Tæniopteris Daintreei*. None of the fronds are perfect, but some reach a length of more than 6 cm. The venation is clearly shown in some of the leaves.

Fig. 19 (192, allotment 32A, Kongwak).—The apical portion of a frond. The apex may be either bluntly rounded, as in the figure, or gradually tapered as shown in the specimen represented in Fig. 20. Fig. 19 shows very clearly the characteristic *Tæniopteris* venation; the secondary veins may be simple, but they are more frequently forked either close to their origin from the midrib, or at different positions in the lamina.

Fig. 20 (53, allotment 49, Jumbunna).—A fragment illustrating the more pointed type of apex; the lamina is 6 mm. in breadth.

Fig. 21 (187, allotment 32A, Kongwak).—Two very narrow leaves of *Tæniopteris Daintreei*.

Fig. 22 (42, allotment 49, Jumbunna).—A fragment, 2.5 mm. in breadth, showing the forked secondary veins of the narrowest form of this species as represented in Fig. 21.

Localities.—Allotment 1, Kongwak; allotment 33C, Kongwak; allotment 32A, Kongwak; allotment 49, Jumbunna; allotment 48, Jumbunna East; Foster River; allotment 13, Jumbunna East; Rainbow Creek, allotment 50, Jumbunna East; Irvine's Creek, Cape Otway district; allotment 53, Jumbunna East.

Other specimens.—25, allotment 65, Jumbunna; 29, allotment 32A, Kongwak; 32, allotment 53, Jumbunna East; 41, 45, 48 (frond 8 mm. broad, very clearly shown), 50, 52, 53, 54, 55, 57 (acuminate apex), 58 and 59, allotment 49, Jumbunna; 84, allotment 48, Jumbunna East; 98 and 99, allotment 13, Jumbunna East; 129 and 131, allotment 50, Jumbunna East (131 with a fragment of *Taxites*); 176, 178, 184, 185, 189 (narrower form), 193 and 194, allotment 32A, Kongwak; 200, allotment 1, Kongwak; 205 (2.8 mm. broad), allotment 33C, Kongwak; 209 (3 mm. broad), Irvine's Creek, Cape Otway district; 214, allotment 13, Jumbunna East.

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* Dun (98).
† Shirley (98), p. 23, Pl. IX., Fig. 2.
‡ *Ibid.*, p. 23.
§ *Ibid.*, Pl. IX., Fig. 1.
|| Stirling (99), Pl. 2, Fig. 4.

Tæniopteris Daintreei, McCoy, var. major.

Figs. 23, 24.

1899. *Tæniopteris Carruthersi*, Stirling's Report, p. 4, Pl. 1, Figs. 1 and 2.

Under this designation are included a few broader leaves which it seems more convenient to refer to McCoy's species than to separate, without more evidence than is available, under a distinct specific name. The species *Tæniopteris Carruthersi* is most probably a distinct type, and characteristic of a somewhat lower geological horizon.*

Fig. 23 (167).—Portions of two imperfect fronds, the larger one is 8.5 mm. long and 2 cm. broad, tapering gradually towards the base. The smaller leaf is 7 cm. in length, and 1.7 cm. in breadth; the veins are not very clearly shown but they appear to agree with those represented in Fig. 19.

Fig. 24 (199).—A portion of a leaf 1.7 cm. broad, with venation like that of Fig. 19.

Localities.—McKenzie's coal seam, allotment 53A, Jumbunna; allotment 1, Kongwak; allotment 32A, Kongwak;

Other specimens.—151 and 152, allotment 53A, Jumbunna; 168, allotment 20, Jumbunna East; 177, allotment 32A, Kongwak.

Family Osmundaceæ ?

Genus Cladophlebis, Brongniart.

This genus† was instituted in 1849 from species of *Pecopteris* previously included in the section Neuropterides. Certain species of the *Cladophlebis* type may be referred to the Polypodiaceæ, as shown by soral characters, while others bear a strong resemblance to the Osmundaceous type, as represented by the recent species *Todea barbara*, Moore. The frequent occurrence of the *Cladophlebis* type of frond among recent ferns belonging to different families necessitates the utmost caution in attempting to assign fossil fronds to definite families without good evidence of fertile pinnæ.

Cladophlebis denticulata, Brongn., var. australis, Morris.

Figs. 25–27.

1828. *Pecopteris denticulata*, Brongniart, *Prodrome*, p. 57; *Hist.* vég. foss. p. 301, Pl. xcviii., Figs. 1 and 2.

1845. *Pecopteris australis*, Morris, *Strzelecki's New South Wales*, p. 248, Pl. vii., Figs. 1 and 2.

1863. *Pecopteris indica*, Oldham and Morris, *Foss. Flor. Gond.*, p. 47, Pl. xxvii.

1869. *Alethopteris australis*, Schimper, *Trai. pal. veg.*, I., p. 569.

1875. *Pecopteris australis* (*P. Scarburgensis*), McCoy, *Pal. Vict.*, p. 16, Pl. xiv., Fig. 3.

1877. *Alethopteris indica*, Feistmantel (77), *Flor. Foss. Gond.*, p. 37, Pl. xxxvi., Fig. 4.

Asplenites macrocarpus, *ibid.*, Pl. xxxvi., Figs. 5–7; Pl. xxxvii., Figs. 3, 4; Pl. xlviii., Fig. 2.

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* Feistmantel (89).

† See Seward (94), p. 87.

A. macrocarpus, Feistmantel (77), Pl. i., Figs. 1 and 2.
Cladophlebis indica, ibid., Pl. i., Figs. 3–5.
1878. *Pecopteris australis*, Etheridge, *Catal.*, p. 97.
1883. *Alethopteris australis*, Tenison-Woods, *Proc. Linn. Soc. New South Wales*, vol. viii., p. 111.
A. concinna, ibid., p. 112., Pl. ix., Fig. 1.
1883. *Todea australis*, Renault, *Cours. foss. bot.* III., p. 81, Pl. xi.
1885. *Alethopteris australis*, Curran, *Proc. Linn. Soc. New South Wales*, vol. ix., p. 251.
1887. *Alethopteris australis*, Johnston, *Proc. Roy. Soc. Tasmania*, p. 374.
1888. *A. australis*, Johnston, *Geol. Tasmania*, Pl. xxi., Figs. 5, 6, 8.
? *A. serratifolia, ibid.*, Pl. xxiii.
1890. *Alethopteris australis*, Feistmantel, *Mem. Geol. Surv.. New South Wales*, p. 109, Pl. xxvii., Fig. 3.
A. concinna, ibid., p. 110.
1892. *A. australis*, Jack and Etheridge, *Geol. Queensland*, p. 316.
1892. *Alethopteris australis*, Stirling, Reports, p. 11.
1898. *Todea australis*, Shirley, *Queensland Geol. Surv.*, p. 17.
1899. *T. australis*, Potonié, in Engler and Prantl, p. 378.
Alethopteris australis, Stirling's Report, p. 3, Pl. 2, Fig. 3.

Frond bipinnate, pinnæ oblique, pinnules slightly falcate or straight, margin entire or serrate near the apex, attached to the pinna axis by the whole of the base, apex acute or slightly obtuse ; a well defined midrib, from which dichotomously branched secondary veins are given off at an acute angle. The pinnules reach a length of more than 3 cm., the fertile segments are practically identical in shape with the sterile, bearing oblique linear sori parallel to the secondary veins.

In 1845 Morris gave the name *Pecopteris australis* to a plant from the Jerusalem Basin, Tasmania, which he described as follows :—" Frond bipinnate, 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 ; midrib slightly flexuous, evanescing towards the apex ; veins oblique, bipinnate, or dichotomous."*

Morris pointed out the resemblance of this type of frond to *Pecopteris Whitbiensis*, Brongn. and *P. Lindleyana*, Royle.

The name *P. Whitbiensis*, as I have elsewhere shown,† has been applied to various forms of bipinnate frond from different mesozoic horizons ; some of them are no doubt identical with *Cladophlebis denticulata*, but many must be referred to *Todites Williamsoni*.‡

Pecopteris Lindleyana, Royle, has been recently re-described by Arber as *Cladophlebis Roylei*§ from the type-specimen in the British Museum. In 1863 Oldham and Morris described as a new species—*Pecopteris indica*—specimens of bipinnate fronds from the Rajmahal series, Bengal ; they recognised the close resemblance to Morris's *P. australis*, but considered the venation characters

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* Morris (45), p. 248.
† Seward (00), p. 136.
‡ *Ibid.*, p. 88.
§ Arber (01), p. 548.

sufficiently distinct to warrant a specific separation.* McCoy† expressed the opinion that Morris's species is identical with an English fern named by Bean (M.S.S.) *Pecopteris Scarburgensis*,‡ a plant identical with *Cladophlebis denticulata*.

The fertile specimen of the New South Wales fern figured by Renault§ bear linear sori parallel to the secondary veins; the sporangia are described as globular-elliptical in shape, and characterized by the occurrence of a sub-apical group of thicker walled cells, as in the recent Osmundaceæ.

Shirley,‖ in referring to Renault's description, speaks of the existence of other fertile examples in the Brisbane Museum. This author also describes a bipinnate frond from Ipswich under the name *Scolecopteris australis*,¶ which he places in the Marattiaceæ, on evidence which appears inadequate. It is not improbable that Shirley's species is identical with Morris's type, and with *Cladophlebis denticulata*. Jack and Etheridge** are disposed to regard John ston's *Alethopteris serratifolia* as identical with Morris's species, and they also suggest that Unger's *Polypodium Hochstetteri*†† from New Zealand is indistinguishable from the New South Wales type.

The Indian specimens figured by Feistmantel as *Asplenites macrocarpus*‡‡ may, I believe, be regarded as fertile fronds of Morris's *Pecopteris australis*. *Asplenites Ottonis*, Schenk,§§ with which Feistmantel compares the Indian fronds, not improbably represents the fertile frond of *Alethopteris Roesserti*, Presl. Some fragments of pinnae from the plant-beds of the Yorkshire coast which I have described as fertile portions of *Cladophlebis denticulata*,‖‖ may be identical with *Asplenites macrocarpus*. These English fragments are not sufficiently well preserved to show the structure of the sporangia, but it has recently been pointed out that in the form and disposition of the sori they agree closely with fertile pinnae of *Todea barbara*.¶¶ Renault's account of the sporangia from the New South Wales frond afford more trustworthy evidence in favour of this comparison. On the whole, the safe course is to adopt the name *Cladophlebis denticulata* for this Australian fern, thus including it with fronds from various European localities in a type with an almost world-wide distribution in the rhaetic and lower jurassic periods, adding that such evidence as we at present possess points to a family relationship with the existing genus *Todea*. We might go further, and follow Renault in the use of the generic name *Todea*, or preferably *Todites*, for this type of frond; but until additional fertile specimens have been examined it is better to adhere to the non-committal designation *Cladophlebis*. A specimen figured by Kurtz*** from a liassic horizon in the Argentine as *Asplenites macrocarpus*, O. and M., is probably a

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* Oldham and Morris (63), p. 47.
† McCoy (75), p. 16.
‡ Seward (00), p. 140.
§ Renault (83), p. 140.
‖ Shirley (98), p. 17.
¶ Shirley (98), p. 17, Pl. XII.
** Jack and Etheridge (92), p. 370.
†† Unger (64).
‡‡ Feistmantel (77), Pls. XXXVI., &c., and (77), Pl. I.
§§ Schenk (67), Pl. XI.
‖‖ Seward (00), Pl. XX., Fig. 3*b*.
¶¶ [Seward and Ford (03).]
*** Kurtz (01), Pl. III., Figs. 1 and 2.

closely allied fern. In speaking of the Australian specimens as *Cladophlebis denticulata*, var. *australis*, I have adopted a course which may not find favour with my co-workers. It has already been pointed out that such a pinnate type of frond as that represented by *Cladophlebis denticulata* has a world-wide distribution in mesozoic floras, and among recent ferns the same type recurs in several genera. The slight variations in the form of the pinnules, the occasional occurrence of fine denticulations, as in most of the English examples of Brongniart's species, or the apparently entire margin of the lamina, as in the Victorian fragments, are, I believe, of insufficient importance to serve as marks of specific distinction. Seeing that there is—as I think—no satisfactory reason for definitely separating the Australian from the European species, and on the other hand admitting the possibility or even probability that this bipinnate type of leaf may have been borne by ferns specifically or even generically distinct, by adding the name *australis* to Brongniart's species *Cladophlebis denticulata*, we state the fact that this particular example of *Cladophlebis* agrees with the fern referred to by various authors as *Alethopteris australis*, and at the same time belongs to that group of fronds of which *C. denticulata* represents the central or standard form.

Fig. 25 (163, allotment 53A, Jumbunna).—Part of a pinna; pinnules 1.5cm. in length. The forked secondary veins are clearly shown on the lamina from which the carbonaceous film has been removed (Fig. 25a).

Fig. 26 (180, allotment 32A, Kongwak).—A portion of a pinnule 9mm. broad, in which the veins are very clearly preserved.

Fig. 27 (166, allotment 53A, Jumbunna).—The longest pinnule has a length of 4cm.; the venation, which is clearly seen in places, agrees with that of Fig. 26. Compare Stirling, (99) Pl. 2, Fig. 3.

Localities.—McKenzie's coal seam, allotment 53A, Jumbunna; allotment 32A, Kongwak; Welshpool.

Other Specimens.—152, 154, and 158, allotment 53A, Jumbunna (with 152 and 154 the broader form of *Tæniopteris* also occurs). 174, Welshpool; 190, allotment 32A, Kongwak.

GENUS THINNFELDIA, ETTINGSHAUSEN.

Thinnfeldia McCoyi, sp. nov.

Fig. 28.

The specimens on which this species is founded are fragments of what is presumably a fern frond characterized by broad and obliquely pointed pinnules with decurrent lower margins, and having the *Neuropteris* type of venation. Each segment is traversed by a midrib, which dies out near the apex, and from which dichotomously branched secondary veins are given off at an acute angle.

