

Queensland.

DEPARTMENT OF MINES.

Queensland Geological Survey.

(B. DUNSTAN, CHIEF GOVERNMENT GEOLOGIST.)

PUBLICATION No. 253.

Mesozoic and Tertiary Insects

OF

QUEENSLAND AND NEW SOUTH WALES.

With 6 Text-figures and 9 Plates.

Descriptions of the Fossil Insects

By R. J. TILLYARD, M.A., B.Sc., F.E.S.

(Science Research Scholar in the University of Sydney.)

AND

Stratigraphical Features

By B. DUNSTAN

(Chief Government Geologist).



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BY AUTHORITY: ANTHONY JAMES CUMMING, GOVERNMENT PRINTER.

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List of Fossil Insects.

Referred to or described.

IPSWICH.

Horizon—? UPPER TRIASSIC.

| | | | | |
|--|----|----|----|--|
| <i>Ademosyne angusta, n. sp.</i> | .. | .. | .. | Page 18, Plate 4, fig. 4. |
| <i>Ademosyne australiensis, n. sp.</i> | .. | .. | .. | Page 18, Plate 4, fig. 3. |
| <i>Ademosyne Cameroni, n. sp.</i> | .. | .. | .. | Page 21, Plate 4, fig. 1. |
| <i>Ademosyne congener n. sp.</i> | .. | .. | .. | Page 20, Plate 2, fig. 8. |
| <i>Ademosyne major, Handlirsch</i> | .. | .. | .. | Page 19, Plate 5, figs. 1, 6. |
| <i>Ademosyne minor, Handlirsch</i> | .. | .. | .. | Page 20, Plate 5, fig. 3. |
| <i>Ademosyne obtusa, n. sp.</i> | .. | .. | .. | Page 19, Plate 4, fig. 5. |
| <i>Ademosyne Olliffi, Handlirsch</i> | .. | .. | .. | Page 19, Plate 1, figs. 3, 8. |
| <i>Ademosyne punctata, n. sp.</i> | .. | .. | .. | Page 21, Plate 5, fig. 4. |
| <i>Ademosyne tumida, n. sp.</i> | .. | .. | .. | Page 21, Plate 6, fig. 2. |
| <i>Austromylacrites latus, n.g. et sp.</i> | .. | .. | .. | Page 13, Plate 2, fig. 1. |
| <i>Cockroach, indet.</i> | .. | .. | .. | Page 35. |
| <i>Dragon-fly wing, indet.</i> | .. | .. | .. | Page 35. |
| <i>Dunstania pulchra, n.g. et sp.</i> | .. | .. | .. | Page 32, Plate 3, fig. 6. |
| <i>Etheridgea australis, Handlirsch</i> | .. | .. | .. | Page 24, Plate 5, fig. 5. |
| <i>Mesochorista proavita, n.g. et sp.</i> | .. | .. | .. | Page 30, Plate 2, fig. 2. |
| <i>Mesogereon neuropunctatum, n.g. et sp.</i> | .. | .. | .. | Page 34, Plate 1, figs. 1, 2. |
| <i>Mesojassus ipsviciensis, n.g. et sp.</i> | .. | .. | .. | Page 35, Plate 2, fig. 7. |
| <i>Mesomantidion queenslandicum, n.g. et sp.</i> | .. | .. | .. | Page 16, Plate 5, fig. 2. |
| <i>Mesophlebia antinodalis, n.g. et sp.</i> | .. | .. | .. | Page 25, Plate 4, fig. 2. |
| <i>Mesorthopteron locustoides, n.g. et sp.</i> | .. | .. | .. | Pages 14, 35, Plate 1, figs. 4, 5; Plate 2, figs. 3-6. |
| <i>Mesostigmoptera typica, Eth. & Olliff</i> | .. | .. | .. | Page 22. |
| <i>Mesothoris clathrata, n.g. et sp.</i> | .. | .. | .. | Page 23, Plate 4, fig. 6. |
| <i>Uromites Willecoxi, n.g. et sp.</i> | .. | .. | .. | Page 22, Plate 4, fig. 7. |

ST. PETER'S.

Horizon—JURASSIC.

| | | | | |
|---|----|----|----|--|
| <i>Elaterites wianamattensis, n.g. et sp.</i> | .. | .. | .. | Page 41, Plate 3, fig. 5. |
| <i>Etheridgea petrica, n. sp.</i> | .. | .. | .. | Page 42, Plate 3, fig. 2. |
| <i>Mesorhynchophora Dunstani, n.g. et sp.</i> | .. | .. | .. | Page 43, Plate 1, fig. 7. |
| <i>Metrorhynchites sydneiensis, n.g. et sp.</i> | .. | .. | .. | Page 41, Plate 3, figs. 3, 4. |
| <i>Notoblattites subcostalis, n.g. et sp.</i> | .. | .. | .. | Page 39, Plate 6, fig. 1; Plate 7, fig. 1. |
| <i>Mesotitan giganteus, n.g. et sp.</i> | .. | .. | .. | Page 40, Plate 7, fig. 2. |

GOODNA.

Horizon—TERTIARY.

| | | | | |
|--|----|----|----|---------------------------|
| <i>Zaporismites Balli, n.g. et sp.</i> | .. | .. | .. | Page 44, Plate 3, fig. 1. |
|--|----|----|----|---------------------------|

DUARINGA.

Horizon—TERTIARY.

| | | | | |
|---|----|----|----|---------------------------|
| <i>Austrolestidion duaringae, n.g. et sp.</i> | .. | .. | .. | Page 45, Plate 1, fig. 6. |
|---|----|----|----|---------------------------|

Stratigraphical Features.

BY B. DUNSTAN.



DENMARK HILL, IPSWICH.

GENERAL NOTES.

THE first discovery of fossil insects in the Ipswich Coal Measures is to be credited to Mr. T. H. Simmonds, of Brisbane, who, in 1890, found at Denmark Hill the specimens described by Messrs. Etheridge and Olliff in the Memoirs of the Geological Survey of New South Wales.* The fossils described include *Mesostigmopera typica*, E. and O., (?) *Glochinnorrhynchus* sp., (?) Hydrophilidæ, (?) Lampyridæ, and Hemiptera. Subsequently Handlirsch† renamed the (?) *Glochinnorrhynchus* as *Etheridgea australis*, another Rhynchophorous beetle as *Pseudorhynchophora Olliffi*, and the two specimens of Hydrophilidæ as *Ademosyne major* and *A. minor* respectively. Nine years later the writer, in examining the rocks at Denmark Hill, came across a bed containing abundance of fossil flora, several species of insects, and a number of *Estheria mangaliensis*. The fossil insects obtained from this bed at that time is the collection which Mr. Tillyard generously offered to describe. This bed was thought at first to be the one from which Mr. Simmonds collected his specimens, but some insect fragments, in the form of elytra, were recently found at a lower horizon in the same locality, so evidently the fossils were not limited to the one bed.

This fossil insect bed, which is about six inches thick, contains an abundant flora made up principally of the fern *Thinnfeldia*, and is closely associated with other similar beds rich in plant remains, the horizon being near the top of the Ipswich Coal Measures.

Coal-seams occur both above and below the geological horizon of the quarry, and only fifty feet of strata separate the fossil beds from the Aberdare coal-seam above, with the Bluff seam occurring about the same distance below.

* The Mesozoic and Tertiary Insects of New South Wales [and Queensland] by R. Etheridge and A. Sidney Olliff. Palæontology No. 7, pp. 9, 22, with 2 plates, 4to. By Auth. 1890.

† Die Fossilen Insekten und die Phylogenie der rezenten Formen. Leipzig, 1903, pp. 1430. Atlas of 51 plates. 4to (Engelmann).

The beds immediately over the Aberdare coal-seam consist mostly of shales, with occasional sandstones, and form the topmost portion of the Ipswich Series. The conglomerates above the coal-bed, shown in section in the text-fig. 2, are the basal beds of the Bundamba Series.

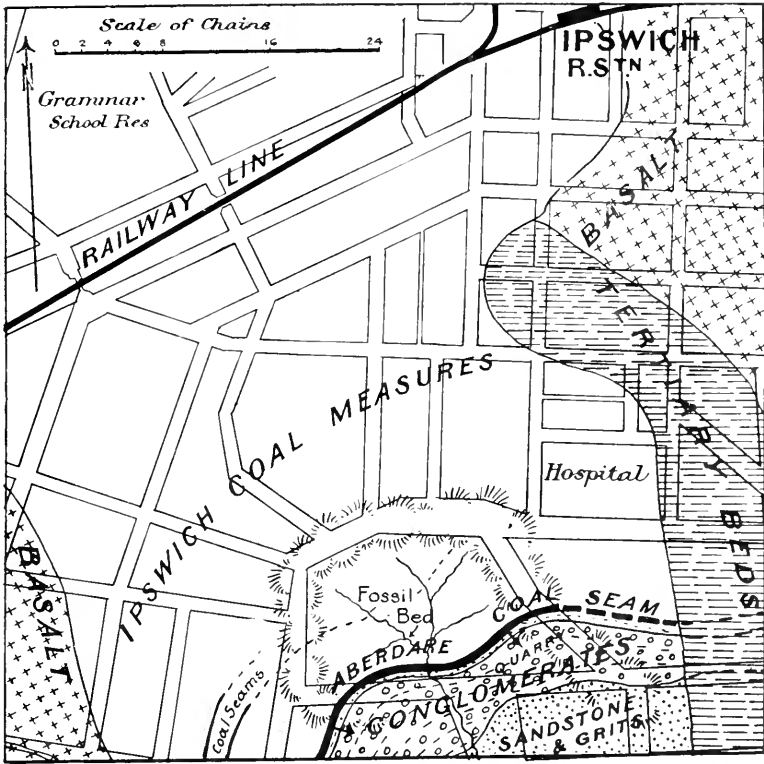
The fauna, of which only the first collection is being described by Mr. Tillyard in this paper, has proved very instructive, and its examination has produced some startling results. It may safely be said that the study of the collections recently made will prove even more remarkable. Quite a number of insect forms have now been recognised, and this palae-entomological work, taken in conjunction with an examination of the flora, should very well show the life of the epoch represented by the Ipswich Coal Measures, so far as land and freshwater conditions are concerned. A noticeable feature about the fossils collected is the absence of all traces of fishes and reptiles, and, with the exception of the little *Estheria*, also all crustaceans.

The flora is wonderful both in its variety and in its state of preservation, and some very useful information is expected as a result of the examination of all the material which Mr. Walkom, Assistant Lecturer in Geology at the Queensland University, has now in hand. Not the least noteworthy are several specimens showing minute organic structure requiring microscopic treatment, other specimens showing well-developed cell structure but without form or venation. Others again have the tissue of the leaf beautifully preserved in silica, while a large number show the fructification of ferns.

The presence of the fine sediments from which the shales were formed is an indication of swampy or stillwater conditions at the time the insects and plants were entombed, prior to which the accumulation of beds of sandstone below the shales suggests that the deposits were formed by current action, and that the area covered by water must have been somewhat extensive.

Volcanic activity at one time evidently interfered with the swampy conditions in covering the shaly sediments with volcanic dust or mud and apparently destroying the insect life and nearly all the plant life on the adjacent land surfaces, the hardy *Thinnfeldia*, however, withstanding the strain and flourishing with even more vigour after the period of volcanic activity than before. In the quarry are to be seen particles of charcoal embedded in the upper portion of the tuff and intermingled with plant fragments, from which it would seem that the volcanic action in its destruction of life by envelopment with ash or dust was accelerated by fire.

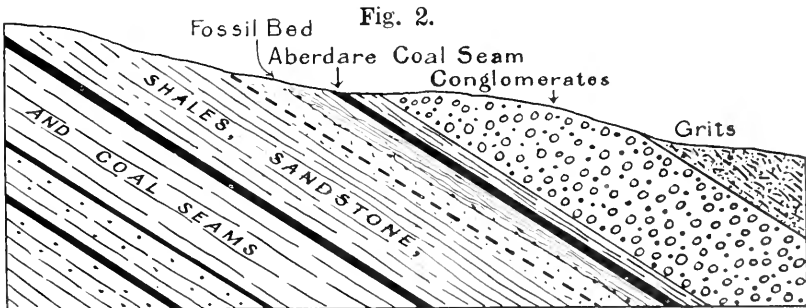
Fig. 1.



Locality Map of Denmark Hill, Ipswich.

Showing the position of the Coal Measures and the Fossil Insect Bed.

These coal measures form the lower portion of the system once termed "Trias-Jura" but which in the recent classification of the Queensland Geological formations are referred to the (?) Triassic.



Ipswich Coal Measures

General Section of Ipswich Beds at Denmark Hill.