A somewhat similar form of leaf is figured by Raciborski* from Poland as *Thinnfeldia* (?)*Haiburnensis*, but, so far as it is possible to judge from small and imperfect specimens, the type represented in Fig. 28 appears to be a form not hitherto described.

Fig. 28 (149, allotment 53A, Jumbunna).—Part of a pinna 6cm. long; the most complete pinnule is 2.5cm. in length, and 1.5cm. broad.

Localities.—McKenzie's coal seam, allotment 53A, Jumbunna; allotment 32A, parish of Kongwak.

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* Raciborski (94), Pl. XX., Figs. 3–6.

Other Specimens.—159 and 162, allotment 53A, Jumbunna; 183, allotment 32A, Kongwak.

Thinnfeldia sp.

Fig. 29.

Fig. 29 (Specimen 90).—An imperfect leaflet rather more than 3cm. long, characterized by a distinct midrib, and curved dichotomously branched lateral veins. The specimen is too small to determine with certainty, but it may be compared with Feistmantel's *Thinnfeldia indica* from the Rajmahal Hills,* and with *T. indica*, var. *media*, as figured by Shirley.†

Locality.—Allotment 49. Jumbunna.

Specimen 89, allotment 49, Jumbunna, is no doubt a smaller piece of the the same form.

GENUS RHIZOMOPTERIS, SCHIMPER.

Rhizomopteris Etheridgei, sp. nov.

Figs. 30–34.

The specimens included under this name are unfortunately very fragmentary, but they seem to be of sufficient interest to be referred to a distinct species. A full diagnosis is from the nature of the material impossible, but the following description of the figured fragments will serve to indicate what I believe to be their most likely interpretation.

Fig. 30 (226, Coal Creek Mine, Korumburra).—This stem fragment shows three oval scars about 3mm. broad, two of which are seen in the figure; it presents a characteristic appearance when seen under a low magnifying power, the surface bears numerous and very small pits arranged in irregular transverse lines, which present the appearance of fine sculpturing; this feature is too small to show in a drawing such as that of Fig. 30, represented natural size, but is clearly seen in the enlarged drawing from another specimen (227, Coal Creek Mine, Korumburra), reproduced in Fig. 32. In addition to this minute sculpturing there are a few pits or scars having the form of a circular depression, about 5mm. in diameter, enclosing a central smaller pit as seen in Fig. 30*a*. A few of the pits are also shown, natural size, in Fig. 30.

Figs. 31 and 32 (227, Coal Creek Mine, Korumburra).—A fragment similar to 226 (Fig. 30); one of the larger scars and the fine surface-sculpturing are shown in Fig. 32. Fig. 32 exhibits more clearly the nature of the larger scars, which have the form of an oval projection lying in a slight depression, and exhibiting a broad U-shaped groove with the free ends bent inwards.

Fig. 33 (228, Coal Creek Mine, Korumburra).—In this specimen none of the larger scars are seen, but the surface of the stem bears numerous circular scars or pits similar to those represented in Figs. 30 and 30*a*. By the side of this stem-fragment one sees on the surface of the rock several impressions of small linear appendages lying obliquely to the stem. These may well be slender roots which were attached by a circular base to the stem; the small scars of Figs. 30 and 33 probably represent the points of exit of these adventitious roots, the central dot in the middle of each of the scars (Fig. 30*a*) marking the position of the single vascular bundle with which each root was supplied.

* Feistmantel (77), Pl. XXXIX.
† Shirley (98), Pl. V., Fig. 1.

Fig. 34 (228, Coal Creek Mine, Korumburra).—This represents one of several flattened fragments, slightly more than 3mm. in breadth, found in close association with the *Rhizomopteris*, and which may be portions of petioles originally attached to the large oval scars shown in Figs. 30–32.

The specimens may be regarded as fragments of a fern stem or rhizome, which bore scattered fronds, each of which was traversed by a single stele of a broadly U-shaped form similar to that of a frond of *Todea* or *Osmunda*. The small circular scars (Fig. 30*a*) probably mark the points of origin of numerous adventitious roots which clothed the stem as in recent species of Osmundaceæ, and the still finer dots, shown in Fig. 32, may possibly indicate the presence of hairs or ramenta. It is impossible to connect this stem with any particular type of frond, but there is the possibility that *Rhizomopteris Etheridgei* is a young stem which bore leaves of the type *Cladophlebis denticulata*, var. *australis*, a fern which is not improbably a member of the Osmundaceæ. But, in the absence of evidence as to the fronds borne by *R. Etheridgei*, we must for the present regard the fragments shown in Figs. 30–34 as probably those of a fern of doubtful systematic position.

Locality.—Coal Creek Mine, Korumburra.

Fragments of Fern Fronds.

1. Specimen 219, from allotment 30, parish of Jumbunna East, represents a small fern frond in the form of a circinately coiled rachis.

2. Specimen 210, from peg 267, parish of Jumbunna East, is no doubt part of a fern rachis with portions of a few pinna axes, but with no trace of pinnules; the collection includes several other fragments, *e.g.*, 132, Elms Creek, Jumbunna East; 155, allotment 53A, Jumbunna; 186, allotment 32A, Kongwak; 200, allotment 1, Kongwak, which may probably be those of the rachises of ferns.

3. Specimen 127, east of Foster River, Moyarra.—A portion of a pinna of a frond too small to determine.

CLASS GINKGOALES.

This division of the Gymnosperms is now generally adopted as the best means of expressing the isolation of the solitary existing species *Ginkgo biloba*, the Maidenhair Tree. It is customary to make use of the generic name *Ginkgo* for the numerous fossil leaves which in form and venation are often indistinguishable from the recent species. Braun's genus *Baiera* is applied to leaves resembling *Ginkgo* in shape, but differing in their narrower and more numerous segments; while it is convenient to retain this name for certain forms of leaves it must be recognised that the distinction between *Ginkgo* and *Baiera* is one of degree, and the choice of one or other term is decided by characters of little or no importance.

The occurrence of transitional forms between more or less entire leaves, such as occur abundantly in the Maidenhair Tree (*Ginkgo biloba*) and like *Ginkgo antarctica*, Sap.,* among fossil types, and those with a much divided lamina with narrow segments, demonstrate the impossibility of strictly defining the limits of the two genera.

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* Ratte (88[3]), Pl. III.; Shirley (98), Pl. I.

Genus Ginkgo, Kaempfer.

Ginkgo sp.

Fig. 35.

Fig. 35 (C., allotment 49, Jumbunna).—The leaf fragment shown in the figure appears to belong to a leaf consisting of a petiole bearing a fan-shaped lamina, divided by a deep median sulcus into two halves, a form of leaf like that of the existing *Ginkgo biloba*. The specimen shows no trace of any division of the lamina into lobes other than the two broad segments separated by a median sulcus; this character points to *Ginkgo* as the most fitting generic designation. The imperfect nature of the specimen and the known variability of *Ginkgo* leaves render it inadvisable to add any specific designation. The specimen may be compared with a small form of *Ginkgo digitata*, Brongn.* It is not improbable that some of the smaller specimens figured by Stirling as *Baiera subgracilis*† may be identical with the type represented in Fig. 35.

Specimen 201 (allotment 1, parish of Kongwak) is similar to that shown in the figure.

Genus Baiera, Braun.

Baiera australis, McCoy.

Figs. 36, 37.

1892. *Baiera australis*, Stirling's Report, Pl. I., Fig. 2.
1899. *Baiera australis*, Stirling's Report, p. 5, Pl. 1, Fig. 3.

Leaves of similar form to those of *Baiera Phillipsi*, Nath., but of rather smaller size. The deeply dissected lamina in the specimens figured (Figs. 36, 37) consists of five linear segments, each traversed by several veins and tapering distally to a bluntly rounded apex.

In Stirling's "Reports on the Victorian Coal-fields," several fragments of *Baiera* leaves are figured as *Baiera australis*, McCoy,‡ which are no doubt specifically identical with those shown in my figures 36 and 37. I have therefore adopted McCoy's term for the Victorian leaves described in the above definition.

This form of leaf bears a resemblance both to *Baiera gracilis*, Bunb., and to *B. Phillipsi*, Nath.; it occupies an intermediate position between the two species, differing from the typical examples of the former in its slightly smaller size and in the smaller number and greater width of the segments, while the divisions of the lamina are slightly narrower than those of *Baiera Phillipsi*. The type of leaf from the English oolite originally described by Phillips as *Sphenopteris longifolia*, and more recently named by Nathorst, *Baiera Phillipsi*,§ agrees closely with those shown in Fig. 36 as regards the size of the lamina, but in the Victorian specimens the veins in each segment are fewer in number and wider apart. A leaf somewhat similar in form, is figured by Nathorst from rhaetic beds of Scania as *Ginkgo taeniata*,‖ and Heer's species, *Ginkgo Sibirica*,¶

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* Seward (00), Pl. IX., Fig. 10.
† Stirling (99), Pl. 1, Figs. 5 and 6.
‡ Stirling (92), Pl. 1, Fig. 2; and (99), Pl. I.
§ Seward (00), p. 270, Fig. 47; and Pl. IX., Fig. 4.
‖ Nathorst (78), Pl. XIII., Fig. 17.
¶ Heer (77).

includes examples closely resembling *Baiera australis*. Tenison-Woods' Ipswich species, *Jeanpaulia bidens*,* represents a type of leaf very similar to the Gippsland species.

Fig. 36 (220, allotment 30, Jumbunna East).—The lamina is not quite complete, and the number of segments may have originally exceeded five; the longest segment has a length of 2·3cm., and is 4mm. in breadth.

Fig. 37 (202, allotment 1, parish of Kongwak).—The lamina is less spreading than in the leaf shown in Fig. 36; in the broadest segment there appear to be nine or ten veins.

Localities.—Allotment 30, Jumbunna East; allotment 32A, Kongwak.

Other Specimen.—29 (Allotment 32A, Kongwak).

Baiera delicatula, sp. nov.

Fig. 38.

Leaf of similar form to *Baiera gracilis*, Bunb., and *B. Muensteriana*, Presl, but of smaller size. The lamina, which is dissected into numerous narrow linear segments, is bisected by a deep median sinus.

This form of leaf may be conveniently regarded as a type distinct from *Baiera australis;* while agreeing in the numerous narrow segments with *B. gracilis* it can hardly be included under that species. The specimen shown in Fig. 38 suggests a leaf of more delicate texture than *B. australis;* the slender and spreading segments might represent the ultimate divisions of a fern frond such as *Actinopteris radiata* or *Schizæa dichotoma*.†

Fig. 38 (208, Irvine's Creek, Otway district).—The petiole is 1·8cm. in length, and the lamina is approximately 3·5cm. broad; the veins are hardly visible.

Locality.—Irvine's Creek, Otway district.

Previous writers have shown that the Ginkgoales were formerly represented in the Australian flora. In 1883 Tenison-Woods‡ figured a leaf under the name *Jeanpaulia bidens* from the Burnett River coal, which he placed in the Ophioglossaceæ. Feistmantel§ included this species, as *Baiera bidens*, in the Taxaceæ, and Shirley‖ adopted the generic name *Ginkgo* for Tenison-Woods' type, which he compared with Heer's *Ginkgo Sibirica* and *G. Schmidtiana*. In 1888 Ratte described an unusually large leaf as *Jeanpaulia palmata*, from the Wianamatta shales, which he speaks of as Triassic; in a later note the same author adopts the generic name *Salisburia*.¶ More recently Shirley** has recorded additional leaves of the *Ginkgo* and *Baiera* type from the Ipswich formation of Queensland. The leaf named by Saporta, ††*Salisburia antarctica*, and figured also by Ratte and Shirley,‡‡ may be added to the list of Australian representatives of the Ginkgoales. In Stirling's Reports of 1892 and 1899

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* Tenison-Woods (83).
† Seward and Gowan (00), Pl. X., Figs. 60 and 67.
‡ Tenison-Woods (83), p. 132, Pl. IV., Fig. 3.
§ Feistmantel (90), p. 158.
‖ Shirley (98), p. 12, Pls. XIX. and XXI.
¶ Ratte (88), p. 1078, Pl. XVII. (88^2), (88^3).
** Shirley (98).
†† Saporta (85), p. 142, Fig. 71, A.
‡‡ Shirley (98), Pl. I., Fig. 1.

Baiera leaves from Korumburra, similar in form to those shown in my Figs. 36 and 37, but of larger size, are figured as *Baiera subgracilis*, McCoy.* In the following list I have made some alterations in nomenclature, which appear to me to express the affinities of the Australian types.

Baiera multifida, Font.

1888. *Salisburia palmata*, Ratte.
1898. *Ginkgo Simmondsi*, Shirley.

The leaves described by Ratte and Shirley may be identical with Fontaine's species from North American rhaetic beds.† Mr. Arber‡ in a recent paper on Australian plants expresses himself in agreement with this opinion.§

Baiera bidens, Ten.-Woods.

A form very similar to Bunbury's *Baiera gracilis*‖ from England and other European regions.

Baiera ginkgoales, Shirley.¶

B. Ipsviciensis, Shirley.**

The leaf named by Shirley, *Ginkgo phœniciformis* is represented by a fragment too small for determination.

Baiera subgracilis, McCoy.

A large type of leaf from Gippsland,†† with several fairly broad linear segments, comparable with *B. bidens*, T.-Woods.

Ginkgo antarctica, Sap.

1885. *Salisburia antarctica*, Saporta.
1888. *S. antarctica*, Ratte.
1898. *Ginkgo antarctica*, Shirley.

This type is recorded by Shirley from Denmark Hill, Ipswich.

A fragment figured by Johnston from Tasmania as *Salisburia Hobartensis* ‡‡ may be compared with *Baiera Phillipsi*, Nath., from the Yorkshire oolite rocks, but the specimen on which Johnston founded his species is hardly large enough for identification.

In addition to the leaves referred to above, the fossils described by Shirley as *Stachyopitys annularioides* and *S. Simmondsi* may be compared with Schenk's rhaetic species *Stachyopitys Preslii*, and, like the latter type, may possibly represent male flowers of one of the Ginkgoales.

Female Flowers (Ginkgoales) (?).

Figs. 39, 40.