The strata at Denmark Hill, both above and below the fossil insect bed, contain several species of plants, of which the following are the principal:—*Thinnfeldia odontopteroides*, Morris; *Tæniopteris Daintreei*, McCoy; *Ginkgo bidens*, Tenison-Woods; *Pterophyllum multilincatum*, Shirley; *Cladophlebis denticulata* var. *australis*, Morris; *Sphenopteris superba*, Shirley; *Stenopteris elongata* var. *spinifolia*, Shirley. Descriptions of several of these fossils were made by Dr. Shirley in the Fossil Flora of Queensland.*

The geological features of the Ipswich Coal Field have been worked out by Mr. W. E. Cameron, Second Government Geologist,† and the accompanying sketch-map of the locality, Fig. 1, showing the position of the insect bed, has been taken from his new map of the field, now in preparation.

DENMARK HILL INSECT QUARRY.

Description of the Beds.

The photographs on Plates 8 and 9 are views of the quarry at Denmark Hill where the fossil insects have been discovered. The beds, it will be observed, have a sharp angle of dip, and further exploration at the bottom of the excavation will be inconvenient on account of the overburden.

About four chains away from the quarry in a north-easterly direction, the horizon of the insect bed can be traced, and prospecting in this locality might be productive.

BED A.—The position marked A in the photograph on Plate 8 forms the base of a number of bands of bluish shale, altogether about 18 inches in thickness, above which other shale beds outcrop, but which are too much decomposed for examination. This series of bands principally contains species of *Thinnfeldia*, which make up about 95 per cent. of the whole contents, with *Beania geminata*, Shir., *Tæniopteris Tenison-Woodsi*, Eth. fil., *Scolecoperis australis*, Shir., and *Ginkgo antarctica*, Shir., also present.

Some of the *Thinnfeldia* specimens found in the shale at the base of the bed, which rests on volcanic tuff, suggest that a rapid desiccation of the tissue of the leaves took place at the time of envelopment, followed later on by its silicification, probably a result of the percolation of heated mineral solutions from the tuff, &c.

* Additions to the Fossil Flora of Queensland, &c., by J.S., p. 20, with 25 plates, 8vo. G.S.Q. Pub. 128, Bull. 7. By Auth., Brisbane, 1898.

† The West Moreton (Ipswich) Coalfield (Second Report on), with special reference to the Bundamba District. With 2 maps, one plate and 3 figures. By W.E.C., p. 57, 8vo. By Auth., Brisbane, 1907, G.S.Q. Pub. No. 201.

These silicified fossils are only to be found at the base of the beds, mostly fragmentary, but showing clearly all the beauty of detail of the cell-structure of the *Thinnfeldia* leaves.

BED B.—This is a light-coloured volcanic tuff with much ferruginous staining. One portion of the exposed bed contains a large concretion of very ferruginous tuff, while irregularities are to be observed between the tuff and the overlying shales. Changes in the local conditions at the time have produced unevenness in the deposition or distribution of the volcanic ejectamenta, and in the irregularities thus produced the fine sediments forming the shales have been quietly laid down.

This tuff occurs as small outcrops at several other horizons below this position and within a thickness of about 200 feet of strata, its conspicuous character being a red colouration. This staining, which is the red oxide of iron, has been leached out of the decomposing blue shales and is not an alteration product of the tuff, the latter probably being trachytic or rhyolitic. The fossil leaf impressions are sometimes completely coated with this bright red pigment, which frequently fills in the minute spaces representing the thickness of the original leaf, and occasionally colours the insects. The average thickness of the bed is about two feet.

Fossil leaves are not common in the tuff and are mostly confined to species of *Thinnfeldia*. Rough impressions of this fern occur in the top portion of the bed close to the shales, and here is also to be observed a layer of what might be termed a charcoal breccia made up of particles of previously burnt wood enveloped in a coarse-grained tuff.

BED C.—This is a bed of shale about a foot thick, somewhat decomposed and iron-stained, in part tuffaceous, and containing a great number of indifferently preserved impressions of *Thinnfeldia*, with *Stenopteris*, *Ginkgo*, *Taniopteris*, *Sphenopteris*, and many other forms of less frequent occurrence.

BED D consists of a three-inch band of hard blue shale, very difficult to split, and much broken up by vertical jointings. Fossil leaf impressions occur in it, but they are fragmentary and poorly preserved.

BED E.—The fossil insect bed of finely arenaceous shale. Near the outcrop the bed is of a brownish grey colour with iron-stained joints and planes, and it is in this part of the bed that most of the insect specimens were discovered. At the bottom of the quarry, more particularly below the ironstone concretion shown in the illustration (Plate 8), the bed is a greenish grey colour, and here

exceedingly few insects were obtained. The insects might be found further to the dip, but the encouragement to prospect does not lie in this direction, but, as stated above, along the outcrop, the position being shown in the photo. on Plate 9. The weathering of the bed near the outcrop has developed a large number of lamination planes, so that a much larger area of surfaces can be examined by splitting the shale than in the lower greenish part of the bed where the laminae are bound together and difficult to separate. Possibly the insects are no less rare in the greenish rock at the bottom of the quarry than in the weathered portion near the outcrop, the character of the lamination in the former only preventing their discovery. The coating on the surface of the fossil impressions has been previously referred to. Sometimes this coating is a film of very fine clay, which, when carefully removed with water and a camel's-hair brush, is found to have covered delicate microscopic structures. In some specimens particles of bright carbon from the original elytron have been preserved, although very little of the original design remains to be seen.

The fossil flora associated with the remains of the insects include the following described species:—

Ferns—

| | | | |
|---|----|----|--------------|
| <i>Dietyophyllum bremerense</i> , <i>Shir.</i> | .. | .. | rare. |
| <i>Oleandridium lentriculiforme</i> , <i>Eth. fil.</i> | .. | .. | rare. |
| <i>Scolecopteris australis</i> , <i>Shir.</i> | .. | .. | rare. |
| <i>Sphenopteris Baileyana</i> , <i>Shir.</i> | .. | .. | rare. |
| <i>S. superba</i> , <i>Shir.</i> | .. | .. | common. |
| <i>Stenopteris elongata</i> , <i>Carr.</i> | .. | .. | very common. |
| <i>S. elongata</i> , var. <i>spinifolia</i> , <i>Ten.-Woods</i> | .. | .. | very common. |
| <i>Taniopteris Daintreei</i> , <i>McCoy</i> | .. | .. | very rare. |
| <i>T. Tenison-Woodsi</i> , <i>Eth. fil.</i> | .. | .. | common. |
| <i>Thinnfeldia indica</i> , var. <i>falcata</i> , <i>Ten.-Woods</i> | .. | .. | very common. |
| <i>T. indica</i> , var. <i>media</i> , <i>Ten.-Woods</i> | .. | .. | common. |
| <i>T. odontopteroides</i> , var. <i>normalis</i> , <i>Shir.</i> | .. | .. | very common. |
| <i>Triphyllopteris botryoides</i> , <i>Shir.</i> | .. | .. | very rare. |

Cycads—

| | | | |
|--|----|----|--------------|
| <i>Beania geminata</i> , <i>Shir.</i> | .. | .. | very common. |
| <i>Pterophyllum multilineatum</i> , <i>Shir.</i> | .. | .. | very rare. |

Equisetales—

| | | | |
|---|----|----|------------|
| <i>Calamostachys australis</i> , <i>Shir.</i> | .. | .. | very rare. |
|---|----|----|------------|

Conifers—

| | | | |
|--|----|----|---------|
| <i>Baiera ginkgoides</i> , <i>Shir.</i> | .. | .. | common. |
| <i>Ginkgo bidens</i> , <i>Shir.</i> | .. | .. | common. |
| <i>G. antarctica</i> , <i>Shir.</i> | .. | .. | common. |
| <i>G. Simmondsi</i> , <i>Shir.</i> | .. | .. | rare. |
| <i>Stachyopitys annularioides</i> , <i>Shir.</i> | .. | .. | rare. |

BED F.—This bed of bluish shale is three inches thick, much jointed, weathered, and iron-stained, with the plant impressions fragmentary and poorly preserved.

BED G.—There are no special features about this shale bed, which much resembles the one above in being jointed and much iron-stained, but with the fossils somewhat better preserved. Its thickness is six inches.

BED H.—This bed is 15 inches thick and is made up of a very slightly weathered dark greyish shale. The fossils are similar to those of the Insect Bed E but the impressions are less fragmentary, while their form and structure can be studied without much difficulty. It is in the upper portion of this bed that two individuals belonging to the Coleoptera and another, evidently a Hemipterous insect, were found, indicating with their accompanying flora that this is probably the bed from which Mr. Simmonds many years ago obtained his fossil insects and leaves. A conspicuous feature about the bed is the comparative rarity of *Thinnfeldia* in it, and the abundance of species of *Tæniopteris*, *Sphenopteris*, and *Stenopteris*. Bed H might be exploited very profitably for the flora it contains, as it is distinctly the most prolific one in the series.

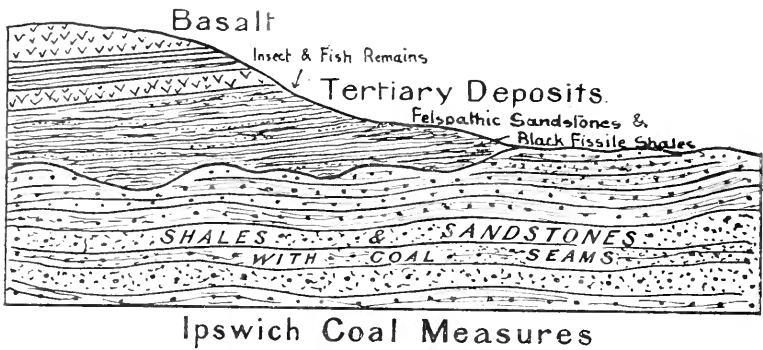
BED I.—Very little attention has been given to the examination of this bed of shales, and therefore nothing can be said of its contents. Where exposed on the surface the bed is 15 inches thick, somewhat weathered, and where examined was found to contain very few fossil impressions.

BED J.—This consists of a bed of sandstone several feet thick. It forms the upper portion of a great development of sandstones exposed in this locality, and is the basement bed on which the fossiliferous shales and the interbedded volcanic tuff were laid down.

GOODNA.

The Goodna fossil insect described by Mr. Tillyard and collected by Mr. L. C. Ball, Third Government Geologist, was found on portion 172, parish of Goodna, about four miles south of Goodna Railway Station, and about a mile west of Woogaroo Creek. The matrix is a dark yellowish brown clay ironstone, and very similar to nodules of clay ironstone common in the locality, and in which a number of fragments of fossil fish have been found. A portion of a dicotyledonous leaf was also observed in the matrix containing the insect, but too indistinct for specific or even generic determination.

Fig. 3.



Diagrammatic Section south of Goodna.

Showing the Tertiary Shales and Sandstones resting on the Ipswich (Triassic) Coal Measures.

The strata in this vicinity consist of clay shales, black fissile shales and sandstone, occurring as a thin superficial deposit resting on the irregular surfaces of the Ipswich Coal Measures and Bundamba Sandstones. They have no possible geological connection with the Triassic beds which yielded the insects at Denmark Hill, and are a Tertiary deposit.

DUARINGA.

In the year 1900 boring operations for coal were carried out at Duaringa, within half a mile of the station of that name, and 65 miles by rail westerly from Rockhampton on the Central Railway line.

The specimens described by Mr. Tillyard from this locality were found in one of the core pieces by the late Mr. T. Coventry, who had them in his possession for some considerable time.

The bore was sunk to a depth of 600 feet, and the material from the bore indicated that the coal measures, the testing of which was the object in view, had not been met with at that depth. This was considered to be rather unexpected, in view of the coal measures being known to exist both to the east and west of the bore. Apparently, a narrow valley has been excavated out of the old land surface of the coal measures and possibly formed a river channel, subsequent to which the area became submerged to much below sea-level, the subsidence of the land and the deposition of the freshwater sediments being synchronous.

The cores from the bore consisted almost entirely of bluish and buff-coloured clays and shales, with occasional bands of lignite.

All the buff-coloured shales, of which there is a thickness of 200 feet, are more or less bituminous, and their utilisation for the extraction of oil has received some consideration.

The lignite bands did not yield any leaf fragments, but several impressions were found in the shales. These were examined by Dr. Shirley, who identified (?) *Magnolia*, *Ficus subgepperti*, *Ficus* sp. ind., and (?) *Marsilea*.*

The shales also furnished a number of fragmentary fish remains, mostly consisting of small bones silicified to honey-coloured chalcedony, but with one specimen showing all the details of the fish outline and structure except the head.†

The geological horizon may be regarded as Tertiary, although opinions have been expressed that the deposits should be considered to be Cretaceous.

ST. PETER'S.

The specimens from the St. Peter's clay pits near Sydney were found many years ago by the writer while collecting fish fossils at the Carrington Brick Company's clay pit. The fish remains have been described by Dr. Woodward,‡ and include the following genera:—*Acentrophorus*, *Cleithrolepis*, *Elonichithys*, *Elpisopholis*, *Myriolepis*, *Palæoniscus*, *Pholidophorus*, *Platysomus*, *Pleurocanthus*, *Sagenodus*, *Semionotus*.