The collection includes several fragmentary specimens which are too imperfect to identify with any certainty, but it is possible they may be portions of a female inflorescence of *Ginkgo* or *Baiera*. In one specimen (Fig. 39, specimen 188, allotment 32A, Kongwak), there is a portion of an axis giving

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* Stirling (92), Pl. 2, Fig. 13 ; (99), Pl. 1.
† Fontaine (92), Pl. II., Fig. 13.
‡ Arber (02), p. 4.
§ See also Seward and Gowan (00), p. 139.
‖ See Seward (00), p. 263, Pl. IX., Figs. 3 and 5.
¶ Shirley (98), Pl. III., Fig. 1.
** *Ibid.*, Pl. III., Fig. 2.
†† Stirling (92), Pl. 2, Fig. 13 ; (99), Pl. 1.
‡‡ Johnston (88), Pl. XXVIII., Fig. 2.

off a few short branches approximately at right angles, which appear to be slightly expanded distally, and show traces of having borne terminal appendages. In the example represented in Fig. 40 (121, allotment 39, Jumbunna), we have a single curved lateral branch bearing a seed-like body 3mm. long; some detached seeds occur on the same piece of rock with fragments of branches or pedicels. In other specimens (*e.g.*, 114) pieces of a broader axis are seen, which may perhaps be identified as portions of the central axis of the inflorescence. It would be seen that the organ consisted of a central axis, about 2mm. in diameter, bearing short curved lateral members, each of which terminated distally in a single seed. It might be suggested that the fossils represent portions of a root or rhizome bearing oval bulbils, but, on the whole, I prefer to consider them as fragments of a female inflorescence.

In 1898 Shirley described some specimens from the Ipswich beds, Queensland, as *Beania geminata*,* but I am inclined to think they do not conform sufficiently to Carruthers' type, *Beania gracilis*,† to be included in his genus; some of the Queensland examples are not unlike the Victorian fragments. The slender pedicel shown in the lower part of Shirley's Fig. 1*b*, Pl. XX., may be compared with the specimen represented in Fig. 40 (No. 121, allotment 39, Jumbunna). Some of the inflorescences figured by Heer from Siberia, *e.g.*, *Czekanowskia setacea*,‡ probably belong to a member of the Ginkgoales, and may be compared with the specimens shown in Figs. 39 and 40. Similarly Nathorst's *Zamiostrobus stenorrachis*§ from the rhaetic beds of Scania, appears to be of the same type, and differs chiefly in size from the Victorian specimens. Nathorst subsequently followed Saporta in employing *Stenorrachis*‖ as a generic designation in place of *Zamiostrobus*.

The material is too meagre for specific designation, we can only suggest the possibility that the fragments belong to a female inflorescence, probably of the same species of either *Ginkgo* or *Baiera*.

Localities.—Allotment 39, Jumbunna; allotment 32A, Kongwak.

Other specimens.—120, 125, and 126 (allotment 39, Jumbunna).

CLASS CYCADOPHYTA, NATHORST.

In a recent memoir¶ Nathorst has suggested the use of the comprehensive term Cycadophyta for plants which are believed to be Cycadean, but which, from insufficiency of data, cannot be referred either to the Bennettitales or the Cycadales. The Bennettitales include plants known to possess reproductive organs of the Bennettites type, while in the Cycadales are included plants with organs of reproduction constructed on the same plan as those of existing Cycads. Nathorst's proposal appears to me a good one, as tending to a more scientific classification of plants which in many cases are unfortunately known to us only in the condition of vegetative leaves.

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* Shirley (98), p. 16, Pl. XX.
† Carruthers (69²).
‡ Heer (82), Pl. VI., Fig. 15.
§ Nathorst (75), Pl. XIII.; (02), Pl. I., Figs. 16, 17.
‖ Nathorst (97), p. 20, Pl. I., Fig. 15.
¶ Nathorst (02).

Genus Nilssonia, Brongniart.

Nilssonia sp.

Fig. 41.

An imperfect fragment of a frond, (161, allotment 53A, Jumbunna), 4cm. in length, the rachis being represented by a broad groove from which are given off truncate segments preserved in such a manner as to show no trace of veins. The form of the frond is similar to that of *Nilssonia compta*, Phill., an inferior oolite species, and of *N. Schaumburgensis*, Dunk., of wealden age. Some fragments figured by Shirley as *Pterophyllum Yerongense** from Yeronge may possibly be identical with the form represented in Fig. 41, but the material is too scanty to admit of a definite expression of opinion.

Among Indian species, a specimen figured by Feistmantel as *Anomozamites Lindleyanus*† agrees most closely with the fragment shown in Fig. 41.

The material is too meagre to enable one to decide between *Anomozamites* and *Nilssonia* as the more suitable designation.

Class Coniferales.

Family Araucarieæ.

Genus Araucarites, Presl.

Araucarites sp. A.

Fig 42.

Fig. 42 (77, allotment 62, Jumbunna).—The single scale, 1·8cm. in length, represented in the figure is probably that of an Araucarian cone, there is a central depressed area, which no doubt marks the position of the single seed, with a slightly projecting ridge on each side. This form of scale may be compared with that of *Araucarites Phillipsi*, Carr.,‡ and with Feistmantel's *A. Cutchensis*.§ The narrower end is that by which the scale was attached to the cone; close to the broader distal margin there is a slightly projecting point, shown as a darker dot in the drawing, which may represent the so-called ligule of certain types of recent *Araucariæ*, but the preservation is not sufficiently clear to admit of a more complete description. On the whole the scale suggests a comparison with those of the female cones of such species of *Araucaria* as *A. Cookii*, *A. Rulei*, &c., which belong to the section *Eutacta*.

Araucarites, sp. B.

Fig. 43.

Fig. 43 (146, allotment 50, Jumbunna East).—This smaller and broader scale shows very clearly the impression of a single central seed, and exhibits still closer agreement with the Eutacta type of cone-scale among recent Araucariæ.

Localities.—Allotment 50, Jumbunna East; allotment 49, Jumbunna; allotment 20, Jumbunna East.

Other Specimens.—11 (2.7cm. long, showing a raised central region occupied by the seed, allotment 65, Jumbunna); 43, allotment 49, Jumbunna; 143, allotment 50, Jumbunna East; 169 and 171, allotment 20, Jumbunna East.

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* Shirley (97[2]), Pl. VII., Figs. *b* and *c*.
† Feistmantel (79), Pl. XVI., Fig. 3.
‡ Carruthers (69); Seward (00), p. 285, Pl. X., Fig. 4.
§ Feistmantel, (76) Pl. IX., Figs. 1–3.

CONIFERALES (INCERTÆ SEDIS).

Cf. Brachyphyllum sp.

Fig. 44.

Fig. 44 (36, allotment 55, Jumbunna).—This fragment, represented in the figure twice natural size, shows a few transversely elongated carbonaceous cushion-like projections about 4.5mm. broad, which may represent the scale-leaves of a coniferous twig of the *Brachyphyllum* type.

TAXITES, BRONGNIART.

Taxites, sp.

Under this comprehensive generic name we may include a single fragment from the Jumbunna district, consisting of a small piece of a shoot bearing linear leaves traversed by a single vein, and terminating in an acuminate apex. The leaves are approximately 1.5cm. in length; they taper towards the base, and appear to be irregularly disposed on the axis of the shoot. The specimen is no doubt a fragment of a coniferous branch, with spirally-arranged univeined leaves, similar to various mesozoic species referred to *Taxites*, *Palissya*, *Sequoia*, and other genera. A comparison may be made with *Taxites zamioides* (Leck. ex Bean MS.)* from the Yorkshire oolite, *T. planus*, Feist., from the Upper Gondwanas of India,† and various other species. The fossil described by Tenison-Woods from Ipswich‡ is similar to the Jumbunna specimen, but the photograph which he gives is too indistinct to show the characters clearly. The specimens figured by Stirling§ as *Palissya australis*, McCoy, may well be identical with the fragment described above.

FRAGMENT OF A CONIFER ?

Fig. 45.

Specimen 38, allotment 55, Jumbunna.—This fragment, 4mm. in diameter shown in the figure ~~three~~ times natural size, resolves itself, on magnification, into a number of small rounded bosses, separated from one another by an intervening depression; the bosses appear to be arranged spirally, and each is marked by a central depression. Schenk,‖ in his Rhaetic Flora, figures the slightly magnified surface of a portion of a shoot of *Schizolepis Brauni*, in which the points of attachment of the clustered leaves are represented by regular raised areas, each with a central depression. In all probability the fragment shown in Fig. 45 is part of a coniferous shoot which bore small crowded leaves, the cushions or bases of which form the bosses, while the exit of the leaf-traces is shown in the depressed dot in the centre of each small boss.

Locality.—Allotment 55, Jumbunna.

GYMNOSPERMÆ (INCERTÆ SEDIS).

GENUS CARPOLITHES, STERNBERG.

Carpolithes, sp. A.

Fig. 46.

Under this generic term we may include some small seeds which probably belonged either to a Cycadean plant or to a member of the Ginkgoales. There is little to be gained by giving a specific name to detached and imperfectly preserved seeds of doubtful affinity.

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* Seward (00), p. 300, Pl. X., Fig. 5.
† Feistmantel (79), Pls. XIII.—XV.
‡ Tenison-Woods (83), p. 160, Pl. IX., Fig. 3.
§ Stirling (99), Pl. 3, Figs. 8, 9.
‖ Schenk (67), Pl. XLIV., Fig. 4A.

Fig. 46 (145, allotment 50, Jumbunna East).—This specimen, 8mm. long by 7mm. broad, consists of a prominent central portion, surrounded in its apical and lateral portions by a narrow flattened border. Similar seeds have been figured by various others, but it is needless to institute a comparison.

Localities.—Allotment 22, Jumbunna East; Rainbow Creek, allotment 50, Jumbunna East;

Other Specimens.—33, allotment 97, Korumburra; 113, allotment 22, Jumbunna East; 142, allotment 50, Jumbunna East.

Carpolithes, sp. B.

In addition to the seeds referred to under *Carpolithes* sp. A, there are a few which differ in their smaller size from that shown in Fig. 46, and may possibly belong to a distinct type.

Localities.—Allotment 97, Korumburra; allotment 50, Jumbunna East.

Other Specimens.—63, 141.

PLANTÆ (INCERTÆ SEDIS).

Fig. 47.

Fig. 47 (216).—This fragment bears some resemblance to an Equisetaceous nodal diaphragm, with portions of linear leaves, but it may perhaps be more accurately described as a portion of a rhizome or root, bearing lateral appendages or rootlets.

Localities.—Allotment 29A, Jumbunna East; allotment 65, Jumbunna.

Other specimens which may be fragments of rhizomes or roots :—22, allotment 65, Jumbunna; 118 and 218, allotment 16, Jumbunna East.

C.—CONCLUSION.

It remains to consider the composition and affinities of the flora represented by the fragmentary specimens from Gippsland. Much of the material is, unfortunately, too imperfect to refer with confidence to previously recorded species, and some of the determinations, which have been made with a certain amount of hesitation, are not of much value in assisting us to form an estimate of the geological horizon represented by the Victorian fossils. One fact that must be borne in mind in making an analysis of the flora is the close correspondence, as regards general composition, of floras described from various part of the world from strata referred to both the rhaetic and jurassic series.

The small number of Victorian species recognised in the Gippsland collection renders difficult a definite statement as to the geological horizon of the plant-bearing beds. Several of the species are almost indistinguishable from types recorded from the inferior oolite beds of England; of these we have—

Lycopodites Victoriæ,
Coniopteris hymenophylloides, var. *Australica*,
Tæniopteris Daintreei, var. *major*,
Cladophlebis denticulata, var. *australis*.
Ginkgo, sp.,
Baiera australis,
Baiera delicatula,
Nilssonia, sp.,
Araucarites, sp.,
Taxites, sp.

It is true that some of these species also bear a very close resemblance to plants recorded from a somewhat lower horizon. Species of *Tæniopteris* are usually unsatisfactory as criteria of age owing to the close resemblance between leaves of this type from rocks ranging from rhaetic to wealden; but the narrow type, *T. Daintreei*, is an uncommon form, which occurs also in India in strata included in the Rajmahal and in the Kota-maleri series; that is, in beds usually regarded as liassic and lower oolite respectively. *Lycopodites Victoriæ* is very similar to the plant named by Oldham and Morris *Araucarites gracilis* from the Rajmahal Hills, and *Sphenopteris Hislopi* from the same beds may be identical with *Sphenopteris ampla* of Gippsland.

The genus *Thinnfeldia*, to which I have referred a few of the Australian specimens, is in some forms characteristic of rhaetic strata, but the fragments from Gippsland do not exhibit much resemblance to the more typical older forms, and in themselves they do not afford an argument against a jurassic age.

On the whole, it would seem probable that these fragmentary relics of a mesozoic vegetation may be regarded as representatives of a jurassic flora, approximately of the same age as the inferior oolite flora of England, or with that of the Rajmahal series of India.

D.—EXPLANATION OF FIGURES.

With a few exceptions, where the magnification is mentioned, the figures are reproduced natural size.

Fig. 1. *Equisetites* sp.

Nodal diaphragms.

Figs. 2–4. *Lycopodites Victoriæ*, sp. nov.

Fig. 2*a*. Leaflet, enlarged twice natural size.

Figs. 5–5*a*. *Adiantites Lindsayoides*, sp. nov.

Fig. 5*a* twice natural size.

Figs. 6–9. *Coniopteris hymenophylloides*, Brongn., var. *Australica*.

Fig. 7*a* twice natural size.

Figs. 10–16. *Sphenopteris ampla*, McCoy.

Fig. 17. *Sphenopteris* sp.

Figs. 18–22. *Tæniopteris Daintreei*, McCoy.

Figs. 23, 24. *T. Daintreei*, McCoy, var. *major*.

Figs. 25–27. *Cladophlebis denticulata*, Brongn., var. *australis*, Morris.

Fig. 28. *Thinnfeldia McCoyi*, sp. nov.

Fig. 29. *Thinnfeldia* sp.

Figs. 30–34. *Rhizomopteris Etheridgei*, sp. nov.

Fig. 32 enlarged twice natural size.

Fig. 35. *Ginkgo* sp.

Figs. 36, 37. *Baiera australis*, McCoy.

Fig. 38. *Baiera delicatula*, sp. nov.

Figs. 39, 40. Female Flowers of Ginkgoales ?

Fig. 41. *Nilssonia* sp.

Fig. 42. *Araucarites* sp. A.

Fig. 43. *Araucarites* sp. B.

Fig. 44. *Brachyphyllum* sp., twice natural size.

Fig. 45. Fragment of Conifer ? three times natural size.

Fig. 46. *Carpolithes* sp. A.

Fig. 47. *Planta incertæ sedis*.

E.—BIBLIOGRAPHY.

The figures in brackets refer to the year of publication, thus (01), 1901.

Andrae, K. T. (53).—Fossile flora Siebenbürgens und des Banates. *Abh. k.-k. geol. Reichs.*, vol. ii., Abth. 3, No. 4, 1853.

Arber, E. N. (01).—Notes on Royle's types of fossil plants from India. *Geol. Mag.* viii., p. 546.

Arber, E. N. (02).—On the Clarke Collection of fossil plants from New South Wales. *Quart. Journ. Geol. Soc.*, vol. lviii., p. 1.

Brongniart, A. (28).—Prodrome d'une histoire des végétaux fossiles. *Paris*, 1828.

Brongniart, A. (28²).—Histoire des végétaux fossiles. *Paris*, 1828.

Carruthers, W. (69).—On some undescribed Coniferous Fruits from the Secondary Rocks of Britain. *Geol. Mag.*, vol. vi., (1) p. 1.

Carruthers, W. (69²).—On *Beania*, a new genus of Cycadean Fruit, from the Yorkshire Oolite. *Geol. Mag.*, vol. vi. (1), p. 97.

Carruthers, W. (72).—Notes on Fossil Plants from Queensland, Australia. *Quart. Journ. Geol. Soc.*, vol. xxviii., p. 1.

Clarke, W. B. (60).—A communication on Prof. McCoy's "new *Tæniopteris*" from the coal-bearing rocks of the Cape Paterson district. *Trans. Roy. Soc., Vict.*, vol. v., p. 89.

Clarke, W. B. (61).—*Ibid.*, vol. vi., p. 32.

Dun, W. S. (98).—Notes on the Australian Tæniopterideæ. *Report Australasian Assoc. Adv. Sci., Sydney*, 1898, p. 384.

Curran, J. M. (85).—On some fossil plants from Dubbo, New South Wales. *Proc. Linn. Soc., New South Wales*, vol. ix., p. 250.

Etheridge, R. (78).—A Catalogue of Australian Fossils. *Cambridge.*

Feistmantel, O. (76).—Fossil Flora of the Gondwana System. *Mem. Geol. Surv., India*, vol. ii., pt. 1. Jurassic (Oolitic) Flora of Kach.

Feistmantel, O. (77).—*Ibid.*, vol. i., pt. 2. Jurassic (Liassic) Flora of the Rajmahal Group in the Rajmahal Hills.

Feistmantel, O. (77²).—*Ibid.*, vol. i., pt. 3. Jurassic (Liassic) Flora of the Rajmahal Group from Golapili (near Ellore), S. Godaveri District.

Feistmantel, O. (79).—*Ibid.*, vol. i., pt. 4. Outliers of the Madras Coast.

Feismantel, O. (89).—Uebersichtliche Darstellung der geologisch-Palæontologischen Verhältnisse Süd-Afrikas. Th. 1. Abh. König. böhm. Ges. Wiss., vii. Folge, Bd. III.

Feistmantel, O. (90).—Geological and Palæontological Relations of the Coal and Plant-bearing beds of Palæozoic and Mesozoic age in Eastern Australia and Tasmania. *Mem. Geol. Surv., New South Wales;* Palæontology, No. 3.

Fontaine, W. M. (83).—Contributions to the Knowledge of the Older Mesozoic Flora of Virginia. *U. S. Geol. Surv. Mon.*, vol. vii.

Fontaine, W. M. (89).—The Potomac or Younger Mesozoic Flora. *U.S. Geol. Surv. Mon.*, vol. xv. *Washington*, 1889.

Heer, O. (77).—Flora Fossilis Arctica, vol. iv.

Heer, O. (82).—*Ibid.*, vol. vi., (ii).

Jack, R. L., and R. Etheridge, Jun. (92).—The Geology and Palæontology of Queensland and New Guinea. *Brisbane*, 1892.

JOHNSTON, R. M. (85).—General Observations regarding the classification of the Upper Palæozoic and Mesozoic rocks of Tasmania. *Proc. Roy. Soc., Tasmania*, 1886.

JOHNSTON, R. M. (87).—Fresh contributions to our knowledge of the plants of Mesozoic age in Tasmania. *Proc. Roy. Soc., Tasmania*, 1887.

JOHNSTON, R. M. (88).—Systematic account of the Geology of Tasmania.

KIDSTON, R. (89).—On some fossil plants from Teilia Quarry, Gwaenysgor, near Prestatyn, Flintshire. *Trans. Roy. Soc., Edinburgh.*, vol. xxv., p. 419.

KURTZ, — (01).—Le Lias de la Piedra Pintada. *Revista Mus. de la Plata.*

LINDLEY, J., and W. HUTTON (31).—The Fossil Flora of Great Britain.

MCCLELLAND, J. (50).—Report of the Geological Survey of India for the season 1848–9. *Calcutta.*

MCCOY, F. (47).—On the Fossil Botany and Zoology of the Rocks associated with the Coal of Australia. *Ann.* and *Mag. Nat. Hist.*, vol. xx., p. 145.

MCCOY, F. (60).——*Proc. Roy. Soc., Victoria*, vol. v., p. x.

MCCOY, F. (61).—*Ibid.*, vol. v., p. 42.

MCCOY, F., (74).—Prodromus of the Palæontology of Victoria. Dec. i–vi. *Melbourne and London*, 1874–79.

MÖLLER, H. (02).—Bidrag till Bornholms Fossila Flora. (*Lunds Universitets Arsskrift, Bd.* 38, *Afd.* 2, *Nr.* 5.) *Kongl. Fysiografisha Sällsk. Hand. Bd.* 13, No. 5.

MORRIS, J. (45).—Strzelecki's Physical Description of New South Wales and Van Dieman's Land. (Fossil Floras, p. 245.) *London.*

NATHORST, A. G. (75).—Om en cycadékotte fran den rätiska formationens lager vid Tinkarp i Skäne. *Ofvers. k. Veten. Akad. Förhand.* No. 10.

NATHORST, A. G. (78).—Beiträge zur fossilen flora Schwedens. Ueber einige rhätische Pflanzen von Pålajö in Schonen. *Stuttgart*, 1878.

NATHORST, A. G. (97).—Zur Fossilen Flora der Polarlander. Th. i. Lief. 2 : Zur Mesozoischen Flora Spitzbergens. *K. Svensk. Vet. Akad. Hand.*, vol. xxx.

NATHORST, A. G. (02).—Beiträge zur Kenntniss einiger Mesozoischen Cycadophyten. *K. Svensk. Vet. Akad. Hand.*, vol. 36, No. 4.

OLDHAM, T., and J. MORRIS (63).—Fossil Flora of the Gondwana System. Vol. i., part 1 : Fossil Flora of the Rajmahal Series in the Rajmahal Hills. *Mem. Geol. Surv., India*, ser. ii. *Calcutta*, 1880.

POTONIÉ, H. (99).—Lehrbuch der Pflanzenpalæonlotogie. *Berlin*, 1899.

POTONIÉ, H. (99^2).—In Engler and Prantl—Die Natürlichen Planzenfamilien.

RACIBORSKI, M. (94).—Flora Kopalna ogniotrwalych Glinek Krakowskich. *Pamiet. Mat. przy. Akad. Umiejetnösci.*

RATTE, — (88).—Notes on two new fossil plants from the Wianamatta Shales. *Proc. Linn. Soc., New South Wales*, vol. i., p. 1078.

RATTE,—(88^2).—Notes on some Australian fossils. *Proc. Linn. Soc., New South Wales*, vol. ii., p. 137.

RATTE, — (88^3).—Additional evidence on fossil Salisburiæ from Australia. *Ibid.*, p. 158.

RENAULT, B. (83).—Cours de botanique fossile, vol. iii. *Paris.*

SAPORTA, LE MARQUIS DE and A. F. MARION (85).—L'Evolution de règne végétal., vol, i. *Paris.*

Schenk, A. (67).—Die fossile Flora der Grenzschichten der Keupers und Lias Frankens. *Wiesbaden*, 1867.

Schimper, W. P. (69–74).—Traité de paléontologie végétale, vol. i., 1869.

Seward, A. C. (94).—Catalogue of the Mesozoic Plants in the Department of Geology, British Museum (Nat. Hist.). The Wealden Flora, pt. i.

Seward, A. C. (00).—The Jurassic Flora. I. The Yorkshire Coast, Catalogue Mesozoic Plants, Brit. Mus., 1900.

Seward, A. C., and J. Gowan, (00).—The Maidenhair Tree (*Ginkgo biloba*, L.). *Annals. Bot.* vol. xiv., p. 109.

[Seward, A. C., and S. O. Ford (03).—On the Anatomy of *Todea*, with notes on the Geological History and Affinities of the Osmundaceae. *Trans. Linn. Soc., London*, 2nd series, Botany, vol. vi., pt. 5.]

Shirley, J.(97).—On *Baiera* (or *Jeanpaulia*) *bidens*, T. W. *Proc. Roy. Soc., Queensland*, vol. xii., p. 74.

Shirley, J. (97^2).—Two new species of *Pterophyllum*. *Proc. Roy. Soc., Queensland*, vol. xii., p. 89.

Shirley, J. (98).—Additions to the Fossil Flora of Queensland. *Geol. Survey, Queensland*, Bullet. 7.

Stirling, J. (92) (93) (95).—Reports on the Victorian Coal-fields. *Dept. of Mines, Victoria.*

Stirling, J. (99).—Notes on the Fossil Flora of South Gippsland Jurassic beds. *Ibid.*, 1899.

Tenison-Woods, J. E. (83).—On the Fossil Flora of the Coal Deposits of Australia. *Proc. Linn. Soc. New South Wales*, vol. viii., pt. 1, p. 37.

Unger, F. (64).—Reise der Oesterreichischen Fregatte Novara. *Wien.*

Zigno, A. de (60).—*Quart. Journ. Geol. Soc.*, vol. xvi., p. 110.

EXPLANATION OF PLATE VIII.

Fig. 1.—*Equisetites* sp. Nodal diaphragms.

Figs. 2, 3, and 4.—*Lycopodites Victoriæ*, sp. nov.

Fig. 2A.—Leaflet, enlarged twice natural size.

Figs. 5 and 5A.—*Adiantites Lindsayoides*, sp. nov.

Fig. 5A twice natural size.

Fig. 6.—*Coniopteris hymenophylloides*, Brongn., var. *Australica*.

Fig. 1

Fig. 2a

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 5a

Fig. 6

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE IX.

Figs. 7 and 9.—*Coniopteris hymenophylloides*, Brongn., var. *Australica.*

Fig. 7A twice natural size.

Fig. 9

Fig. 7ª

Fig. 7

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE X.

Fig. 8.—*Coniopteris hymenophylloides*, Brongn., var., *Australica.*

Figs. 10 and 11.—*Sphenopteris ampla*, McCoy.

Fig. 8

Fig. 10

Fig. 11

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XI.

Fig. 13.—*Sphenopteris ampla*, McCoy.

Fig. 13

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XII.

Figs. 12, 14, and 15.—*Sphenopteris ampla*, McCoy.

Fig. 14

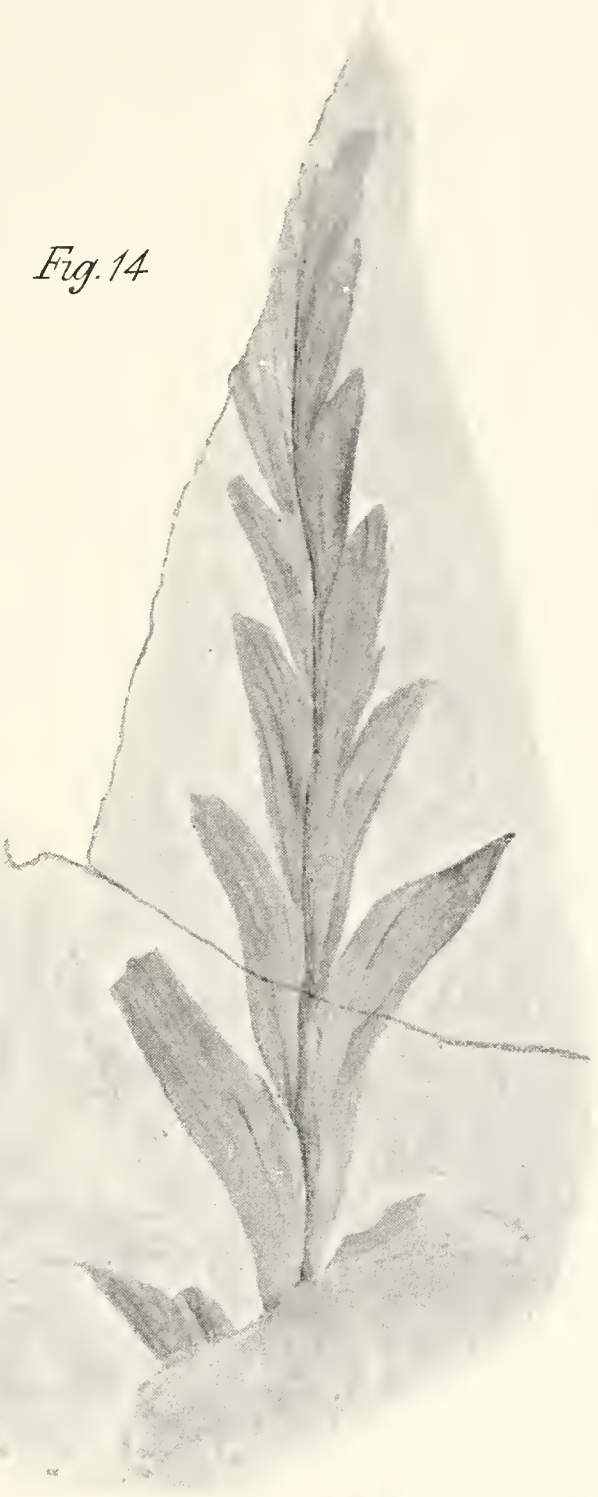

Fig. 15

Fig. 12

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XIII.