A large labyrinthodont about twelve feet long, almost perfect and wonderfully preserved, was also found. It is allied to *Mastodonsaurus*, but has not yet been described. In addition, numerous specimens of *Unio* and *Unionella* have been found,§ while amongst the flora the principal genera recorded from the locality consist of *Thinnfeldia*, *Sphenopteris*, *Cladophlebis*, *Macrotæniopteris*, *Oleandridium*, *Tæniopteris*, *Podocamites*, *Baiera*, and *Phyllotheca*.

The deposits consist mostly of greyish clay shales, with numerous narrow bands and concretionary nodules. These bands and nodules are partly composed of clay ironstone and are marked with lines of

* Fossil Plants from Duaringa, Ipswich, Dawson R., and Stanwell, &c. By J. Shirley, B.Sc. (Bull. 18), p. 16, with 3 plates, 8vo. By Auth., Brisbane, 1902, G.S.Q. Pub. No. 171.

† (a) On the Geology of the Dawson and Mackenzie Rivers &c., by B.D. Feap. By Auth., Brisbane, 1901, G.S.Q. Pub. No. 155, p. 20.

(b) Annual Progress Report of the Geological Survey for the Year 1900 (1901). G.S.Q. Pub. No. 159, p. 16.

‡ Fossil Fishes of the Hawkesbury Series at St. Peter's, by A. G. Woodward, LL.D., F.R.S. Memoirs of the Geol. Surv. of N.S. Wales, Palæontology No. 10, p. 22, with 3 plates, 4to. Sydney. By Auth. 1908.

§ The Invertebrate Fauna of the Hawkesbury-Wianamatta Series of New South Wales, by R. Etheridge, junr., Curator of the Australian Museum. Memoirs of the Geol. Surv. of N.S.W., Palæontology No. 1, p. 25 with 2 plates, 4to. Sydney. By Auth. 1888.

stratification which, in the case of the concretions, pass out into the shales in which they are imbedded. There is no doubt of their being formed *in situ*—although an opinion has been expressed to the contrary—the hardening being produced by the organic acids in the animal and plant remains acting on the ferruginous constituents of the shales. Iron pyrites is of frequent occurrence, and some of the fossil fish and insects have been preserved in this mineral. Fossils are occasionally found which are not encased in the concretionary clay ironstone, but in such cases the matrix of shale is generally more or less sandy and porous, allowing free percolation of mineral solutions, and consequently with less precipitation of mineral matter around the fossils. One could tell fairly well by appearances if a concretion contained shells, leaf fragments, fish remains, or nothing at all, those containing the fish almost always conforming with the shape of the individual, and having a somewhat concave depression above, and a gentle convexity below.

The Unios were always found in roughly spherical concretions, generally congregated around an axis of wood which must have been partly decayed before fossilization, the insects being found in concretions in association with both fossil fishes and Unios.

The shales containing the fossil remains—insects, fishes, labyrinthodonts, coprolitic fragments, and plants—belong to the Wianamatta shales, a series probably equivalent to the Upper Clarence Series in Northern New South Wales and the Darling Downs-Walloon Coal Series in Southern Queensland. This position for the St. Peter's fossil beds places the horizon in the Jurassic and above the fossil bed at Ipswich, which is probably Upper Triassic.

Description of the Fossil Insects.

By R. J. TILLYARD.

1. INTRODUCTION.

THIS paper deals with a number of fossil insects from Denmark Hill at Ipswich, and St. Peter's near Sydney, and also individual specimens from Goodna near Ipswich, and from Duinga on the Queensland Central Railway line; these were forwarded to me for study in October, 1913, by Mr. B. Dunstan, Chief Government Geologist of Queensland, to whom I desire to express my deep indebtedness for the privilege of being allowed to examine such an interesting collection.

The collection of fossils principally consists of two very distinct groups from different localities, viz. : (1) specimens from the Ipswich Coal Measures, South Queensland, and (2) specimens from the Wianamatta Shale of the St. Peter's Brickworks, Newtown, Sydney, New South Wales. About three-fourths of the specimens of insects are from the former beds. Besides the undoubted remains of insects, there were a few doubtful specimens, which have not been determined satisfactorily, owing to lack of definite characters. These have been omitted from the paper. The consignment also contained a large number of specimens of a fine Peracarid Crustacean from St. Peter's, two specimens of a Zygopterid Dragon-fly larva from a bore at Duinga in Central Queensland, and an Osmyid from Goodna, near Brisbane. Some of the crustacean specimens, all of which appear to belong to a single species, are in a fine state of preservation, but their description would be out of place in this paper, and hence they have been omitted.

The first examination of these fossils indicated that the Ipswich specimens are, fortunately, both varied and abundant, and in the best state of preservation for study and description. The grain of the Ipswich shales and sandstone is fairly fine, so that the fossils, though sometimes rather faintly impressed upon the rock, offer the ideal conditions for study by strong oblique light. By this means the various sets of cross-veins in the wing venation can be brought into relief. The main veins in almost all cases show a characteristic structure, and are easily followed.

The St. Peter's fossils, on the other hand, are nearly all preserved in a hard, somewhat brittle, blackish rock of very uneven cleavage,

which makes the venation very difficult to follow. In one or two cases where the fossil lies on a plane surface, the specimens happen to be almost entire, and the pressing down of the fore-wing upon the hind-wing at a slightly different angle makes it impossible to disentangle the complex venation satisfactorily. They include a number of Coleoptera, together with the remains of some very large insects referable to the Protorthoptera.

The *Goodna* specimen forms a simple impression in a yellowish brown clay ironstone, being dark-coloured, well defined, and easily distinguished. The wing is very delicate, and a large somewhat oval piece is missing towards the distal end.

As regards the *Duaringa* specimens, these are in the soft core of a bore, and are poorly preserved. Only a small portion of the hardest part of the chitin is still visible ; the rest of the insect is only in rough outline.

It seemed advisable to keep the fossils from the four different localities distinct throughout, so the paper is divided into four sections, the first dealing with the Ipswich fossils, the second with those from St. Peter's, the third with the Osmyloid from Goodna, and the fourth with the *Duaringa* larvæ. Each ends with a summary of results and a short attempt to indicate the important points in which the fossils may be considered to have altered our views on the phylogeny of the Insecta. For the accumulation of the fossil insects we are indebted to Mr. Dunstan, who collected the St. Peter's specimens many years ago, while Lecturer in Geology at the Sydney Technical College, and the Ipswich specimens soon after he came to Queensland. With regard to the Ipswich fossils, the collection, small as it yet is, suggests that Mr. Dunstan might show these beds to rank in the future with those of Commeny in France and Solenhofen in Bavaria, in the value of their insect record.

Some of the figures of the specimens which accompany this paper have been drawn under the camera lucida, others being reproduced by photography, all necessitating the use of a strong oblique light. It has sometimes been necessary to change the direction of the light once, or even twice, during the drawing of a single specimen, in order to bring into relief different sets of cross-veins. The main veins are usually easily followed in any light, and cannot very well be confused with scratches or with thin strands of plant-material.

In the descriptions of the wings, the Comstock-Needham notation has been followed throughout. The six main veins of the wing from the front to the back are called the costa (*C*), subcosta (*Sc*), radius (*R*), media (*M*), cubitus (*Cu*), and analis (*A*). It is not, of course,

claimed with some of the fragments that the interpretation offered is not open to question. Handlirsch's monumental work* has frequently been referred to, and has proved itself invaluable, especially for the means of comparison with fossils from other parts of the world.

New generic and specific names have only been proposed when the specimens were seen to be sufficiently well preserved to warrant definite characterisation and classification, while a number of undetermined forms have been relegated to "Insecta Incertæ Sedis," without being named.

2. IPSWICH FOSSIL INSECTS.

Order **BLATTOIDEA.**

Family MYLACRIDÆ.

Genus **AUSTROMYLACRITES**, gen. nov.

Tegmen broadly oval, with numerous main veins diverging from the base; all the veins dichotomously branched at intervals; no cross-veins or interpolated sectors.

TYPE:—*Austromylacrites latus*, sp. nov.

AUSTROMYLACRITES LATUS, sp. nov.

Plate 2, fig. 1.

A fragment showing the greater portion of the basal half of the tegmen, carrying nine main veins, all branching dichotomously at wide intervals. The arrangement of the veins is very symmetrical about the longitudinal axis of the wing, so that it is impossible to determine with certainty which is the costal and which the anal border. Venation well preserved and easily followed.

MEASUREMENTS:—Greatest length of fragment 11 mm., greatest breadth 10 mm.

TYPE:—Spec. 8 (Plate 2, fig. 1). (B. D. Coll.)

OBS.:—The venation of this interesting fossil bears an exceedingly close resemblance to that of the specimen† described and figured by Scudder‡ from the Upper Carboniferous of Mazon Creek,

* Die Fossilen Insekten. Leipzig, 1908.

† Not placed generically: specific name—*Gurleyi*, Scudder.

‡ Revision of the American Fossil Cockroaches, with Descriptions of New Forms, by S.I.L.S., p. 145, with 12 plates. Bull. 124, U. S. Geol. Surv. By Auth., Wash., 1895.

Illinois, U.S.A. It is definite evidence that, even as early as Mesozoic times, Australia was a sanctuary for archaic forms which probably had died out long before in the Northern Hemisphere.

Order **PROTORTHOPTERA.**

GENUS **MESORTHOPTERON**, gen. nov.

Forewing narrower than hindwing, very densely veined, and slightly thickened, probably forming a weak tegmen. Hindwing not thickened, membranous, hyaline, with less dense venation. Subcosta is a fairly strong straight vein, sending off a series of obliquely placed parallel cross-veins into the fairly wide costal space above it. Radius forms a very strongly built vein lying fairly close below the subcosta, and giving off posteriorly at least one branch, the radial sector (*Rs*). Median vein slenderer, giving off before the level of the origin of *Rs* at least three branches *anteriorly from the main stem*, the first two of these arching slightly upwards towards *R*. Cubitus branched in forewing, possibly unbranched in hindwing. Several anal veins present in hindwing.

TYPE :—*Mesorthopteron locustoides*, sp. nov.

MESORTHOPTERON LOCUSTOIDES, sp. nov.

Plate 1, fig. 4, and Plate 2, figs. 3-6.

This species is represented by three fragments, two of which (Plate 2, figs. 3, 4—5, 6) are very similar in shape, and represent closely similar portions of the left hind and fore wing respectively. The third piece (Plate 1, fig. 4) is a slightly smaller fragment from a more distal part of a hindwing. Had it not been found close to the other two, there would be little to connect it with them, but it seems to be undoubtedly a portion of the same insect.

The fragment labelled *5a* (Plate 2, fig. 5) and that labelled *5b* (Plate 2, fig. 3), when compared together, are seen to differ in three important particulars: (1) The fragment *5b* is a much lighter and more delicate impression, scarcely raised at all above the rock level on which it is placed, whereas *5a* is more distinct, and appears to represent definitely a wing of thicker substance; (2) the former shows little trace of cross-veins, whereas the latter is covered by a dense network of small cells, except in the costal space; (3) judging by the amount of divergence of the main veins, *5b* was a broader wing than *5a*. All these three facts point definitely to specimen *5a* being the forewing and specimen *5b* the hindwing. The thicker texture and denser venation of *5a* suggests at once that this forewing

acted, at least partly, as a tegmen, and forming an intermediate stage in the phylogeny of the present-day strong and narrow Orthopterous tegmen characteristic of many recent Locustoidea.

The two wings agree in the following characters:—The nature of the costal area bounded by the straight subcosta below and crossed obliquely by parallel cross-veins, the comparative sizes and positions of *Sc* and *R*, the rather peculiar sculpture of the broad radius (not shown in the figures but visible in the specimens with careful lighting), the position and direction of the radial sector, and the nature of the branches of the media. They differ only in texture, width, density of venation, and probably in the form of the cubital and anal veins. It will be seen that the fragment of hindwing is a portion slightly nearer the base than that of the forewing, and shows us not only a series of anal veins, but also the very characteristic origins of the three anterior branches from the main stem of the media. The archings upwards towards the radius in the case of the first two of these are very similar in both wings. In the forewing there is preserved a wider area of the costal space, showing the parallel oblique cross-veins to be unbranched distally. The close double row of cells between *Sc* and *R* in the forewing is in sharp contrast with the apparently free corresponding space in the hindwing. The few cross-veins which can be made out in the hindwing, *c.g.* those between *R* and the uppermost branch of *M*, show that the venation of this wing was much more open than that of the forewing. In the latter there is a dense system of small cells between all the main veins.

Turning to the specimen *5c* (Plate 1, fig. 4), this is determined as part of a hindwing on account of its open venation. The slant of the cross-veins forming the two upper rows of the specimen suggests that the fragment lies close to the costal border. Apart from this, if the specimen had been found alone there is nothing to suggest to what order it might belong, the lower cross-veins suggesting a portion of a large Odonate wing.

MEASUREMENTS:—Basal fragment of forewing (*5a*)—greatest length 12 mm., greatest breadth 8 mm. Basal fragment of hindwing (*5b*)—greatest length 11 mm., greatest breadth 8.5 mm. Distal fragment of hindwing (*5c*)—greatest length 9 mm., greatest breadth 9 mm.