Fig. 16.—*Sphenopteris ampla*, McCoy.

Fig. 17.—*Sphenopteris* sp.

Figs. 19, 20, 21, and 22.—*Tæniopteris Daintreei*, McCoy.

Fig. 17

Fig. 16

Fig. 22

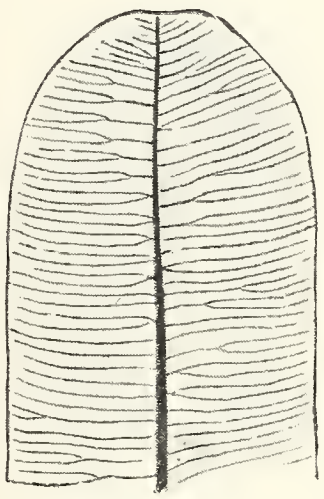

Fig. 19

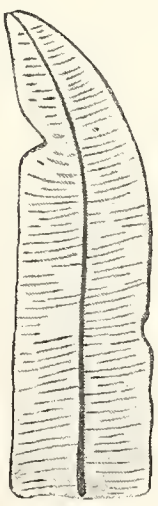

Fig. 20

Fig. 21

JURASSIC PLANTS FROM SOUTH GIPPSLAND AND OTWAY DISTRICT.

EXPLANATION OF PLATE XIV.

Fig. 18.—*Tæniopteris Daintreei*, McCoy.

Fig. 18

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XV.

Figs. 23 and 24.—*Tæniopteris Daintreei*, McCoy, var. *major*.

Fig. 24

Fig. 23

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XVI.

Figs. 25, 25A, 26, and 27.—*Cladophlebis denticulata*, Brongn., var. *australis*, Morris.

× 2

Fig. 25a

Fig. 25

Fig. 26

Fig. 27

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XVII.

Fig. 28.—*Thinnfeldia McCoyi*, sp. nov.

Fig. 29.—*Thinnfeldia* sp.

Figs. 30, 30A, 31, 32, 33, and 34.—*Rhizomopteris Etheridgei*, sp. nov. Fig. 32 enlarged twice natural size.

Fig. 35.—*Ginkgo* sp.

Fig. 30

Fig. 30a

Fig. 31

Fig. 32

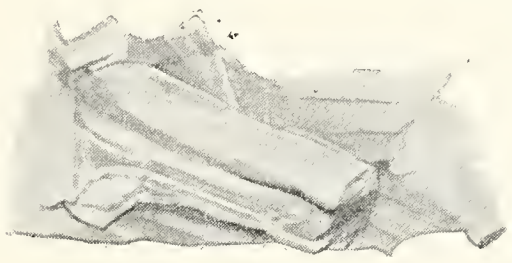

Fig. 34

Fig. 33

Fig. 28

Fig. 35

Fig. 29

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

EXPLANATION OF PLATE XVIII.

Figs. 36 and 37.—*Baiera australis*, McCoy.

Fig. 38.—*Baiera delicatula*, sp. nov.

Fig. 36

Fig. 38

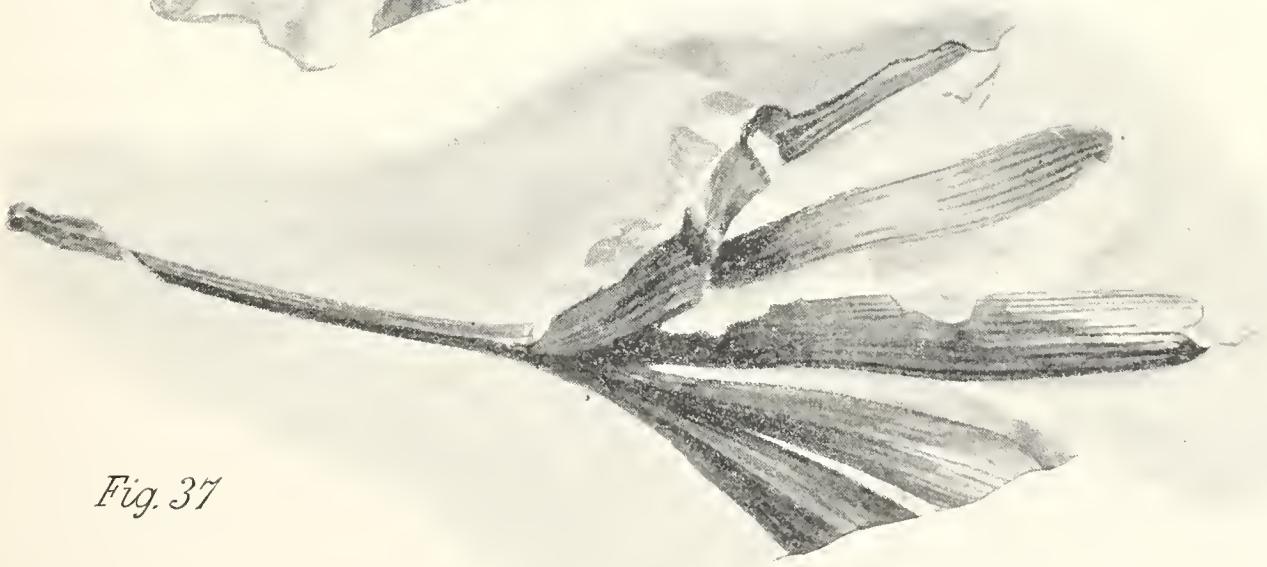

Fig. 37

JURASSIC PLANTS FROM SOUTH GIPPSLAND AND OTWAY DISTRICT.

EXPLANATION OF PLATE XIX.

Figs. 39 and 40.—Female Flowers of Ginkgoales?

Fig. 41.—*Nilssonia* sp.

Fig. 42.—*Araucarites* sp. A.

Fig. 43.—*Araucarites* sp. B.

Fig. 44.—*Brachyphyllum* sp., twice natural size.

Fig. 45.—Fragment of Conifer? ~~three~~ times natural size.

Fig. 46.—*Carpolithes* sp. A.

Fig. 47.—*Planta incertæ sedis.*

Fig. 39

Fig. 40

Fig. 41

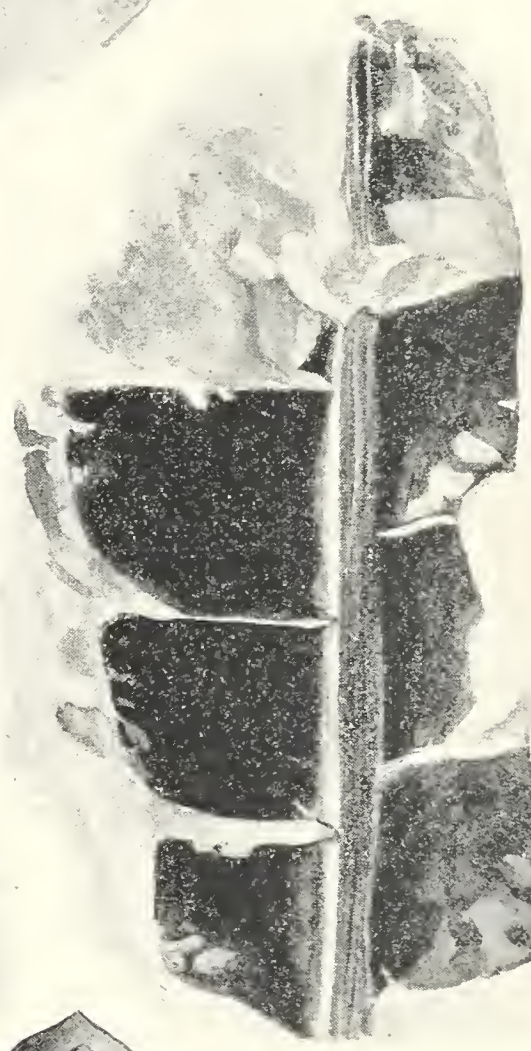

Fig. 42

Fig. 43

Fig. 46

Fig. 44

Fig. 45

Fig. 47

JURASSIC PLANTS FROM SOUTH GIPPSLAND.

FURTHER NOTES ON THE CAINOZOIC FLORA OF SENTINEL ROCK, OTWAY COAST.*

(*By Henry Deane, M.A., F.L.S.*)

(Specimens 34 to 76, and 162 to 182 inclusive.)

The leaf remains are very largely of a type related to *Coprosma*. A few others are found, but the one mentioned is the prevailing one, and gives a character to the vegetation which has been preserved in these beds. There is a singular absence of the various types prevalent in the other deposits already dealt with, namely, Pitfield, Mornington, and Berwick.

Coprosmæphyllum, gen. nov.

The characters of the genus are those of the larger leaved Coprosmæ. The midrib is well developed and rather broad, often wavy in outline, the lateral or secondary veins are alternate, and before reaching the margin, curve round and join the next above. There is a well marked series of tertiary veins, forming a coarse network between the secondary veins, and finally a finer network forming the skeleton of the whole lamina of leaf. The width of the midrib and secondary veins, especially near their base, seem to show that the living leaves were more or less fleshy or succulent, like those of the existing genus *Coprosma*.

The genus *Coprosma* flourishes at the present time in New Zealand and the Pacific Islands, and it possesses several representatives in Eastern Australia. The late Baron von Mueller united under this name the allied genus *Nertera*, which extends not only to New Zealand, but also to Antarctic and Andine America. The genus thus enlarged contains, according to the Baron's last census, ten species indigenous to South-eastern Australia; six of these are found in Victoria and five of the latter are common to Tasmania. It is not at all unlikely, therefore, that the genus *Coprosma* itself flourished in early cainozoic times in Victoria. I have, however, decided to place the fossil leaves under a new genus, *Coprosmæphyllum*, the name of which indicates the resemblance to which I have called attention.

Coprosmæphyllum ovatum, sp. nov.

Plate XX., Figs. 1, 2, and 3.

Leaf ovate, sometimes as much as 3 inches in length and $1\frac{1}{4}$ inches in breadth, tip more or less expanded, but sometimes almost pointed; base from almost cordate to somewhat attenuate. Venation generally very distinct; midrib straight or slightly wavy; lower lateral veins long, making an angle of from 30° to 35° with the midrib, curved, and running nearly parallel to the margin; the others more divergent, starting at an angle of about 45°, but also curved and bending round to meet the next above. Tertiary veins and finer network as described for the genus.

The leaves partake of the character of the three New Zealand species, *Coprosma robusta*, Raoul, *C. grandiflora*, Hooker, and *C. lucida*, Forst.

The leaves figured are those contained in Specimens 35, 57, and 168, but the same species is preserved in a large number of other specimens.

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* See Preliminary Report, Geol. Surv. Vict., Records, Vol. I., Pt. 1, p. 13.

Coprosmæphyllum angustifolium, sp. nov.

Plate XX., Figs. 4, 5, and 6.

Leaves up to $2\frac{1}{2}$ inches in length and about $\frac{3}{4}$ inch. in breadth. Base of leaf tapered, apex obtusely pointed. Venation not very prominent, lateral veins leaving the midrib at any acute angle.

This species differs from *C. ovatum, supra*, in the narrowness of its leaves, in the shape of the leaf apex, in the shortness of the basal lateral veins, and in the small angle at which the lateral veins leave the midrib; also in its less prominent venation.

The leaves figured are those in Specimens 41, 49, and 161, but the same species is preserved in several other specimens.

Coprosmæphyllum minus, sp. nov.

Plate XX., Figs. 7 and 8.

Leaves broadly ovate, from $\frac{3}{4}$ inch to $1\frac{1}{2}$ inch in length. Lateral veins starting often almost at right angles to the midrib, and strongly curved, venation in other respects that of the genus.

The leaves of this species are characterized by their generally smaller size, oval shape, and by the angle at which the lateral veins leave the midrib.

The leaves figured are those contained in Specimens 36 and 71. The same species is preserved in other specimens.

Coprosmæphyllum attenuatum, sp. nov.

Plate XX., Figs. 9 and 10.

Leaves a little more than an inch in length, and from $\frac{3}{8}$ inch to $\frac{1}{2}$ inch in width; apex tapered, almost acuminate, but the tip obtuse. Venation that of the type.

This species differs from *C. ovatum, supra*, in its smaller size and tapered apex, the apex in *C. ovatum* being expanded at the tip.

The leaves figured are those preserved in Specimens 180 and 182. Specimen No. 76 contains the same species.

Persoonia cuneata, sp. nov.

Plate XX., Figs. 11 and 12.

Leaves about $1\frac{1}{4}$ inches long, and nearly $\frac{1}{2}$ inch wide, more or less cuneate, convex. Midrib well marked, lateral veins forming an acute angle with midrib. Reticulation not visible. The character of the leaves is that of some Persooniæ, and I have therefore found it convenient to place them under that genus.

The leaves figured are those contained in Specimens 39 and 62.

Phyllocladus simplex, sp. nov.

Plate XX., Fig. 13.

Leaf narrow rhomboidal, about $1\frac{1}{2}$ inches in length, $\frac{11}{32}$ of an inch in width, obtuse, slightly falcate. Venation of closely parallel veins like *Araucaria* and its allies, also *T. phyllocladus*.

The shape of the leaf suggests affinity to *Phyllocladus rhomboidalis*, Rich., the Tasmanian species, which also possesses numerous parallel veins, and, although it is undivided, I consider it may be provisionally placed under that genus. There is, unfortunately, only one specimen, namely, that preserved in No. 44.

FERN.

Plate XX., Figs. 14 and 14a.

Lamina about 1 inch long, $\frac{1}{4}$ inch wide, with oblique base and irregularly dentate or serrate margins. Midrib clearly defined, lateral veins parallel but not close together, making an angle of about 70° with the midrib, and running out to the sinuses of the margin. Intermediate venation apparently finely reticulate.

The figure is taken from Specimen No. 40, Fig. 14a, showing a portion highly magnified.

There are some other leaves preserved, the affinities of which are uncertain, but as they are interesting, they have been figured. They are as follows :—

Leaf $1\frac{1}{4}$ inches long, $\frac{3}{8}$ inch wide, slightly curved, cordate at base, apex obtuse. Midrib well defined. Lateral veins, three or four only on each side, curved and much inclined to the midrib ; tertiary venation reticulate, the veins showing as lines running almost at right angles to the midrib, but falling away towards the margin.

The leaf (Specimen No. 47) is figured in Plate XX., Fig. 15.

Plate XX., Fig. 16, shows a leaf preserved in Specimen 52. It is about $1\frac{1}{4}$ inches long, narrow ovate ; midrib thick, slightly undulate ; lateral veins few in number, curved ; intermediate venation, reticulate, with a tendency to arrangement at right angles to the midrib and lateral veins. There is some little resemblance to Mr. R. M. Johnston's *Phyllites Breadalbanensis*, *Geol. Tas.*, Plate XLVII., Fig. 1, but the latter is longer, and has more lateral veins. A possible relationship which suggests itself is to *Ficus*.

Plate XX., Fig. 17, shows a leaf preserved in Specimen 63. The leaf is linear obtuse, about 1 inch long, rugose, and with revolute margins. The midrib is well marked ; lateral veins almost transverse, branched before reaching the margin ; tertiary venation not conspicuous. The character of the leaf resembles that of *Lasiopetalum rufum*, *R. Br.*

Plate XX., Fig. 18, shows a leaf preserved in Specimen 68. The leaf is ovate, cuneate attenuate at the base, $1\frac{1}{4}$ inches long, with smooth and revolute margins ; midrib well defined, lateral veins rather numerous, almost transverse, and apparently branching off into an irregular reticulation. Affinity to *Myrsine* suggests itself.

Plate XX., Fig. 19, shows a forked and jointed branchlet, probably *Casuarina*. The specimen in which it is preserved is No. 70.

Plate XX., Fig. 20, shows a fragment of a leaf preserved in Specimen 73. Its venation is peculiar ; its highly reticulate character resembles that of *Mirbelia*.

(Specimens Nos. 284 to 318 inclusive.)

The leaf remains are generally not well preserved, and are fragmentary. Where distinguishable they are mostly of *Coprosmæphyllum*. Some few specimens are in very good condition, notably No. 293, which is *C. ovatum*.

The series is remarkable for containing little else than these fragments of *Coprosmæphyllum* leaves. Specimen 312, however, contains two fossils which are of special interest. One is a small leaf a little over $\frac{1}{4}$ inch long, ovate, pointed at apex, with a distinct but short petiole at base. The venation is obscure, but seems to be reticulate. The affinity which suggests itself is to *Pultenæa*. (See Plate XX., Fig. 21.)

The other leaf is about $\frac{5}{8}$ inch long and very narrow. The venation is that of the parallel-veined, plurinerved type of *Acacia*.

This leaf is shown in Plate XX., Figs. 22 and 22a, the latter being magnified.

EXPLANATION OF FIGURES—PLATE XX.

Figs. 1, 2, and 3. *Coprosmæphyllum ovatum, sp. nov.*
Figs. 4, 5, and 6. *C. angustifolium, sp. nov.*
Figs. 7 and 8. *C. minus, sp. nov.*
Figs. 9 and 10. *C. attenuatum, sp. nov.*
Figs. 11 and 12. *Persoonia cuneata, sp. nov.*
Fig. 13. *Phyllocladus simplex, sp. nov.*
Fig. 14. Pinnule of fern, Fig. 14a, portion magnified.
Fig. 15. Leaf, affinity uncertain.
Fig. 16. Leaf resembling *Phyllites Breadalbanensis, R. M. Johnston.*
Fig. 17. Leaf resembling *Lasiopetalum rufum, R.Br.*
Fig. 18. Leaf of a *Myrsine* type.
Fig. 19. Branchlets of *Casuarina sp.*
Fig. 20. Fragment of leaf resembling *Mirbelia.*
Fig. 21. Small leaf with possible affinity to *Pultenæa.*
Fig. 22. Leaf with venation resembling that of *Acacia, section Plurinerves.*
Fig. 22a. Ditto, magnified.

Frank R. Leggatt, Del.

CAINOZOIC PLANTS FROM SENTINEL ROCK, OTWAY COAST.

REPORTS ON GRAPTOLITES.

(*By T. S. Hall, M.A.*)

From San Remo, Nos. 161–173.

The specimens, obtained from slate pebbles in jurassic conglomerate on the shore a little to the north-west of Griffith's Point, San Remo, are preserved in a somewhat metamorphosed slate, so that their condition is not good enough for exact determination. They are, however, of interest from the occurrence of *Callograptus* and *Ptilograptus*, which have not hitherto been recognised in Australia.

Diplograptus spp.—Specimens Nos. 163, 166, 168, 169, 171 contain obscure examples of the genus.

Climacograptus spp.—Examples occur on Specimens 163, 170, 171 (several),

Dicellograptus sp.—No. 172 shows an example with the habit of *D. sextans*. J. Hall, but no details are visible.

Dicellograptus sp.—Nos. 162, 163, and 166 contain examples of another small species about the same size as the previous one, but with a differently formed base and a pair of apertural spines.

Dictyonema sp.—No. 167 (measured), 170 (three or four examples at different levels), 173. The species has a close resemblance to *D. delicatulum*, Lapw. The occurrence of the genus is noticeable, as hitherto it has proved to be rare in Australia, except at Lancefield. Owing to its extensive range it is not of much stratigraphical value, and the specimens present are very fragmentary and badly preserved. The branches are nearly parallel and about ·25mm. in diameter. There are about sixteen branches in 1cm. (40 in an inch). The connecting bars are normal to the radiating branches, and the rectangular spaces are three or four times as long as wide.

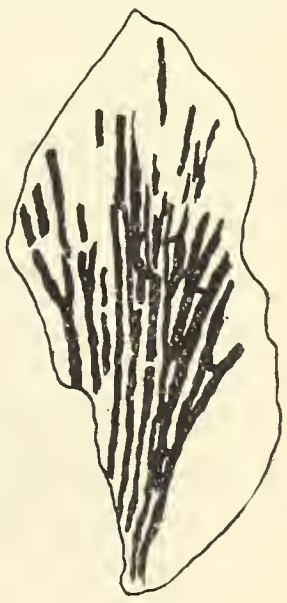

Fig. 1.
Callograptus sp.
(Nat. size.)

Callograptus sp.—Nos. 161 (figured), 165. In general appearance the fragments resemble *C. salteri*, J. Hall. They are, however, stouter than the specimens figured by Hall,* but not so much so as that figured by Hopkinson,† from St. David's, in Wales. (See Fig. 1.)

* Grap. Quebec Group, Pl. XIX., Figs. 5, 6.

† Quart. Jour. Geol. Soc., v. 31, Pl. XXXVI., Fig. 10.

Fig. 2.
Ptilograptus sp.
(Nat. size.)

Ptilograptus sp.—Nos. 161 (figured), 173. The length of the "pinnæ" is shorter than the extreme one quoted by James Hall,* but the specimens resemble his figure very closely. In fact, I am unable to point out any difference between our specimens and *P. plumosus*, J. Hall. Number 173 shows a branching of the main stem.

The associated forms at Point Levis are lower ordovician, while no restricted representatives of that age occur in the present collection.

As the series submitted was obtained from several pebbles in the conglomerate, it is not worth while discussing the collection as a whole, but, judging by the matrix, the probability is that all belong to the same series, which on the evidence of the *Dicellograptus* may be called upper ordovician. There is nothing in any of the other genera present contradictory of this view.

University, Melbourne, 14th April, 1904.

From Knowsley East, Nos. 174–217.

One of the forms somewhat distantly resembles *Ptilograptus*, but I am inclined to doubt the graptolite nature of all of them, and to consider them as Algæ.†

Associated with these are a few lingula-like brachiopods and a few sponge spicules.

University, Melbourne, 23rd July, 1902.

From near the "Trap" area marked on Quarter-sheet 15 N.E., near Vaughan, Nos. 218–235.

The graptolites submitted from this locality are identical in appearance with those mentioned by myself in a paper on the geology of Castlemaine as coming from Tarilta.‡ As the matrix is the same, and as the "Trap" area is practically at Tarilta, I think the two collections come from the same outcrop.

The species present are *Didymograptus bifidus*, *D. extensus* (*?*), *Tetragraptus quadribrachiatus*, *T. serra*, *T. fruticosus* (three-branched variety), *Dichograptus* sp. indet., *Phyllograptus typus* and *P.* sp.

The horizon is that which I have called the *Tetragraptus fruticosus* zone, and judging by the presence of *D. bifidus*, and the fact that *T. fruticosus* is represented by the three-branched variety, the beds may be looked at as probably the almost exact equivalents of those exposed in Wattle Gully, on the great Chewton anticline. The beds coming up at Tarilta are not, as far as my examination of the country some years ago went, visible to the north, owing, most likely, to a northerly pitch, and the only rocks outcropping in that direction are those belonging to higher zones.

University, Melbourne, 14th August, 1902.

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* Grap. Quebec Group, p. 140.

† [These specimens have been examined by Mr. J. E. Marr, F.R.S., of Cambridge, who has determined them as probably algæ.—J.W.G.]

‡ Proc. Roy. Soc. Victoria, 1894, p. 76.

From the Wood's Point District, Nos. 236–256.

(*By T. S. Hall, M.A.*)

Nos. 236–255 are from the Yarra Track, 1½ miles south-west of Kelly's Hill. No. 256 is from the Wood's Point Company's tunnel, Wood's Point township.

The list of species, as far as the somewhat imperfect nature of the material allows of identification, is as follows :—

Dicellograptus affinis, T. S. Hall. Specimens 236, 237, 239, 241, 242, 243, 245, 246, 247, 249, 250, 252, 253, 254, and 255.
Dicellograptus sp. Specimens 240, 247, and 251.
Diplograptus foliaceus, Murch. Specimens 236, 240, 248, and 253.
Diplograptus cf. *foliaceus*, Murch. Specimen 243.
Diplograptus cf. *tamariscus*, Nich. Specimens 236, 238, and 252.
Diplograptus sp. Specimens 239, 242, 247, 249, and 256.
Climacograptus hastatus, T. S. Hall. Specimens 237 and 254.
Climacograptus tubuliferus, Lap. Specimen 254.
Climacograptus cf. *innotatus*, Nich. Specimen 244.
Climacograptus sp. Specimens 245, 247, and 255.
Dendrograptus (?) sp. Specimen 246.

Hitherto I have been unable to do much more than attach tentative names to graptolites from the Wood's Point (Matlock) districts, but having recently had a better preserved collection from New South Wales in my hands, I am able to assert some specific identities which have been made by actual comparison of specimens. The list given above shows some striking resemblances to that from Stockyard Creek, county of Wellesley, New South Wales, a locality close to the northern border of Croajingolong, the four species definitely determined occurring also at the New South Wales locality. On the other hand, *Climacograptus bicornis*, so characteristic of the Stockyard Creek series, is not present apparently at Matlock. One of these species is a European one, and the other three are closely allied to European forms. *Climacograptus tubuliferus*, and the three allied to our Australian ones, are associated in Britain. The range of the two species which are only compared with European ones, namely, *Diplograptus* cf. *tamariscus* and *Climacograptus* cf. *innotatus*, is, however, quite different, for in Britain they are silurian (upper silurian) only, whereas the Wood's Point beds are undoubtedly upper ordovician. The specimens of the two species are only indifferently preserved, though represented by several examples. Thus in *Diplograptus* cf. *tamariscus* the form of the polypary, with its pointed base, its prolonged virgula and virgella, and the shape of the thecæ, seem identical with the European form, but ours is slightly larger. The same may be said of *Climacograptus* cf. *innotatus*, the form of the thecæ, with their curiously placed spine, and the habit of the polypary, remind us of the British species, but again ours is a little larger. Even if the species are distinct, still their facies is younger, judged by European standards,than that of the named species in the beds.

The collection is of interest as showing the similarity in age between the upper ordovician Matlock beds and the New SouthWales series, which, with an almost identical fauna, has been traced at intervals from Deddick, in Victoria, to Tomingley, in New South Wales, a distance of more than 300 miles from north to south.

University, Melbourne, 25th March, 1903.

From Waratah North.

No. 257, from Bald Hill, Waratah North (or Tarwin South), is an imperfect specimen of *Diplograptus* sp.

From Grice's Creek, Mornington, Nos. 258–270.

The specimens, which occur in boulders, in no instance are sufficiently well preserved to admit of specific determination. Those numbered 258, 261, 262, 264, 266, 267, belong to the genus *Climacograptus*, and quite possibly all represent the same species. No. 261 shows a *Diplograptus* as well.

The age indicated is either lower silurian or upper ordovician, or, as the Survey Map of Victoria would show it, either the lower part of the upper silurian, or upper part of the lower silurian.

University, 25th June, 1903.

From Balnarring, Nos. 271–281.

The specimens are identified as follows :—

Tetragraptus approximatus, Nicholson. Specimens 271 and 275.
Tetragraptus quadribrachiatus, J. Hall. Specimens 272, 276, and 280.
Tetragraptus fruticosus, J. Hall. (?) Specimen 274.
Didymograptus cf. *pritchardi*. Specimen 281.
Ostracoda. Specimens 277 and 278.
Tetragraptus quadribrachiatus, J. Hall.

The remaining specimens are indeterminate.

T. approximatus is a new record for Australia, in fact I am not aware of its occurrence outside of Canada, where Nicholson described it in 1873. The specimen queried as *T. fruticosus* shows the sicula and a couple of thecæ only, but I fancy the record is correct. What I have compared with *Didymograptus pritchardi*, a Lancefield species, is very indistinct, and I cannot make out the thecal characters clearly, so that its value is not great.