TYPES:—The three fragments, Specs. *5a*, *5b*, *5c* (Plate 1, fig. 4; Plate 2, figs. 3-6). (B. D. Coll.)

OBS.:—The chief interest in this species appears to lie in the fact that it gives us a definite connection between Handlirsch's Protorthoptera of the Carboniferous and Permian in the Northern

Hemisphere,* and the Locustoidea of the present day. Some of the species figured by Handlirsch resemble fairly closely the hindwing of the species here described. The question of the advance in tegmination in the forewing is a difficult one. Wherever the substance of the wing is not completely destroyed, as in the present case, but replaced by an inorganic deposit, the relative thickness of fore and hind wings can be fairly well gauged. There can be little hesitation, in the present case, in correlating the advance from an unspecialised hyaline wing towards a true tegmen with the retention of an originally "paleodictyopterous" condition of the venation, or else with the elaboration of such a condition from an earlier simpler venation. The question, therefore, arises whether some of the Carboniferous Paleodictyopterous wings were semi-tegminous, and whether we may not soon expect to complete a chain of phylogenetic evidence connecting some of our recent Orthoptera with Palæozoic forms placed by Handlirsch outside this order.

Genus MESOMANTIDION, gen. nov.

Wing large, elongate, with strong radius and media. A weak costal vein reaches the anterior border quite close to the base, cutting off a narrow precostal area intersected by a few simple cross-veins. Subcosta is slender but long. Radius is strong, nearly straight, supporting above it a large subcostal area narrowest at base and crossed by numerous irregular cross-veins, obliquely placed, and sometimes irregularly branched. No radial sector present, unless distally from the preserved part of the wing. Media is a strong branching vein, the main stem (*M2*) apparently giving off both an anterior branch (*M1*) and a posterior branch (*M3*) at about the same level, *i.e.*, a little beyond the level of the ending-up of *C*. Both *M1* and *M2* are again branched further distally. Three slender veins below *M* appear to represent the cubitus and analis. Cross-veins in single rows only.

TYPE:—*Mesomantidion queenslandicum*, sp. nov.

MESOMANTIDION QUEENSLANDICUM, sp. nov.

Plate 5, fig. 2.

The fragment *1a* represents the basal half, or perhaps a little more than half, of a rather large wing. It shows the very peculiar convexly curved anterior border still preserved in certain recent Mantoids, such as *Metallica*, and appears to lie not far from the direct ancestral line of that peculiar group. The most remarkable points in the wing are the presence of a separate precostal area, the

* *Loc. cit.*

greatest width of the subcostal space distally, and the very strong development of the media. It is unfortunate that the actual origins of *M1* and *M3* with *M2* should be obliterated. It is quite possible that, as in *Metalleutica*, a short distal radial sector may have been present, arising beyond the distal end of the preserved portion.

MEASUREMENTS :—Length of preserved portion of radius 39 mm., greatest breadth of fragment 18 mm.

TYPE :—Spec. 1a (Plate 5, fig. 2). TYPE-COUNTERPART :—Spec. 1b. (B. D. Coll.)

OBS. :—The remarks made upon the significance of the genus *Mesorthopteron* apply with some modification to *Mesomantidion* also. If we decide to class as Protorthoptera all those fossils which cannot be definitely placed in our recent Orthopterous families, but still possess an undoubted Orthopteroid structure, we shall be right in including both these genera in that ancient order. Nevertheless, *Mesomantidion* is nearer to a definite phylogenetic connection between the Protorthoptera and recent Mantoidea, just as *Mesorthopteron* helps to bridge the gap between the Protorthoptera (and incidentally also the Palaeodictyoptera) and the recent Locustoidea. Further discoveries along these interesting lines in the Queensland Trias may be awaited with much interest.

Order COLEOPTERA.

Family HYDROPHILIDÆ (?).

Genus ADEMOSYNE, *Handlirsch* (1908).

This genus was formed by Handlirsch for the reception of the two species of Coleoptera figured by Etheridge and Olliff* from Ipswich, Queensland, as Hydrophilidæ. The type species *A. major*, Handlirsch, is said by him to resemble closely the Liassic genus *Nannoödes*. It is a rather small, somewhat heart-shaped beetle, about 4.5 mm. long.

In this genus a number of forms have been placed which agree in having the elytra sculptured with from six to nine fine striæ, and with or without punctures. The interstices are usually low, smooth (punctate in *A. punctata*) or slightly raised. If they are really aquatic beetles (as may be assumed from their comparative abundance) they would go equally well into either Hydrophilidæ or Parnidæ. The two large species, *A. tumida* and *A. Cameroni*, also appear to show very great resemblance to elytra seen in many species

* Loc. cit., pl. 2, fig. 6 (*A. major*), fig. 7 (*A. minor*)

of the genus *Adelium* (family Tenebrionidae). All that can be said is that this type of sculpture is not a sufficient guide to enable their being placed definitely in any single family.

There are no complete specimens in the collection, but a number of separate elytra. In studying these, one has nearly always the advantage of examining two impressions. The elytron being very convex, it follows that it forms a kind of mould, within which a cast of the internal sculpture is formed and preserved. It will be convenient, therefore, to designate as the *mould* the *concave* impression in the rock which preserves the *external* sculpture, using the term *cast* for the *convex* impression which preserves the *internal* sculpture.

ADEMOSYNE AUSTRALIENSIS, sp. nov.

Plate 4, fig. 3.

ELYTRON, 3.4 mm. long, 1.2 mm. wide. Sculpture, ten delicate longitudinal interstices, with intercostal punctate striæ. Shape, nearly a regular ellipse, margin and suture nearly equally curved, and apex obtusely pointed. Marginal border about same width as intervals between striæ, the suture border being wide near the base. Convexity, considerable.

TYPE:—Specs. 12*a* and 12*b* (mould and cast) (Plate 4, fig. 3).
CO-TYPE:—Specs. 13*a*, 13*b* (mould and cast), and 43 (mould). (B. D. Coll.)

OBS:—Differs from the genotype in the elytra being less tapered posteriorly, and larger. Closely resembles *A. minor*. Handlirsch, in shape, but the latter is much smaller, and is shown with only seven or eight interstices.

ADEMOSYNE ANGUSTA, sp. nov.

Plate 4, fig. 4.

ELYTRON, 3 mm. long, 1 mm. wide. Sculpture not completely preserved, but formed by eight or nine striæ without punctures on the striæ. Shape, a narrow oval, somewhat pointed posteriorly, preserved, but formed by eight or nine low costæ without punctures on the striæ. Shape, a narrow oval, somewhat pointed posteriorly, with suture and margin equally curved and tapering to the apex. Marginal border narrow. Convexity, low and less marked than in *A. australiensis*.

TYPE:—Specs. 15*a* and 15*b* (mould and cast) (Plate 4, fig. 4).
CO-TYPE:—Specs. 16*a*, 16*b* (mould and cast). (B. D. Coll.)

OBS:—Its narrow shape, low ridges, and absence of punctate striæ separates it from all other species of *Ademosyne*.

ADEMOSYNE OBTUSA, sp. nov.

Plate 4, fig. 5.

ELYTRON, 2.3 mm. long, 1 mm. wide. Sculpture very clearly marked, consisting of nine rather thick ridges, parallel except at the extreme end. Shape, a rather wide bluntly rounded oval, the posterior end rather obtuse. Convexity, considerable.

TYPE:—Specs. 9*a* and 9*b* (mould and cast) (Plate 4, fig. 5). (B. D. Coll.)

OBS.:—Appears to be a very distinct species, the high convexity, parallel ridges, and the difference of width separating it from *A. angusta*.

ADEMOSYNE OLLIFFI, *Handlirsch*.

Plate 1, figs. 3, 8.

Pseudorrhynchophora Olliffi, Handlirsch. Die Fossilen Insekten, Leipzig, 1908.
Rhynchophorous beetle. Etheridge and Olliff. Mem. Geol. Surv. N.S.W. Palæontology, No. 7, Sydney, 1890.

An examination of the genotype reveals peculiarities not shown in the drawing of the cast by Eth. and Olliff,* and there is nothing to warrant the original determination of this fossil as a Rhynchophorous beetle. It is therefore retained provisionally in *Ademosyne*, even though the elytron is rather small and narrow for this genus.

ELYTRON, 1.7 mm. long, 0.7 mm. wide. Sculpture, nine delicate ridges with punctate or pitted furrows. Shape, a narrow oval, the shoulder or base being round, the posterior end or apex obtusely pointed. Convexity, rather low.

TYPE:—Spec. S1 (Plate 1, fig. 3) (Simmonds Coll.). CO-TYPE:—Spec. 35 (Plate 1, fig. 8) (B. D. Coll.).

OBS.:—The type specimen has not the straight suture shown in the drawing referred to, the suture and the margin being almost equally curved. Its narrow oval shape is a conspicuous character.

ADEMOSYNE MAJOR, *Handlirsch*.

Plate 5, figs. 1, 6.

Ademosyne major, Handlirsch. Die Fossilen Insekten, Leipzig, 1908.
Hydrophilidæ? Etheridge and Olliff, Mem. Geol. Surv. N.S.W. Palæontology, No. 7, Sydney, 1890.

ELYTRON, 2.8 mm. long, 1 mm. wide. Sculpture, eight distinct

* Loc. cit., Plate 2, fig. 5.

and finely punctate striae, the punctures being at regular intervals between the base and the apex. Convexity, moderately high.

TYPE :—Spec. S2 (Plate 5, fig. 6) (Simmonds Coll.). CO-TYPES :—Specs. 36*a* and 36*b* (mould and cast) (Plate 5, fig. 1) ; spec. 10 (cast) and spec. 44 (cast). (B. D. Coll.)

OBS. :—The suture is not straight as shown by Eth. and Olliff,* but has a decided curve towards the apex. The type specimen also shows sculpture lines on the prothorax, and impressions which appear to be under the elytra.

ADEMOSYNE MINOR, *Handlirsch*.

Plate 5, fig. 3.

Ademosyne minor, Handlirsch. Die Fossilen Insekten, Leipzig, 1908.

Hydrophilida? Etheridge and Olliff, Mem. Geol. Surv. N.S.W. Palaeontology, No. 7, Sydney, 1890.

ELYTRON, 2 mm. long, 0.8 mm. wide. Sculpture consists of eight lines, without other ornamentation. Shape, a somewhat narrow oval, with apex rounded, and suture slightly curved. Convexity, moderately high.

TYPE :—Spec. S3 (Simmonds Coll.). CO-TYPE :—Specs. 38*a* and 38*b* (mould and cast) (Plate 5, fig. 3) ; spec. 39 (cast). (B. D. Coll.)

OBS. :—Its oval shape is somewhat like that of *A. australiensis* but its size approaches that of *A. Olliffi*. The drawing by Eth. and Olliff † is of the mould, showing the external sculpture.

ADEMOSYNE CONGENER, sp. nov.

Plate 2, fig. 8.

ELYTRON, 4 mm. long, 2.1 mm. wide. Sculpture consists of nine finely punctate striae. Shape, apex obtusely pointed, margin and suture both curved with a gentle taper to the apex. Convexity moderately high.

TYPE :—Spec. 40 (cast) (Plate 2, fig. 8). CO-TYPE :—41*a*, 41*b* (counterpart), 42 (cast). (B. D. Coll.)

OBS. :—Somewhat like *A. australiensis*, but the posterior half is more tapering, the form larger, and the sculpture less pronounced.

* Loc. cit., Plate 2, fig. 6.

† Loc. cit., Plate 2, fig.

ADEMOSYNE TUMIDA, sp. nov.

Plate 6, fig. 2.

The specimen has the whole of the right elytron and the distal portion of the left preserved.

ELYTRON, 7.5 mm. long, 2.9 mm. wide. Sculpture, eight punctate striæ, very faint except towards the apex; interstices finely granular. Shape, apex blunt, base slightly curved, suture nearly straight, margin gently curved from shoulder to apex, marginal border equal in width to that of the interstices, but wider towards the shoulder. Convexity, rather low near base, much swollen towards the apex.

TYPE :—Specs. 45*a* (mould), 45*b* (cast) (Plate 6, fig. 2). (B. D. Coll.)

OBS. :—This is one of the two largest species of *Ademosyne*. It is conspicuous because of its tumid appearance, its well-developed interstices, the extreme fineness of the pittings on the striæ, and its strongly marked marginal border.

ADEMOSYNE CAMERONI, sp. nov.

Plate 4, fig. 1.

ELYTRON, 7.2 mm. long, 3 mm. wide. Sculpture, eight well-developed punctate striæ, the punctures being deep and clearly marked. Shape, apex pointed, base nearly straight, suture and margin almost equally curved and tapering to the apex, both sutural and marginal borders equally narrow.

TYPE :—Specs. 46*a* (mould), 46*b* (cast) (Plate 4, fig. 1). (B. D. Coll.)

OBS. :—The species is distinguished by the punctures being quite separate and distinct.

ADEMOSYNE PUNCTATA, sp. nov.