The age of the containing rocks is clearly lower ordovician, and if the identification of *T. fruticosus* is correct, it is Bendigonian. In any case it cannot be younger than Lower Castlemaine.

The finding of these organic remains in the Mornington Peninsula is of considerable interest, as by Selwyn the age was regarded as silurian ("upper silurian"), the conclusion being arrived at only on general character of the rocks and the finding of some imperfect remains in Sandstone Id., off Hastings. Graptolites of doubtful age, but in any case younger than these, have previously been recorded from the supposed eocene conglomerates of the district, but the present collection apparently definitely settles the age of the series.

University, 25th June, 1903.

From Bull Dog Creek, near Dromana, Nos. 282–314, 327–335.

I understand the locality from which these specimens came is in the same district as the preceding. The species present represent the same fauna as that exhibited by the specimens from Balnarring dealt with above, and afford further confirmation of the occurrence of lower ordovician rocks in the district, while the Bendigonian age is now definitely fixed.

The rocks are intensely hard and cherty, but do not seem to have undergone much compression, as the graptolites are in many cases partly in relief. The rocks, however, do not split well, and so the specimens are often imperfectly shown, and can rarely be further developed. In many cases the impressions are fairly sharp. Ostracods, a brachiopod, and some sponge spicules, are present in the collection.

The specimens have been determined as follows :—

Tetragraptus approximatus, Nicholson.—Nos. 282, 283, 285, 286, 290, 293(?), 295, 306, 307, 313(?).

Tetragraptus quadribrachiatus, J. Hall.—Nos. 282, 294, 300(?), 302, 307, 310, 311, 328, 331, 333, 334, 335.

Tetragraptus fruticosus, J. Hall.—Nos. 289(?), 291, 330. Specimen No. 330 is a typical four-branched form, and fixes the Bendigonian age beyond a doubt.

Didymograptus spp. indet.—Nos. 284, 287, 291. These specimens, though well preserved, are too imperfect for identification, being unknown to me.

Temnograptus sp.—No. 327. This is too much weathered for determination. It is a large form, though much smaller than *T. magnificus*, Pritchard, and is apparently new.

Dendrograptus(?), No. 332.—A few small fragments.

Among Ostracoda, *Rhinopterocaris maccoyi* is represented by Nos. 283, 287, and other genera are shown by Nos. 300, 334. No. 294 is a cast of a small brachiopod. Sponge spicules, indeterminate, but Hexactinellids, showing the third ray are seen on Nos. 311 and 328. The remaining specimens are indeterminate.

University, 25th June, 1903.

From Junction of Stander's Creek with the Goulburn River, near Wood's Point.

No. 326. The specimen submitted appears to be either a *Dendrograptus* or a *Dictyonema ;* it is impossible to say which. Both genera have a very wide range, and afford no satisfactory information as to age. The former extends from cambrian to middle devonian (Hamilton), the latter from cambrian to silurian.

University, 20th July, 1903.

ON SOME BRACHIOPODS AND A BIVALVE FROM HEATHCOTE.

(*By Fredk. Chapman, A.L.S., F.R.M.S.*)

The following fossils are comprised in a series collected by Prof. J. W. Gregory, D.Sc., F.R.S., from the older palæozoic beds at Heathcote, which have been grouped with the cambrian on the evidence of certain trilobite remains.

The preservation of these fossils is such that it is not easy in all cases to determine the forms, even generically, with certainty, for they are chiefly represented either by internal casts or impressions of the shells. The matrix in which they are found is a fine reddish argillaceous or sandy material, and the fossils have to be isolated by carefully picking away the surrounding rock.

The evidence derived from the present collection of fossils seems to make it fairly certain that we are dealing with an ordovician facies, with which are mingled a few forms of silurian affinities.

By far the larger number of specimens may be referred to the genus *Orthis*, with its sub-genera *Hebertella* and *Bilobites;* but other genera are also present as *Siphonotreta*, *Chonetes*, *Strophomena*, and *Rhynchonella* (*Camarotoechia ?*), as well as a small bivalve provisionally referred to *Modiolopsis*.

The collection contained—

Siphonotreta obovata, sp. nov.—Specimen 3 (figured).
Siphonotreta discoidalis, sp. nov.—Specimen 22 (figured).
Chonetes concinna, sp. nov.—Specimen 25 (figured).
Strophomena flabelloides, sp. nov.—Specimens 7, 8, 9 (figured), 10, 11.
Orthis fragments.—Specimens 1, 2, 12, 14, 16, 17, 18, 19, 20, 26, 30, 31, 32, 35, 36.
Orthis leviensis(?), Eth. fil.—Specimen 23 (figured).
Orthis tenera, sp. nov.—Specimens 13, 27 (figured).
Orthis (*Hebertella*) *vespertilioides*, sp. nov.—Specimen 21 (figured).
Orthis (*Hebertella*) *raristriata*, sp. nov.—Specimen 28 (figured).
Orthis (*Bilobites*) *divaricata*, sp. nov.—Specimens 5, 37 (figured).
Rhynchonella (*Camarotoechia?*), sp.—Specimen 29 (figured).
Modiolopsis (*?*) *knowsleyensis*, sp. nov.—Specimen 15 (figured).

DESCRIPTION OF SPECIES.

CLASS BRACHIOPODA.

SIPHONOTRETA, DE VERNEUIL.

Siphonotreta obovata, sp. nov.

Plate XXI., Fig. 1.

Ventral valve sub-oval, sub-acuminate posteriorly, broadly rounded at opposite border. Surface of valve high and well rounded anteriorly. Foramen large, placed obliquely to the upper surface and close to the posterior margin; area on each side of foramen much depressed. Surface of valve marked by numerous fine concentric lines. Greatest length of valve, 5mm.; width 4.5mm.

This species is like *S. unguiculata*, Eichwald, in some respects, but is altogether broader; the concentric markings are finer, and the foramen is set on a conspicuous prominence. No vestiges of spines were seen in this specimen.

Siphonotreta discoidalis, sp. nov.

Plate XXI., Figs. 2 and 2a.

Valves nearly discoidal, excepting at the umbonal region, where they are produced into a short beak, below which is a small foramen. Shell surface, marked with fine striæ, nearly concentric with margin. The specimen from which the figure was taken is an impression of the pedicle valve, and the delicate surface of the shell is faithfully reproduced in a wax squeeze; the latter shows a distinct trace of the ventral canal. Length of valve 4mm.; width 4mm. The spines are not preserved in this specimen.

CHONETES, FISCHER DE WALDHEIM.

Chonetes concinna, sp. nov.

Plate XXI., Fig. 3.

Valves sub-rectangular, with a strong median sulcus on the dorsal side. Lateral edges nearly straight, slightly hooked at the posterior angles. Cardinal area with a series of strongly developed teeth. Surface of valve finely striate, in a nearly vertical manner, near median sinus. Greatest width 6mm.

This species closely approaches *C. minima*, Sow., sp.,* in general shape, the chief differences being the hooked extremities of the posterior border, the finer striations and the stronger median sulcus.

STROPHOMENA, DE BLAINVILLE.

Strophomena flabelloides, sp. nov.

Plate XXI., Fig. 5.

A cast showing the interior of a dorsal valve of a brachiopod, allied to *Strophomena*, having a median cardinal process and elevated margin. Shell plicate, especially around the margin. Length 7mm.

This form is of somewhat frequent occurrence in the present collection of fossils. In the outline of the shell, and in the dichotomous plications of the marginal portion of the shell, it reminds us of *Orthis flabellulum*, but the relative form of the valves in our specimen is that of a *Strophomena*.

ORTHIS, DALMAN.

Orthis leviensis (?), Etheridge, fil. †

Plate XXI., Fig. 4.

An impression of a ventral valve of an Orthis, which is closely allied to the above species, occurs in our series from Heathcote. The drawing was made from a wax squeeze, and, allowing for the partial obliteration of the sharp ridges, this form closely approaches the specimens found in the Ordovician of the Levi Range in South Australia, which were described by Mr. Etheridge, junior. Height of the Heathcote specimen 9.5mm.; width 11.5mm.

Orthis tenera, sp. nov.

Plate XXI., Figs. 8 and 8a.

Shell nearly hemispherical, hinge-line straight. Cardinal area only slightly elevated. Surface of shell swollen on dorsal side, in the umbonal region. Marked by two concentric depressions or bands running nearly parallel with the curved border, and numerous fine radial lines from the umbo. Height 8mm.; width 13mm.

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* Sil. Syst., 1839, p. 629, Pl. XIII., Fig. 4.

† Parl. Papers, S. Australia, No. 158, 1891, p. 14, Pl. I., Figs. 5–7.

This form seems nearly allied to *Orthis lunata*, Sowerby, in the general shape of the shell; the radial lineation is, however, stronger and closer in the latter species.

Orthis (Hebertella) vespertilioides, sp. nov.

Plate XXI., Fig. 6.

Shell sub-rectangular. Hinge-line undulate; lateral edges strongly curved. Ventral valve with a strong median sinus, which gives to the shell the appearance of a bilobate orthid. Marked with numerous fine riblets radiating from the umbo. Height 4.5mm.; width 8mm.

The general form and markings of this species remind one of *O. vespertilio*, Sowerby, but the latter is higher, and therefore more quadrate. *O. vespertilio* is a well-known species in the Bala beds of Shropshire, in England.

Orthis (Hebertella) raristriata, sp. nov.

Plate XXI., Figs. 7 and 7A.

Shell sub-quadrate, hinge-line wider than the rest of the shell. Lateral margins curved outwards posteriorly. Median sinus sharply defined. Surface of shell with vestiges of a few short costæ arranged around the marginal portion. Height 5.3mm.; width 8.6mm.

The shape of the valves and their outlines remind one of *Orthis sinuata*, J. Hall, from the Hudson group, Cincinnati, Ohio,* but the lineations on the surface are much more numerous than in our specimen.

Orthis (Bilobites) divaricata, sp. nov.

Plate XXI., Fig. 9.

This species resembles *O.* (*B.*) *varica*, Conrad, in form, but it has a slightly longer hinge-line, coarser riblets, and a greater divergent lobation of the anterior part of the shell. The costæ are bifurcate, and transversely marked by numerous fine striæ running nearly concentrically with the border of the shell. Height 5mm.; width 6.5mm.

Rhynchonella (Camarotoechia ?), sp.

Plate XXI., Fig. 10.

The specimen figured is a sinus area of a ventral valve of a rhynchonellid. The shell is strongly sulcate and subdivided anteriorly into twice the number of riblets.

PELECYPODA.

MODIOLOPSIS, J. HALL.

Modiolopsis (?) knowsleyensis, sp. nov.

Plate XXI., Figs. 11 and 12.

The figure here given represents a minute and thin-shelled form found in a hard ochreous fissile rock at Heathcote. It appears to be a right valve. The hingement is of the Dysodont order or edentulous. Adductor scars are visible at the extremities; the anterior scar is crossed by numerous fine lines running parallel with the hinge-line. Interior of shell marked by fine concentric, and sometimes laminate lines. Length 4mm.; width 2.4mm.

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* See also Hall and Clarke, Nat. Hist., New York, vol. viii., Brachiopoda, pt. I., 1892, p. 198, Pl. V A., Figs. 1–8.

EXPLANATION OF PLATE XXI.

Fig. 1. *Siphonotreta obovata*, sp. nov., Pedicle valve. × 4 (Spec. 3).

Fig. 2. *S. discoidalis*, sp. nov., Pedicle valve from a cast of an impression, with trace of the median canal. Fig. 2a. Elevation of pedicle valve. × 4 (Spec. 22).

Fig. 3. *Chonetes concinna*, sp. nov. Dorsal valve, and denticulate cardinal area. × 4 (Spec. 25).

Fig. 4. *Orthis leviensis* (?), Eth. fil. Ventral valve. Taken from a wax impression. × 2 (Spec. 23).

Fig. 5. *Strophomena flabelloides*, sp. nov. Ventral valve inner surface. × 4 (Spec. 9).

Fig. 6. *Orthis* (*Hebertella*) *vespertilioides*, sp. nov. Ventral valve. × 3 (Spec. 21). Taken from a wax impression.

Fig. 7. *Orthis* (*Hebertella*) *raristriata*, sp. nov. Dorsal aspect. Fig. 7a. Elevation of dorsal valve and cardinal area. × 3 (Spec. 28).