Plate 5, fig. 4.

ELYTRON, 4 mm. long, 1 mm. wide. Sculpture, eight faint striæ; these and the interstices both punctate, the distance between the punctures being about equal to the width of the interstices.

TYPE :—Spec. 47*a* (mould), 47*b* (cast) (Plate 5, fig. 4). (B. D. Coll.)

OBS. :—This is the only species of *Ademosyne* having both interstices and striæ punctate. Towards the base the punctate character becomes more conspicuous.

Family BUPRESTIDÆ (?).

MESOSTIGMODERA TYPICA, *Eth. & Olliff.*

Mesostigmodera typica, Etheridge and Olliff, Mem. Geol. Surv. N.S.W. Palaeontology, No. 7, Sydney, 1890.

ELYTRON, 15 mm. long, 4.8 mm. wide. Sculpture is as shown in the three figures by Eth. and Olliff,* but an enlargement of the specimen represented in figure 1 (the interior impression or cast) shows an absence of pits, each tubercle consisting of an annular structure with a central core. The tubercles are about 0.2 mm. in diameter, and separated from one another by a distance a little greater than their diameter. They are arranged in about 17 rows, the tubercles in adjacent rows being generally placed opposite one another, but frequently an intermediate arrangement is to be observed. A double line of tubercles exist in the space between the suture and the sutural line, packed close together and without pits around them.

TYPE:—Specs. S5a and S5b (mould and cast). (Simmonds Coll.)

OBS.:—The drawings mentioned above have been reversed in reproduction, and fig. 1 (the mould) should have shown the external sculpture represented in fig. 3, while fig. 2 (the convex counterpart or cast) should have shown the internal impression.

It is not possible to determine with certainty the family to which this fossil belongs. The shape and sculpture of the elytron strongly suggest a close relationship with *Stigmodera*, the well-known Australian genus of Buprestidæ.

Family TENEBRIONIDÆ.

Genus ULOMITES, gen. nov.

Appears to be closely allied to the recent Australian genus *Uloma*, with which it agrees very closely in the sculpture and shape of the elytra.

TYPE:—*Ulomites Willcoxi*, sp. nov.

ULOMITES WILLCOXI, sp. nov.

Plate, 4 fig. 7.

ELYTRON, 11 mm. long, 3 mm. wide. Shape, sides sub-parallel, base round, apex pointed, slightly falcate; marginal and sutural borders narrow. Sculpture, seven distinct punctate striae, the distance

* Loc. cit., Plate 2, figs. 1-3.

between the punctures being about half the width of the interstices. Marginal interstices becoming wider and slightly more prominent towards the apex, where it sharply tapers off. Sutural border flat and about half the width of the interstices, marginal border narrower but prominent. The cast shows the interstices to be faintly granulate on the interior surface, the mould showing the exterior to have a more marked and clearly defined granulation.

TYPE:—Spec. 50*a* and 50*b* (mould and cast) (Plate 4, fig. 7). (B. D. Coll.)

OBS.:—A beautifully preserved specimen of a very typical Tenebrionid elytron. I have dedicated the species to Mr. Willcox, who assisted in the collecting of the Ipswich fossil flora and fauna many years ago, and who is now engaged on this work.

Family CERAMBYCIDÆ.

Genus MESOTHORIS, gen. nov.

Resembles the recent Australian genus *Thoris* in the shape and sculpture of the elytra, which are marked all over with definite areole separated by longitudinal and transverse ridges.

TYPE:—*Mesothoris clathrata*, sp. nov.

MESOTHORIS CLATHRATA, sp. nov.

Plate 4, fig. 6.

ELYTRON 7.2 mm. long, 2.5 mm. wide. Shape, margin much curved, suture less so, apex bluntly pointed, base somewhat narrow. Sculpture, nine longitudinal ridges, with intersecting cross-ridges, together forming a network or areolate structure. The pittings are variably depressed, generally round but occasionally oval and irregular, the diameter being rather less than that of the ridges. The ten rows of areolæ formed by the nine ridges and cross-ridges diminish in number, with very little convergence, towards both apex and base, the areolæ retaining a nearly uniform size all over the elytra. The marginal border is slightly narrower than the sutural one, the width being less than that of the costal ridges, both being rather well-defined and finely granulate.

TYPE:—Specs. 48*a*, 48*b* (mould and cast) (Plate 4, fig. 6).
Co-TYPE:—Spec. 49 (cast, pair of elytra); Specs. 51*a*, 51*b* (mould and cast). (B. D. Coll.)

Obs. :—The co-type agrees very closely with the type specimen, but shows that the elytra vary in length up to 9.6 mm. Specs. 51a and 51b have a marginal ridge which is probably a distortion. They also show the granulations on the marginal and sutural border. Spec. 49 shows a very minute cellular structure where the elytron has been broken, this being, probably, a portion of the remains of a plant common in the shale matrix, and not belonging to the individual.

Family CURCULIONIDÆ.

ETHERIDGEA AUSTRALIS, *Handlirsch*.

Plate 5, fig. 5.

Etheridgea australis, Handlirsch. Die Fossilen Insekten, Leipzig, 1908.

Glochionorhynchus? Etheridge and Olliff, Mem. Geol. Surv. N.S.W. Palæontology, No. 7, Sydney, 1890.

ELYTRON, 3.6 mm. long, 1.4 mm. wide. Sculpture—no ridge present, but there are thirteen rows of minute tubercles which vary much in size and prominence and in their distance from one another.

TYPE :—Spec. S4 (Plate 5, fig. 5). (Simmonds Coll.)

Obs. :—The ridge shown in the drawing of the type by Eth. and Olliff* is probably a post-mortem distortion. Other subordinate irregularities to be observed in the type specimen, but not shown in the figure, are probably due to the same cause. The illustration is also reversed, the type specimen being the right and not the left elytron, the correct position being shown in the present reproduction.

Order ODONATA.

Sub-Order ? Anisoptera.

Sub-Family MESOPHLEBINÆ.

Genus MESOPHLEBIA, gen. nov.

Nodus well developed, but continued straight downwards beyond *Sc*, instead of being bent outwards in the direction assumed by the nodi of all recent Odonata, and stopping short at the radius. No sub-nodus present. Subcosta terminating at nodus. Pterostigma present, well formed, an elongate parallelogram with the lower side (formed by the radius) convexly thickened; a weak brace-vein present (*Bc*). *M1* arching up to run close under pterostigma. Postnodal sector (*M1a*) present, well formed. *M2* leaving *M* as distad from nodus as

* Loc. cit., Plate 2, fig. 4.

M3 leaves it proximad, *i.e.*, about four cells' length. The sector lying between *M2* and *M3* indeterminate, apparently arising just distad from *M3* and supported by strong cross-veins placed very obliquely on either side of it, below the level of the nodus. Presence or absence of bridge and oblique vein indeterminate, owing to obliteration of venation in the region where the latter should be looked for. *M4* very irregular distally, breaking up into a zigzag row of cell-borders. Space between *M4* and *Cu* very wide, but filled by only a single row of elongate cells bounded by parallel cross-veins. *Cu* reaches the wing border at a level more than half-way between nodus and pterostigma.

TYPE:—*Mesophlebia antinodalis*, sp. nov.

Obs.:—It is difficult to indicate any affinities between this extraordinary wing and that of any other Odonate, fossil or recent. The obviously very great breadth of the wing in proportion to its length, and the close approximation of the nodus to the pterostigma, make it almost certain that the wing is the hindwing of an Anisopterous dragon-fly. On the other hand the absence from the fragment of the very important basal half of the wing, and the obliteration (apparently by partial decomposition of overlying vegetable remains) of just that small portion of the series of cross-veins between *M2* and *M3* where we should expect to find the oblique vein, makes the definite determination of the sub-order to which it belongs an impossibility. It is not inconceivable that a Zygopterous hindwing of the type shown in *Epiophlebia* might not have possessed a quadrilateral wide enough to allow of the development of a single row of cells between *M4* and *Cu*, as elongate as those here shown. Pending the discovery of further remains of this interesting insect, which we may reasonably hope will be found if the Ipswich beds are more fully worked, the genus has been placed in a new sub-family, Mesophlebiinae, characterised by the form of the nodus, and placed provisionally as an isolated side-branch of the sub-order Anisoptera.

MESOPHLEBIA ANTINODALIS, sp. nov.

Plate 4, fig. 2.

The fragment 3a consists of the greater portion of the distal half of the wing, from a point on the radius about six cells proximad from the nodus, to a point just short of the wing-tip. A fracture roughly perpendicular to the distal ending of *M3*, and hence parallel to the direction of the nodus, has destroyed the extreme distal portion of the wing-border. Vegetable remains overlie the wing in several places, and have caused obliterations of some important cross-veins.

A vegetable stem, very strongly marked, lies right across the wing just distally from the nodus. The stem is actually *beneath* the wing, since the main veins can be followed easily across it.

Under strong oblique light, it is just possible to see two nearly parallel oblique marks passing from *M2* to *Rs* in the region just distally below the curve of *M2* (left clear in the figure). One of these is definitely determined to be a light scratch: the other might possibly be the partly obliterated remains of the oblique vein. Much as one would like to determine the oblique vein definitely and thus know whether the specimen should be placed in the Anisoptera or in the Epiophlebiinae (and it should be remarked that the oblique vein ought to occur just at this point), yet it cannot be said that this important vein has been satisfactorily made out, and so it is preferred to leave it undetermined. The same may be said of the origin of the vein provisionally labelled *Rs*: the wing is just hereabouts in very poor condition, and none of the veins can be closely followed out. On the other hand, the perfect preservation of the nodus and pterostigma is indeed marvellous. Even the slight "ribbing" of the costa just distad from the nodus can be identified by careful manipulation of the light, while the pterostigma is still more easily picked out as a somewhat darkened and thickened patch near the wing-tip, enclosed by veins whose outline is absolutely perfect. The alternate convexity and concavity of the main veins are also easily distinguished.

MEASUREMENTS:—Greatest length of fragment 21.5 mm., greatest breadth 11 mm., distance from nodus to pterostigma 12 mm., length of pterostigma 2.8 mm.

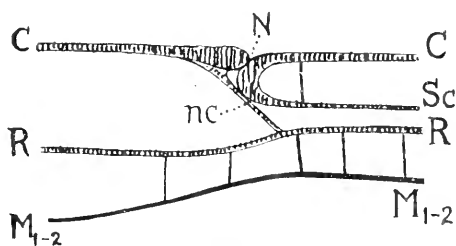
TYPE:—Spec. 3*a* (Plate 4, fig. 2). TYPE-COUNTERPART:—Spec. 3*b*. (B. D. Coll.)

THE PHYLOGENY OF THE NODUS IN THE DRAGON-FLY WING.

The discovery of *Mesophlebia* gives us a very important clue to the phylogeny of that extraordinary and unique formation in the Dragon-fly wing known as the *nodus*. So far its origin has been only speculated upon. Now at last we have some solid ground on which to base its phylogeny. In *Mesophlebia* the nodus is very beautifully preserved, and it is also of a form not found in any recent Dragon-fly wing. It is shown enlarged in text-fig. 4. It will be seen that the nodus is made up of two distinct parts, one distal from and the other proximal to the nodal joint. The proximal part is formed by the distal end of *Sc* being turned up and fused with the costa; this fusion is thickened and beautifully rounded off. The distal part is obviously formed simply by a specialised cross-vein,

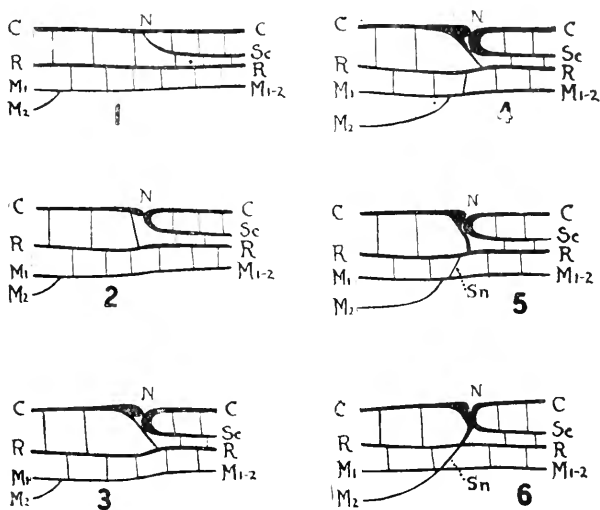
strengthened above by an enlarged knob on the costa. This cross-vein will be termed the *nodal cross-vein (nc)*. The sudden bend of *R* is a mechanical device correlated with the shifting of the nodal cross-vein from an originally perpendicular to an oblique position. The costal knob rests upon the curved fused part of *Sc* with *C*, and the result appears to be a rather loose joint.

Fig. 4.

*The Nodus in Mesophlebia.*

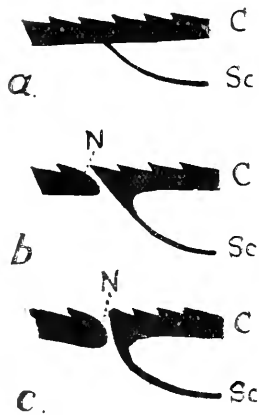
The nodus of recent dragon-flies (text-fig. 5₆) differs from that of *Mesophlebia* in two important respects. Firstly, the joint is a much more complete one, the proximal and distal parts of the nodus being more closely fused. Secondly, the lower half of the nodal cross-vein has become bent at an obtuse angle to the rest, and is continued downwards between *R* and *M₁₋₂* by a thickened oblique vein called the *subnodus (Sn)*, which in its turn is usually continued directly by *M₂*. In *Mesophlebia*, *M₂* leaves *M₁₋₂* a considerable distance distad from the level of the nodus, and the subnodus is quite absent.

Fig. 5.

*Six stages in the Phylogeny of the Nodus.*

In text-fig. 5 there are six probable stages indicated in the phylogeny of the nodus. No. 1 shows the archaic state in which there was no nodus, but the subcosta ended up on the costal border at *N*, a little proximally to one of the cross-veins. In No. 2, the costal break or joint is formed and the cross-vein is just about to move out of the perpendicular to form a support. In No. 3 the support is formed and we have the *Mesophlebia*-stage. In No. 4 *M2* begins to move backwards along *MI-2* towards the nodus level. In No. 5 one of the cross-veins between *R* and *MI-2* begins to turn obliquely so as to support *M2*, and the lower part of the nodal cross-vein begins to follow it. Finally, in No. 6, the complete *cross-support* from nodus to *M2* is achieved, and the subnodus definitely established, while the fusion of parts around the nodal joint has reached its maximum. This gives us the nodus as seen in the dragon-fly wing of to-day.

Fig. 6.



Phylogeny of the Costal Joint in Mesophlebia.

The only difficulty to be surmounted now is an explanation of how the costal joint arose, and this is explained by a reference to text-fig. 6. To understand the illustration it is necessary to remember that the so-called "costa" of the dragon-fly wing is not in reality one of the main veins of the wing, *i.e.* it is not formed about a precedent trachea in the larval wing-sheath. The costal trachea is vestigial and the "costa" is simply the immensely strengthened anterior border of the wing. Its structure is therefore quite different from that of a main vein. Instead of being a uniform longitudinal rod, it is seen to be very distinctly ribbed by a series of spines or teeth. It seems almost certain that each portion of the costa bearing a single tooth is the product of a single pair of hypoderm cells of

the wing-sheath. Thus there is no difficulty in understanding how a definite break or joint could be formed at the point where the subcosta joins it. The joint would be formed merely by separation of the block of chitin carrying the tooth beneath which the subcosta becomes united, from the next distally placed block. By subsequent enlargement of these two depositions of chitin, the nodal joint would be definitely formed.

The form of the nodus in *Mesophlebia* does not, therefore, preclude the supposition that this insect may actually lie in the direct ancestral line of some of our recent dragon-flies. Unless the basal half of the wing is discovered, and an examination made of the region of the arculus and triangle, *Mesophlebia* must always remain a puzzle. At present, it seems best to place it in a new sub-family Mesophlebiinae, characterised by the form of the nodus, the breadth of the wing, and the closeness of the pterostigma to the nodus. As stated before, this family may be only doubtfully added as a side-branch to the sub-order Anisoptera.

Order **MECOPTERA** (PANORPATÆ).

Family PANORPIDÆ.

Genus MESOCHORISTA, gen. nov.

FOREWING.—Outline oval; cross-veins nearly all either absent or so weakly developed as to be undecipherable in the fossil. Subcosta straight, parallel to costa, giving off a short slanting branch to costa at about the middle of the wing-length. A small cross-vein between costa and subcosta close to base. Radius curving away from *Sc* near base, then straight and running nearly parallel below *Sc*. Radial sector arising a little beyond one-fourth of the wing-length, branching dichotomously; each branch again dividing, the upper one far distally, the lower close to its origin. Media arched convexly costad near base, and soon branching into two: the lower branch is simple, continuing the line of the main stem straight on to the middle of the posterior border; the upper branch is divided dichotomously, each division again branching into two, of which the lower in each case again subdivides. First cubital vein weakly developed, lying in a deep fold or concavity; second cubital vein strong and straight, raised on a strong ridge or convexity. First anal vein also convex and straight, nearly parallel to *Cu2*; second anal vein weakly formed, lying in a concavity; third anal vein short, convex, and well formed.

TYPE :—*Mesochorista proavita*, sp. nov.

OBS. :—A genus very closely allied to *Tæniochorista* (Recent, Brisbane).

MESOCHORISTA PROAVITA, sp. nov.

Plate 2, fig. 2.

The specimen is clearly a forewing. Here and there, in certain lights, very faint impressions of cross-veins are observed which are not shown in the drawings. Between the basal cross-vein and the short distal branch of *Sc*, three weak cross-veins are observed close together. The most interesting fact about this fossil is its close resemblance to the wing of *Tæniochorista pallida*, Esben-Petersen, a very rare Panorpid known only from Brisbane, where it appears to have an aquatic or semi-aquatic existence. A comparison of the two wings brings out the following points :—The two short cross-veins connecting *C* with *Sc* are present also in *Tæniochorista*, in the same positions. The more distal one is also oblique, as in the fossil, but the curve of *Sc* distad from it is not so marked. In *Tæniochorista* there are also the three other weakly formed cross-veins close together, midway between the two.

All Panorpids have a number of short cross-veins between the main branches at intervals. In *Tæniochorista* these are formed of weak colourless chitin, little thicker than the membrane of the wing itself. They are not easy to see, unless the wing be held up to the light. It could scarcely be expected that these cross-veins would be preserved in the fossil wing. In view of the close correspondence in all other points, we may be fairly sure that they were actually present. The only one that can be definitely detected is a rather strong cross-vein descending upon *Cu* from the first dichotomy of *M*; only the upper half of this is preserved. *Tæniochorista* has this cross-vein present and more strongly formed than the others.

The radius and radial sector appear to be almost exactly alike in the two forms. In the media, the only difference is that in *Tæniochorista* only the most posterior of the four stems formed by the second branching of the upper branch of *M* is again branched; *i.e.*, the lower or posterior arm of the uppermost distal fork is absent, and only one vein runs to the wing border there instead of two. The correspondence between the cubital and anal regions of the wing in the two genera appears to be exact.

We may say definitely that, assuming the presence of the cross-veins already discussed in *Mesochorista*, the latter would become *Tæniochorista* by (1) a slight lengthening of the wing, (2) the loss of

the small arm distally on *M*, mentioned above, and (3) a slight straightening of *Sc* at the oblique distal cross-vein. It appears, therefore, that *Mesochorista* is undoubtedly the ancestor of *Teniochorista*, and we can only marvel at the slightness of the change through such long ages. The persistence of the five costal cross-veins in the same position for so long a time seems to be an extraordinary case of the survival of comparatively useless structures: the middle three, at any rate, appear to be quite useless. The allied genus *Chorista* has no cross-veins in this space, but the costa is more strongly arched. *Chorista* is also aquatic, and may well represent another line of descent from a form very close to *Mesochorista*, but with stronger cross-veins.

MEASUREMENTS :—Greatest length of fragment 10.5 mm., breadth 4 mm. The forewing of *Teniochorista pallida* is 16 mm. long; that of *Mesochorista* appears to have been about 13 mm. in all.

TYPE :—Spec. 32*a* (Plate 2, fig. 2). TYPE-COUNTERPART :—Spec. 32*b*. (B. D. Coll.)

OBS. :—A consideration of the characters to be observed in this interesting fossil offers very definite evidence of the stability of aquatic or semi-aquatic life in the region of Southern Queensland from the Trias to recent times, and helps us to understand how it was that *Ceratodus* also remained unchanged and unmolested in this same area. It should be added that specimens of *Teniochorista* are exceedingly rare, and nothing is known of their life histories, except that they are aquatic or semi-aquatic.

Order LEPIDOPTERA.

Family DUNSTANIDÆ.

Genus DUNSTANIA, gen. nov.

HINDWING.—Very broad, surrounded by a wide margin without pits. All the rest of the wing-membrane, between the veins, densely pitted all over; these pits appear to represent the bases of insertion of the wing-scales, which are completely lost. Subcosta waved, reaching the anterior border at a distance of one-fifth of the wing length from the apex. Upper branch of radius waved, ending at apex. Basal cell (d_1) formed between radius and media, narrow, elongate, with short distal side somewhat weakly formed. Beginning above the distal end of this cell, and extending distally from it, is a larger second cell (d_2), narrow, but increasing in width distally until near its apex, where the enclosing veins curve gracefully in to meet at an angle. From this angle a single vein runs to the *termen* well

below the apex. The two veins bordering d_2 both appear to be branches of the radius. Media wavy, giving off a short weak connection to the radius to form the distal side of d_1 . Cubitus with two branches: the upper one simple, slightly waved, the lower one broken at about two-fifths of its length, at a point from which a perpendicular vein branches off to the posterior border. Rest of wing lost.

TYPE:—*Dunstanía pulchra*, sp. nov.

OBS.:—I have dedicated this, the most perfect and beautiful of the Ipswich fossil insects, to Mr. B. Dunstan, Chief Government Geologist of Queensland, to whose untiring energy and keenness and ceaseless search we owe the preservation of this and the other fossils described in this paper.

The genus *Dunstanía* may be placed as the sole representative of a new family Dunstaniidae, characterised by the presence of the two cells as shown, and the weak closure of d_1 distally.

DUNSTANIA PULCHRA, sp. nov.

Plate 3, fig. 6.

This almost perfect specimen of a left hindwing is one of the most striking and beautiful fossil insect wings so far discovered. The border of the wing, together with all the veins, is of a pale colour. On both sides of each vein, and also internally to the wing border, there runs a very distinct brownish band, giving the wing a very striking and characteristic appearance. These brown bands are interrupted, or rather reduced to a lighter tint, across two transverse areas, one just distal to d_1 , the other between the apex of d_2 and the external border of the wing. It is possible that this may be simply due to the condition of preservation, or an indication of an original banded colour pattern, which probably existed originally also on the scales.

The external wing-border, or *termen*, shows signs of a delicate transverse ribbing. This extends also somewhat indistinctly round the apex on to the costa.

I have to thank Dr. A. J. Turner, F.E.S., of Sherwood, near Brisbane, for the suggestion that this fossil represents a hindwing in spite of the absence of frenulum or jugum.* Neither of these structures need be present in the hindwing of a moth; for instance, in the recent family Lasiocampidae their place is taken by an enlargement of the costal area. *Dunstanía* may well have resembled a Lasiocampid both in flight and appearance.

* An observation which has been fully justified by the discovery, since it was made, of the narrower and more elongated forewing of this same species.

The formation of the cells appears to differ in very important points from anything known in the Lepidoptera of to-day. Comparing the wing with those of certain archaic Lepidoptera, such as one of the Hepialidae or Limacodidae, we see that in the latter the cell d_1 is of considerably greater length, while there is also another closed cell below it, between M and Cu . It is by fusion of these two cells that the wide cell of the butterfly-wing has been evolved. In *Dunstania*, however, the upper cell of the two (d_1) alone is completed, and even that is only weakly closed distally. The cubitus remains quite distinct, and its upper branch shows no signs of any attempt at approaching the media. This arrangement is evidently in correlation with the extreme breadth of the wing, with which also we may perhaps correlate the presence of the perpendicular "support" on the lower branch of the cubitus.

When we come to discuss the second cell d_2 , comparisons fail us, and we can only see in it an instance of specialisation along a line quite extinct at the present day. It would be natural to suppose that this cell is enclosed between the radial sector above and the upper branch of the media beneath, and that the two continue in a fused condition beyond the cell. This, however, is not borne out by the structure of the distal end of d_1 . It appears definitely as if both the veins enclosing d_2 were branches of the radius, and that the media only maintains a weak connection with the lower vein by means of the weak distal side of d_1 . As this problem can never be definitely solved in the absence of the possibility of referring to the precedent wing-tracheation, it is preferred to leave these veins unnamed.

MEASUREMENTS:—Total length of wing to apex 20 mm., greatest breadth of fragment 11.5 mm.

TYPE:—Spec. 2*a* (Plate 3, fig. 6). TYPE-COUNTERPART:—Spec. 2*b*. (B. D. Coll.)

Order PROTOHEMIPTERA.

Genus MESOGEREON, gen. nov.

Venation, so far as preserved, resembling that of *Eugereon* as regards the main veins. Cross-veins excessively numerous, but *in process of reduction*, being represented by numerous short transverse ridges crossing the main veins, but not proceeding far into the intermediate spaces. Spaces between the main veins, beyond the ends of the cross-ridges, filled with moderately numerous and very distinct raised hemispherical tubercles and hollow pits.

Costa, subcosta, and radius unbranched in the fragment; media branched, and probably cubitus also. Cross-ridges absent from the three first-mentioned veins.

TYPE:—*Mesogereon neuropunctatum*, sp. nov.

MESOGEREON NEUROPUNCTATUM, sp. nov.