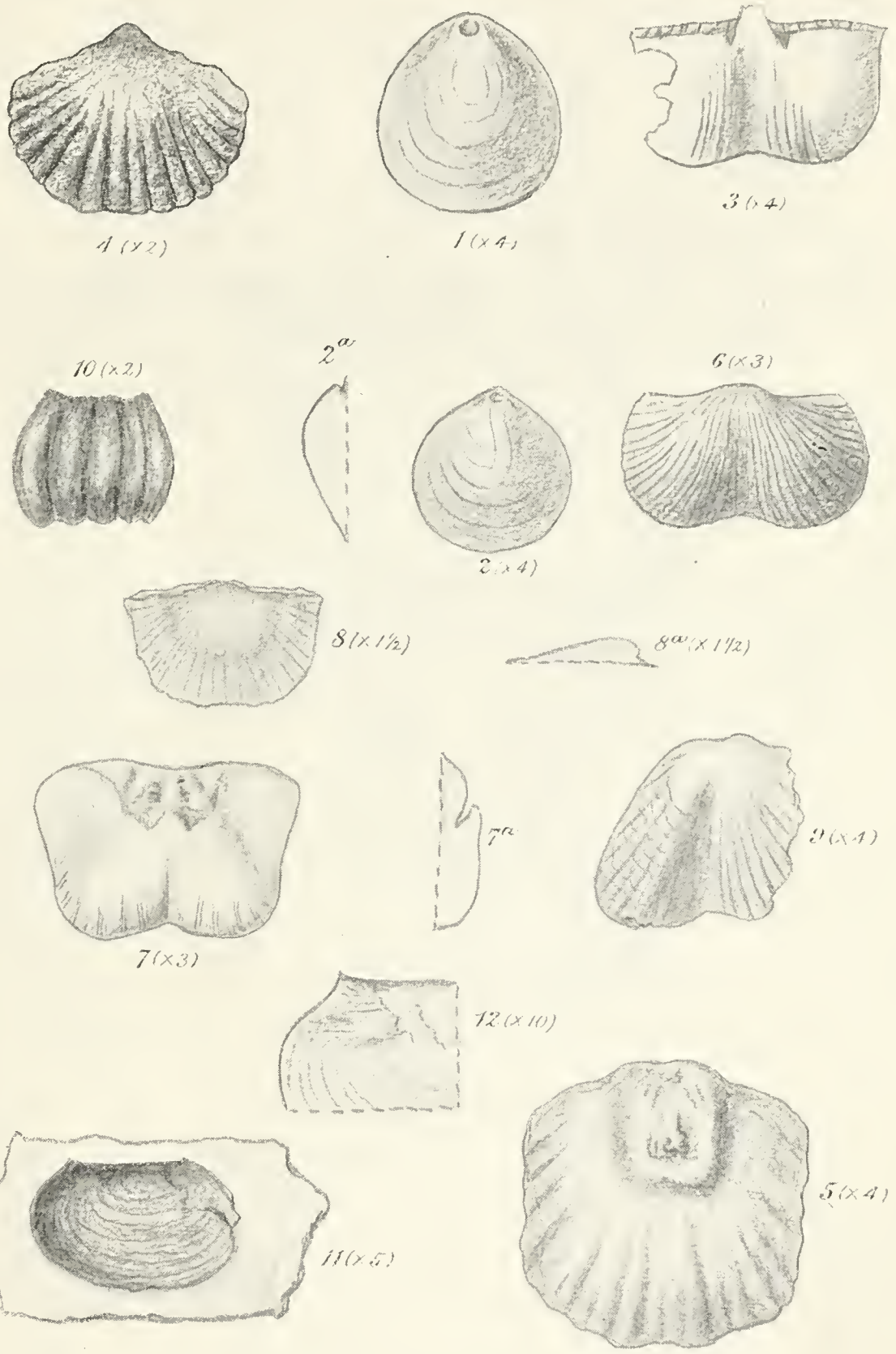
Fig. 8. *Orthis tenera*, sp. nov. Dorsal valve. Fig. 8a. Elevation of dorsal valve. × 1½ (Spec. 27).

Fig. 9. *Orthis* (*Bilobites*) *divaricata*, sp. nov. Ventral valve. × 4 (Spec. 37).

Fig. 10. *Rhynchonella* (*Camarotoechia* ?), sp. Sinus area of ventral valve. × 2 (Spec. 29).

Fig. 11. *Modiolopsis* (*?*) *knowsleyensis*, sp. nov. Interior of right (?) valve × 5 (Spec. 15).

Fig. 12. *Modiolopsis* (*?*) *knowsleyensis*, sp. nov. Part of valve interior showing striated muscular impression. × 10.



OLDER PALÆOZOIC SHELLS FROM HEATHCOTE.

ON SOME CAINOZOIC FORAMINIFERA FROM BROWN'S CREEK, OTWAY COAST.

(*By Frederick Chapman, A.L.S., F.R.M.S.*)

From specimens of clay submitted to me by Prof. J. W. Gregory, F.R.S., I have obtained a series of microscopic fossils, which, although not comprising many species, is of especial interest, since one of the genera represented is of rare occurrence in the fossil state.

The material in which the fossils are found is of two kinds.

Sample 1 consists of an ochreous brown clay, almost chocolate-coloured when wet, and which breaks up into flaky mud when immersed in water. The majority of the foraminifera separated from this sample belong to the genus *Cyclammina*. These tiny shells are abundant in the clay, and may be seen in small patches or nests on the surfaces of the parted rock-specimens. This segregation of shells is most likely due to their drifting into hollows of the mud during the successive movements of ripples or currents. A similar phenomenon may often be observed at the present day in tidal pools and rippled shore sands. It is also seen in many estuarine clays of pleistocene age, notably in the fen districts of England, where, as was described by J. R. Green,* the silt of the Isle of Ely shows, when cut through vertically, thin sinuous lines corresponding with the layers left by the tide in pools and ripple-marks. The other genera found in this sample are *Haplophragmium*, *Lituola*, and *Ammodiscus*.

Sample 2 is a dark-brown to black pyritous and sandy clay, with intercalated layers of highly-polished wind-worn quartz grains. The washed material contains but few foraminiferal tests, and these also are of the arenaceous type of shell structure, belonging to the genus *Haplophragmium*.

No other fossil remains appear to be present in these hand-specimens, excepting a few obscure worm burrows (?), found in Sample 1.

The specimens were collected by Mr. A. E. Kitson, F.G.S., from Brown's Creek, between the Aire and Joanna Rivers, south coast of Victoria.

DESCRIPTION OF THE SPECIES.

Family Lituolidæ.

genus haplophragmium, reuss.

Haplophragmium latidorsatum, Bornemann, sp.

Plate XXII., Fig. 1.

Nonionina latidorsata, Bornemann, 1855, Zeitschr. Deutsch. Geol. Gesellsch., vol. vii., p. 339, Pl. XVI., Fig. 4.

Haplophragmium latidorsatum, Born., Brady, 1884, Rep. Chall., vol. ix., p. 307, Pl. XXXIV., Figs. 7–10, 14.

Flint, 1899, Rep. U. States Nat. Museum, 1897, p. 276, Pl. 20, Fig. 1.

A stout form of *Haplophragmium*, with few chambers. It is not common in our specimen No. 1, from Brown's Creek; the tests are of a pale brown colour, smooth, but rather coarsely arenaceous in structure.

Haplophragmium glomeratum, Brady.

H. glomeratum, Brady, 1884, Rep. Chall., vol. ix., p. 309, Pl. XXXIV., Figs. 15–18.

* Journ. Roy. Micr. Soc., Lond., vol. i., 1881, p. 473.

The Victorian specimens are few-chambered, and are somewhat flattened, in this respect resembling the fossil forms found in the gault clays of England. Rare in Samples 1 and 2 from Brown's Creek, Victoria.

Haplophragmium canariense, d'Orbigny, sp.

Plate XXII., Fig. 2.

Nonionina canariensis, d'Orbigny, 1839, Barker-Webb and Berthelot, Hist. Nat. Iles Canaries, vol. ii., pt. 2, "Foraminifères," p. 128, Pl. II., Figs. 33 and 34.

Haplophragmium canariensis, d'Orb., sp., Flint, 1899, Rep. U.S. Nat. Mus., 1897, p. 277, Pl. XX, Fig. 3.

This neat form is represented here by a small specimen from each of the samples, Nos. 1 and 2.

GENUS LITUOLA, LAMARCK.

Lituola simplex, sp. nov.

Plate XXII., Figs. 3 and 4.

Test roughly sub-circular, thin; surfaces and outline irregular; structure of test coarsely arenaceous. Indications of an internal spiral conformation are seen on the lateral surfaces of the test. The fractured portions of the test show a close labyrinthic condition of the interior. The later part of the shell tends to become rectilinear. In this latter feature it bears some resemblance to *Haplophragmium agglutinans*, d'Orbigny, sp., but the compact non-septate character of the interior shows its relationship to be rather with *Lituola*. Longest diameter of the test ·55mm. Not uncommon in Sample 1. Rare in Sample 2.

GENUS AMMODISCUS, REUSS.

Ammodiscus incertus, d'Orb., sp., var. macilenta, nov.

Plate XXII., Fig. 5.

This variety, which is here a constant form, is distinguished from the type form by its excessively thin arenaceous test. The successive whorls are much compressed, and especially those of the later part of the shell. The last whorl has a tendency to become hollowed along the central area of its surface. Diameter of test ·4mm.

The extreme tenuity of these and other associated arenaceous forms points to calm conditions when these deposits were laid down. Not uncommon in Sample 1.

GENUS CYCLAMMINA, BRADY.

Cyclammina complanata, sp. nov.

Plate XXII., Fig. 7.

Test spiral, discoidal, much compressed. Margin sub-acute or slightly rounded, undulate. Whorls partially evolute. About twelve chambers to the outer whorl in full-sized specimens. Septal lines sinuous. A deep umbilical depression usually present. Surface of test smooth; in worn specimens pitted, showing evidence of the internal cancellated structure. In median section the main bulk of the chambers is seen to be occupied by labyrinthic shell-structure. Diameter of test from 1 to 2mm.

One of the chief points of interest with regard to this form is its relationship to other fossil types of the same genus. The species to which *C. complanata* bears most resemblance is *C. acutidorsatum*, Hantken, sp.* In this species, however, the whorls of the shell are involute, or embracing. Naumann and Neumayr have described a *Cyclammina* from the "Kalkstein" (? jurassic), of Japan,† and this seems to be the oldest recorded example; it is stoutly built, with about eight segments in the outer whorl. The pliocene species described by De Amicis—*Cyclammina pliocœna*‡—is sub-elliptical rather than discoidal in outline, and has fewer segments. Our species bears a general likeness to the recent species, *C. cancellata*, Brady, but is more compressed, and the peripheral margin is correspondingly sharper. *C. complanata* is very abundant in Sample No. 1, Brown's Creek, Victoria.

Cyclammina paupera, sp. nov.

Plate XXII., Fig. 6.

Test discoidal, in the form of an involute spiral, much compressed at the periphery, umbilicus excavate; segments irregular, often aberrant in form; septal lines sinuous or anteriorly convex; shell-surface smooth. Average diameter of test 1mm. Frequent in Sample 1, Brown's Creek, Victoria.

Age of the Deposits.—With regard to the distribution of *Cyclammina* in cainozoic fossiliferous beds in Europe, we note in particular the nearly allied *C. acutidorsatum*, which occurs in the *Clavulina-szaboi* beds of Hungary, equivalent to beds of upper eocene and oligocene elsewhere.

The present species is also characteristic of the Spring Creek beds, near Geelong, and specimens in the National Museum, Melbourne, are of the exceptional size of 3mm. in diameter. Since this form also occurs at Spring Creek, in beds of Jan Jukian age, it is presumed that the clays of Brown's Creek are on the same geological horizon.

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* *Haplophragmium acutidorsatum*, Hantken, 1875, Mitth. Jahrb. Kön. Ungar. Geol. Anstalt, vol. iv., pt. 1, p. 12, Pl. I., Fig. 1.

† Denkschr. A. K. Wien., vol. lvii, p. 26, Pl. V., Fig. 7.

‡ Naturalista Siciliano, 1895, vol. xiv., Nos. 4, 5, *et seq.*, p. 12, Pl. I., Fig. 19.

EXPLANATION OF PLATE XXII.

Fig. 1. *Haplophragmium latidorsatum*, Bornemann, sp.
Fig. 2. *Haplophragmium canariense*, d'Orbigny, sp.
Figs. 3 and 4. *Lituola simplex*, sp. nov.
Fig. 5. *Ammodiscus incertus*, d'Orb., sp., var., *macilenta*, var. nov.
Fig. 6. *Cyclammina paupera*, sp. nov.
Fig. 7. *Cyclammina complanata*, sp. nov.
All figures enlarged 36 times.

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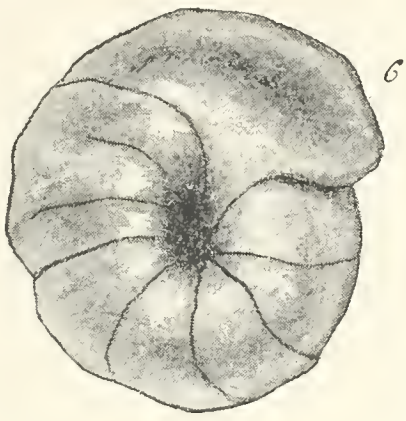
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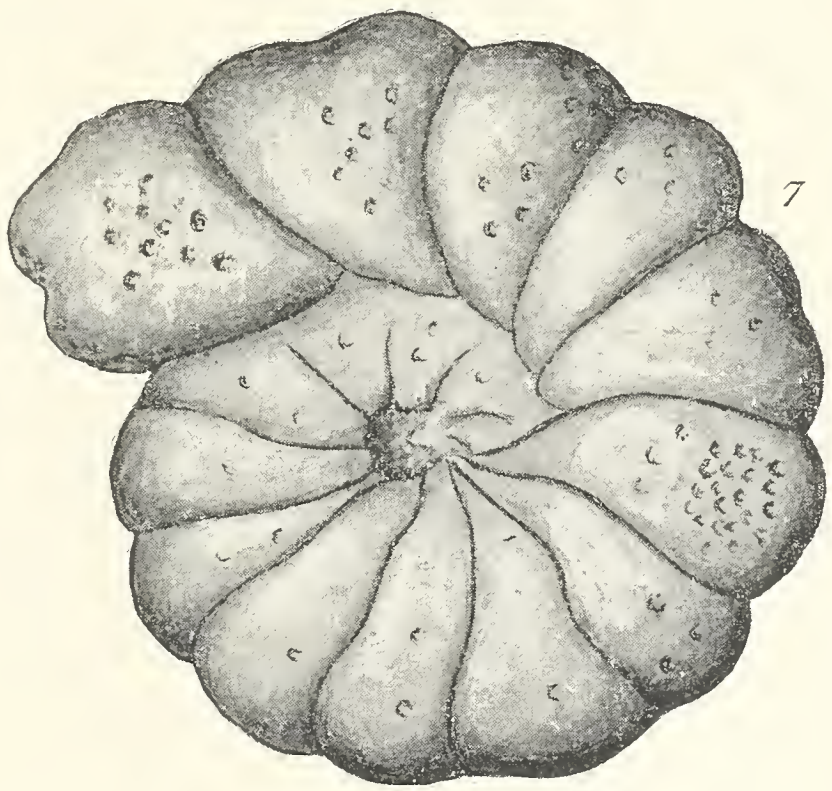
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CAINOZOIC FORAMINIFERA FROM BROWN'S CREEK. x 36.