Plate 1, figs. 1, 2.

This is only a small fragment of what is evidently a large wing, the magnification being $\cdot 75$. An underlying irregularity in the rock has badly broken the line of the costa, subcosta, and radius; probably the wing became pressed down just there over some hard plant-remains. The extraordinary cross-ridges are very clearly shown, and give the wing an appearance quite unlike anything else known to me in the Insecta. In the clear areas of the wing it is surprising to find both tubercles and pits scattered about indiscriminately. The size of these suggests that the wing itself belonged to a very large insect.

MEASUREMENTS :—Greatest length of fragment 23 mm., greatest breadth 17 mm.

TYPE :—Spec. 19a (Plate 1, figs. 1, 2). TYPE-COUNTERPART :—Spec. 19b. (B. D. Coll.)

OBS. :—In the absence of the mouth parts, the placing of this fossil in the Protohemiptera is only provisional. The evidence in favour of it may be stated under two main heads—(1) the resemblance of the venational plan to that of *Eugereon*, the famous Protohemipterid from the Lower Permian of Germany, and (2) the presence of the tubercles and pits resembling those found on the wings of certain Palæohemiptera. The genus, indeed, is distinctly a connecting link between these two orders, and shows us the evolutionary method by which the Palæohemiptera (and hence probably also our recent Hemiptera) were actually derived from the Protohemiptera. It is doubtful indeed whether the two distinct orders should be any longer maintained.

Order **HEMIPTERA.**

Family JASSIDÆ.

Genus MESOJASSUS, gen. nov.

A small Jassid-like forewing, tapering slightly in width from close to the base up to the rounded tip. Basal three-fifths of wing thickened and closely covered with small pits; distal two-thirds

much thinner, with only faint signs of pitting. The boundary between the thickened and thin portions of the wing appears to run transversely across the wing, not obliquely. Most of the costal border missing, and venation not easily made out. A typical hexagonal closed cell can be seen towards the middle of the thin area, and part of a similar cell placed postero-basally to it.

TYPE :—*Mesojassus ipsviciensis*, sp. nov.

MESOJASSUS IPSVICIENSIS, sp. nov.

Plate 2, fig. 7.

This small forewing may be fairly closely compared with *Archijassus Heeri*, Geinitz (Handlirsch, Atlas, plate xliii. fig. 41), which it much resembles in shape and size. The distal venation is, however, rather different, as far as it can be made out, and the transverse boundary separating the two parts of the wing is very different from the arrangement shown in *Archijassus*. The latter insect was found in the Upper Lias of Dobbertin, Mecklenburg.

MEASUREMENTS :—Length 6 mm., greatest breadth 1.7 mm.

TYPE :—Spec. 33 (Plate 2, fig. 7). (B. D. Coll.)

INSECTA INCERTÆ SEDIS.

SPECIMEN 4 appears to be a small portion of a wing of *Mesorthopteron locustoides*, sp. nov., showing a piece of the radius, and the origin of several of the branches of the media. The outline of the preserved portion is deceptively like that of a complete wing of small size. (Plate 1, fig. 5.) The fragment measures 13.5 mm. long, 3 mm. wide.

SPECIMEN 6.—A small portion of a large wing, 19 mm. by 2 mm., showing two large parallel main veins, with two short cross-veins. Possibly part of a large dragon-fly wing, consisting of costa and subcosta, with two antenodals.

SPECIMEN 7.—A small insect, 6 mm. long, 3 mm. wide, resting in natural position with wings folded down the back. Probably a small cockroach. Venation not distinct enough to allow of definite determination.

SUMMARY OF IPSWICH RESULTS.

The following insects from the Denmark Hill beds have been named and described :—

| ORDER. | GENUS. | SPECIES. |
|-------------------|--|------------------------------------|
| Blattoidea .. | <i>Austromylacrites, gen. nov.</i> | <i>A. latus, sp. nov.</i> |
| Protorthoptera .. | <i>Mesorthopteron, gen. nov.</i> | <i>M. locustoides, sp. nov.</i> |
| " .. | <i>Mesomantidion, gen. nov.</i> | <i>M. queenslandicum, sp. nov.</i> |
| Coleoptera .. | <i>Ademosyne, Handlirsch</i> | <i>A. australiensis, sp. nov.</i> |
| " .. | " .. | <i>A. angusta, sp. nov.</i> |
| " .. | " .. | <i>A. Cameroni, sp. nov.</i> |
| " .. | " .. | <i>A. congener, sp. nov.</i> |
| " .. | " .. | <i>A. major, Handlirsch.</i> |
| " .. | " .. | <i>A. minor, Handlirsch.</i> |
| " .. | " .. | <i>A. obtusa, sp. nov.</i> |
| " .. | " .. | <i>A. Olliffi, Handlirsch.</i> |
| " .. | " .. | <i>A. punctata, sp. nov.</i> |
| " .. | " .. | <i>A. tumida, sp. nov.</i> |
| " .. | <i>Etheridgea, Handlirsch</i> | <i>E. australis, Handlirsch</i> |
| " .. | <i>Mesostigmolera, Eth. and Olliff</i> | <i>M. typica, Eth. and Olliff</i> |
| " .. | <i>Mesothoris, gen. nov.</i> | <i>M. clathrata, sp. nov.</i> |
| " .. | <i>Ulonites, gen. nov.</i> | <i>U. Willeoxi, sp. nov.</i> |
| Odonata .. | <i>Mesophlebia, gen. nov.</i> | <i>M. antinodalis, sp. nov.</i> |
| Mecoptera .. | <i>Mesochorista, gen. nov.</i> | <i>M. proavita, sp. nov.</i> |
| Lepidoptera .. | <i>Dunstania, gen. nov.</i> | <i>D. pulchra, sp. nov.</i> |
| Protohemiptera .. | <i>Mesogereon, gen. nov.</i> | <i>M. neuropunctatum, sp. nov.</i> |
| Hemiptera .. | <i>Mesojassus, gen. nov.</i> | <i>M. ipswichensis, sp. nov.</i> |

TOTAL :—Eight orders, thirteen genera, and twenty-two species, of which seventeen species are new.

OBS. :—Reviewing the above list, the extraordinary range and diversity of the insect fauna of these beds become at once apparent. Did we not know for certain that these fossils occurred in one bed, it would require rather a stretch of the imagination to believe that such was the case. Some of the forms (e.g. *Austromylacrites* and *Mesogereon*) are little removed from certain Carboniferous and Permian insects of the Northern Hemisphere. Others are scarcely distinguishable from forms existing in South Queensland at the present day. Thus the fauna of the Ipswich Trias embraces within a mere handful of specimens types which range from Carboniferous to recent times !

We may perhaps best comprehend this if we recall the fact that to-day in Australia *Ceratodus* and fresh-water Teleosts inhabit the same stream, with Cycads and Leguminosæ growing side by side on the same hill. How would some geological student of future ages, versed only in the succession of forms in the Northern Hemisphere, be able to interpret the fossils that he might find side by side in strata laid down at the present day ? The Ipswich fossils show that

it was the same in Australia in the Trias as it is to-day, and that the Australian fauna then, as now, combined numerous archaic types with certain highly specialised forms peculiar to the continent.

It is obvious that such an assemblage of forms can be of little value in fixing the horizon of the strata in which they occur. Their value lies rather in their application to the phylogeny of the Insecta. In the record of fossil insects so far discovered, the Trias is exceedingly poor, numbering only a few species of Coleoptera from Sweden and Germany, and two genera apparently allied to the Megalopterous genus *Chauliodes*, together with a few forms, mostly Coleoptera, already described from Ipswich. Now the record of what we may call the "Giant Age of Insects," first unearthed by Brongniart in the magnificent deposits of Commeny in France (Upper Carboniferous), can be followed with scarcely any break into the Permian. Above this, in the Northern Hemisphere, comes the immense gap of the Trias. When the insects again come fairly into view, in the Lias of England and Germany, a very different and considerably more specialised assemblage of forms is met with. There seems to be no hope that this gap will ever be bridged by discoveries in the Northern Hemisphere, since the Trias as a whole appears to be lacking in fresh-water deposits of the kind in which we are accustomed to search for insects. It is not unreasonable, therefore, to turn to the Ipswich beds for evidence that will supply the missing links. How splendid that evidence may yet prove to be, provided that these fossils can be diligently searched for and preserved, this small first haul of treasures amply shows.

The chief general results of the discovery of these fossils may be briefly stated thus :—

1. Certain insect types characteristic of the late Palæozoic in the Northern Hemisphere, and not found in the Mesozoic, are now shown to have had fairly close relatives in the Trias of Australia. Such types include *Austromylacrites*, *Mesorthopteron*, and *Mesomantidion*.
2. The first known appearance of a true dragon-fly, with nodus and pterostigma, can now be assigned to the Trias, instead of the Lias. It was probably an Anisopterid.
3. A Panorpid (Mecoptera), scarcely differing from a form still alive in Southern Queensland, existed in the Australian Trias. This group has already been recorded from the Lias in the Northern Hemisphere.

4. A Lepidopterous insect, a fairly large moth, is present in the Australian Trias. As the Lepidoptera have not until now been traced back beyond the Upper Jurassic, this discovery is of great importance. Also, as this insect existed in a period long before that generally agreed upon when flowering plants first appeared (Lower Cretaceous), it is an interesting question as to what it fed upon and what its mouth parts were like.
5. A true Hemipterid (allied to the recent *Jassida*) existed side by side with a large insect probably related to *Eugereon*, and hence referable to the Protohemiptera. *Jassida* are known from the Lias of the Northern Hemisphere, but the Protohemiptera did not survive beyond the Permian.
6. The large gap in the Insect Record (Trias) is at last in process of being satisfactorily bridged over.

3. ST. PETER'S FOSSIL INSECTS.

Order **BLATTOIDEA.**

Family **BLATTIDÆ.**

Genus **NOTOBLATTITES**, gen. nov.

Rather large insects with broad oval tegmina. Tegmen with a strong subcosta reaching nearly to tip of wing and supporting a broad costal area crossed by simple or once-branched oblique cross-veins. Costal border only slightly convex. Radius very strong, parallel with and moderately close to *Sc*. Radius gives off three branches posteriad, close together at about one-third of the wing length; of these the lowest (most basal) is unbranched, the middle gives off three branches posteriad, while the uppermost (most distal) is dichotomously branched. *Media* with at least three branches posteriad from main stem. A number of cubital and anal veins and branches (origins not distinct).

Resting position typically blattoid, with tegmina laid flat along back; in position of rest, the insect formed a moderately wide oval with the sides nearly parallel, only very slightly convex. Tips of hindwings projected beyond the curved ends of the tegmina.

TYPE:—*Notoblattites subcostalis*, sp. nov.

NOTOBLATTITES SUBCOSTALIS, sp. nov.

Plate 6, fig. 1, and Plate 7, fig. 1.

This species is represented on Plate 6, fig. 1, by a nearly complete and very well-preserved tegmen (Spec. 24a) and on Plate 7, fig. 1, by two whole specimens at rest in natural positions (Spec. 25a), together with a portion of another wing. In the well-preserved individual, Spec. 24a (Plate 4, fig. 1), the nature of the cross-venation can be fairly well made out. The costal cross-veins were strong and placed fairly wide apart. At the base, the cross-venation is a dense network of small polygonal cells, very irregular. This is figured between *Sc* and *R*, but omitted from the anal area, which is, however, actually covered with a similar network. Further distad the venation becomes simplified, tending to develop into simple series of parallel and slightly oblique cross-veins, as shown in the figure.

On Spec. 25a (Plate 7, fig. 1), which is a piece of very dark clay ironstone about $4\frac{1}{2}$ by $3\frac{1}{2}$ inches, an almost complete individual is shown in the position of rest, measuring 62 mm. long by 34 mm. wide; head, prothorax, and part of the tips of the hindwings are missing. The position of the head is covered by portion of another tegmen laid crosswise and projecting away towards the right, where it is broken off about halfway. This fine individual appears to have been a female. Just above and to the left of it lies another partially complete impression measuring, however, only 50 mm. long by 24 mm. wide, and thus probably a male. The main veins and costal cross-veins in the three individuals are very clear.

MEASUREMENTS:—Spec. 24a. Length 46 mm., breadth 21 mm. The tip is missing.

TYPES:—Spec. 25a (Plate 7, fig. 1). TYPE-COUNTERPART:—Spec. 25b (almost complete male and female). CO-TYPE:—Spec. 24a (Plate 6, fig. 1). CO-TYPE-COUNTERPART:—Spec. 24b (right tegmen). (B. D. Coll.)

OBS.:—This insect, which is without doubt a cockroach, nevertheless approaches the Protorthoptera in the great length of its subcosta and the comparative straightness of its main veins. It appears to have been closely allied to several of the numerous Carboniferous forms, notably *Elaphroblatta ensifera*, Brongniart, figured by Handlirsch.*

* Loc. cit. Atlas, plate xix, figs. 17-18.

Order **PROTORTHOPTERA.**Genus **MESOTITAN**, gen. nov.

Size enormous: main veins very strongly built, cross-veins regularly arranged in single rows, slightly oblique. Radius and subcosta nearly parallel and moderately close together; many radial branches.

TYPE:—*Mesotitan gigantes*, sp. nov.

MESOTITAN GIGANTEUS, sp. nov.

Plate 7, fig. 2.

This large specimen is on a broken block of partly decomposed clay ironstone and poorly preserved. Both the type and counterpart are preserved and show very clearly the strong convexity and concavity of the veins. The wings are probably in the position of rest, slanting somewhat away from what appears to be the long axis of the body. As the hindwing underlies the forewing at only a small angle it is impossible to make out the tangle of main veins. The preserved portion of the insect measures 125 mm. long by 146 mm. wide, and appears to represent only a small basal portion of the wings. The forewing when completed was probably at least eight or nine inches long and three inches wide at its broadest part. If this estimate is correct this huge insect must have had an expanse of about twenty inches.

TYPE:—Spec. 22*a* (Plate 7, fig. 2). TYPE-COUNTERPART:—Spec. 22*b*. (B. D. Coll.)

OBS.:—It is a pity that this gigantic insect is not better preserved for comparison with *Titanophasma* from the Carboniferous of Commeny, with which it very probably had considerable affinity. The existence of these giant insects in Mesozoic strata in Australia long after they had become extinct in the Northern Hemisphere is a point of very great interest, and bears out the view already expressed, that archaic remnants have always formed a considerable part of the Australian fauna.

SPECS. 21*a*, 21*b*.:—Besides the type specimen, a small portion of a Protorthopterous wing is represented in Specs. 21*a* and its counterpart 21*b* (B. D. Coll.). This individual measures 49 mm. by 12 mm., and shows the cross-veins arranged in regular parallel rows. Probably this is a small piece of a wing of *Mesotitan*.

SPECS. 23*a*, 23*b* :—Another individual and its counterpart (B. D. Coll.) measures 43 mm. by 15 mm. This is apparently a portion of a wing similar to that of *Mesotitan*, but much smaller, probably not exceeding four or five inches in total length. The cross-veins are arranged in a single parallel series between two main veins (possibly *Sc* and *R*), but between a number of descending branch veins they are densely packed, forming a close polygonal network, as in *Titanoplasma*. The specimen is not sufficiently characterised to merit a name.

Order **COLEOPTERA.**

Family ELATERIDÆ (?).

(Genus ELATERITES, gen. nov.)

ELYTRON, elongate oval, tapering posteriorly, closely resembling that of a recent "Click" beetle; no definite sculpture visible, except a slight roughness of the surface.

TYPE :—*Elaterites wianamattensis*, sp. nov.

ELATERITES WIANAMATTENSIS, sp. nov.

Plate 3, fig. 5.

ELYTRON, complete cast of right one; appears to have been slightly roughened or perhaps pubescent.

MEASUREMENTS :—Length 6.5 mm., greatest breadth 1.8 mm.

TYPE :—Spec. 30 (Plate 3, fig. 5). (B. D. Coll.)

Family MALACODERMIDÆ.

(Genus METRORHYNCHITES, gen. nov.)

ELYTRON, elongate oval, with three strong longitudinal ribs, one roughly parallel with inner border, and extending to tip, the other two roughly parallel with outer border and meeting the first rib at two separate points near apex. Closely resembles elytron of recent genus *Metrorhynchus* inhabiting Southern Queensland.

TYPE :—*Metrorhynchites sydneyensis*, sp. nov.

METRORHYNCHITES SYDNEIENSIS, sp. nov.

Plate 3, figs. 3, 4.

ELYTRON, nearly complete cast and mould of left one; besides the three ribs referred to above, the surface of the elytron appears to have been finely granular.

MEASUREMENTS :—Length 8 mm., breadth 2 mm.

TYPE :—Specs. 28*a* and 28*b* (mould and cast) (Plate 3, figs. 3, 4). (B. D. Coll.)

Family CURCULIONIDÆ.

Genus ETHERIDGEA, *Handlirsch*.

? *Glochinoxynchus*. Etheridge and Olliff.* Type :—*E. australis*, Handlirsch.† (Triassic, Ipswich.)

ETHERIDGEA PETRICA, sp. nov.

Plate 3, fig. 2.

The specimen is a nearly complete insect, resting with dorsal surface uppermost; a small portion of the right side of the prothorax and parts of both elytra are missing. The insect is rather broadly oval in form, the head barely visible, being partly tucked below the prothorax.

PROTHORAX, wide, massive.

ELYTRA, wide at bases, narrowing posteriorly, very convex. In sculpture they are roughly tuberculate, the tubercles being arranged in numerous longitudinal rows close together.

MEASUREMENTS :—Length 10.5 mm., breadth 4.9 mm.

TYPE :—Spec. 31 (cast) (Plate 3, fig. 2). (B. D. Coll.)

OBS. :—This insect has elytra somewhat larger than that of the genotype *E. australis*, but of very similar shape and sculpture, so that it is unnecessary to differentiate the two generically. An examination of the type specimen of *E. australis* shows that the tubercles are in thirteen rows, but smaller and somewhat more regularly disposed than in the present species. On one part of the elytra the tubercles are set in an open network or areolar structure, which, however, is not a cast of the exterior sculpture but a mineral replacement of the chitin. The lower impression, or cast, is simply tuberculate. The Rhynchophoran affinities of this beetle are beyond doubt, having regard to its general form, the position of the head, and the sculpture of the elytra.

Genus MESORHYNCHOPHORA, gen. nov.

ELYTRON, very broad at base, tapering to a fairly narrow rounded apex; surface very convex, with four striæ converging distally, separated by wide flat interstices.

TYPE :—*Mesorhynchophora Dunstani*, sp. nov.

* *Loc. cit.*

† *Loc. cit.*

MESORHYNCHOPHORA DUNSTANI, sp. nov.

Plate 1, fig. 7.

ELYTRON, 15 mm. long. 5 mm. wide. The specimen shows practically the whole of the right elytron. The five flat interstices shown in the cast are granulate near the apex, and minutely tuberculate on their sides near the base. On the exterior (mould) the interstices are only faintly impressed. The Rhynchophoran affinities of this form do not rest upon such sure grounds as those of the preceding species, but are based solely upon the shape and convexity of the elytron.

TYPE:—Specs. 27*a* (Plate 1, fig. 7) and 27*b* (mould and cast). (B. D. Coll.)

INSECTA INCERTÆ SEDIS.

SPECIMENS 26A and 26B (mould and cast). Portion of a roughly granulate elytron, broken off longitudinally; length 11.5 mm. Probably a Curculionid.

SPECIMENS 29A and 29B (mould and cast). Body of an elongate oval beetle with elytra *in situ*; roughened sculpture. Length 9 mm., breadth 4 mm. Too indistinct for classification.

SUMMARY OF ST. PETER'S RESULTS.

The following is a list of the fossil insects named and described from the St. Peter's beds:—

| ORDER. | GENUS. | | SPECIES. |
|----------------|--------|------------------------------------|---------------------------------------|
| Blattoidea | .. | Notoblattites, <i>gen. nov.</i> | .. N. subcostalis, <i>sp. nov.</i> |
| Protorthoptera | .. | Mesotitan, <i>gen. nov.</i> | .. M. giganteus, <i>sp. nov.</i> |
| Coleoptera | .. | Elaterites, <i>gen. nov.</i> | .. E. wianamattensis, <i>sp. nov.</i> |
| .. | .. | Metrorhynchites, <i>gen. nov.</i> | .. M. sydneyensis, <i>sp. nov.</i> |
| .. | .. | Etheridgea, <i>Handlirsch</i> | .. E. petrica, <i>sp. nov.</i> |
| .. | .. | Mesorhynchophora, <i>gen. nov.</i> | .. M. Dunstani, <i>sp. nov.</i> |

Omitting the unnamed fragments we thus have representatives of three orders, totalling six genera—five of which are new—and six species.

The evident abundance of Coleoptera within this fauna and that of Ipswich is a point worthy of note. Our records suggest that at least seven families were represented in these Mesozoic beds, viz., five at Ipswich, and three at St. Peter's, the Curculionidæ being present in both. Records of Coleoptera have so far not been traced any further back than the Triassic.

The most striking point about the collection from St. Peter's is the occurrence of the gigantic *Mesotitan*, a form which certainly links up the insect fauna of this locality with that of Commeny. Although the Giant Age of Insects ceased in the Permian as far as the Northern Hemisphere was concerned, yet at St. Peter's we have direct evidence that some at least of these forms lingered on far into the Mesozoic in Australia, existing side by side with far more highly specialised Coleoptera, and closely allied to present-day forms. The cockroach *Notoblattites* also may be classed as a representative of a very archaic group of Blattoidea which attained their maximum development in the Northern Hemisphere near the end of the Paleozoic Age.

4. GOODNA FOSSIL INSECT.

Order **NEUROPTERA (PLANIPENNIA)**.

Family **OSMYLIDÆ**.

Genus **EUPORISMITES**, gen. nov.

Closely allied to *Porismus*, but more especially to *Euporismus*. A broad elegant fringe of close parallel veins borders the whole wing. This is formed anteriorly by a large number of closely arranged costal cross-veins, distally by the parallel branchings of the numerous primary branches of the radial sector, and lower down by branches from the media, both main branches of the cubitus, and probably of the analis also. Subcosta and radius very close and parallel, but distinct, and with at least two short cross-veins still visible between them. Origin of radial sector missing, but evidently placed well basad: at least ten branches pass from below this sector, and are separated by somewhat regularly arranged single rows of straight cross-veins. Most of the media, cubitus, and all the analis missing.

TYPE:—*Euporismites Balli*, sp. nov.

EUPORISMITES BALLI, sp. nov.

Plate 3, fig. 1.

This specimen was found by Mr. L. C. Ball, some miles to the south of Goodna, in Tertiary beds resting unconformably upon the Ipswich and Bundamba Series. The wing is clearly visible, and easily studied, owing to its dark colouration.

Two recent Australian Osmylids are without doubt very closely related to this fossil—viz., *Porismus strigatus*, Burm. and *Euporismus albatrov. mihi* (MS).* The former inhabits dry or moderately dry

* The description of this insect will shortly be published.

places, and is a smaller insect than the fossil species. Its wings are somewhat broader, and their colour is black with rich yellow markings. It is fairly common in Eastern Australia. *Euporismus* on the other hand is exceedingly rare, being only known from the very inaccessible mountainous region on the Great Dividing Range at the head of the Condamine River, Queensland, near the New South Wales border. Also, it is an aquatic insect, resting on rocks bordering the stream. The wing is closely similar in size and shape to that of the fossil, and is coloured black with an intricate pattern of whitish bands and areas. The venations of the two are so closely similar that it is not unreasonable to believe that the fossil specimen represents one individual of a species directly ancestral to *Euporismus*.

The wing appears to be a hindwing, judging by the shape of the costal area. Curiously enough, the large distal patch missing from the specimen corresponds very closely in size and shape with the large black patch on the hindwing of *Euporismus albatrox*. The coincidence suggests that *Euporismites* also had a patch in this position, and that the decomposition of the pigment caused the loss of this part of the wing.

MEASUREMENTS :— Greatest length of fragment 22 mm., greatest breadth 10.5 mm.

TYPE :— Spec. 34*a* (Plate 3, fig. 1). TYPE-COUNTERPART :— Spec. 34*b*. (Geol. Surv. Mus. Coll.)

5. DUARINGA FOSSIL INSECTS.

Order **ODONATA**.

Family **LESTIDÆ**.

Genus **AUSTROLESTIDION**, gen. nov.

Plate 1, fig. 6.

The two specimens 20*a* and 20*b*, obtained from the core of the Duaringa bore, are counterparts, but are figured together on Plate 1, fig. 6. The impressions, which are poor and not easy to make out, are those of two Zygopterid Dragon-fly larvæ, one of which lies obliquely across the other.

The larger of the two larvæ as shown in the figure extends from A to B, the head being clearly seen at A, with considerable remains of the chitinous exoskeleton. Both the compound eyes (*e*) are easily made out, though much crushed. Between these two eyes lie two elongate pieces of chitin (*a*) which may represent a detached piece of the epicranium, but appear to be much more probably the flattened

basal joints (scape) of the antennæ. If so, this larva had a somewhat elongate scape, intermediate between the usual short form and the hypertrophied scape, such as still exists in the larva of *Synlestes*.

The thorax of the larva AB is only poorly outlined, but a small piece at *w* pressed obliquely down upon it appears to represent a wing-sheath. A little further back, to the right, lie the remains of the right hind-leg (*p*), showing clearly the femur, tibia, and a small piece of the tarsus. Below this, and apparently detached from the rest of the specimen, lie the last six segments of the abdomen, and two of the caudal gills (*g*). The anterior abdominal segments, very flattened out, appear to be just indicated to the right of the detached portion. The latter is only visible in Spec. 20*a*, lying above the letter B.

One of the caudal gills has its outline fairly well shown (*g* above B) and a portion of the chitin at its base is still preserved. The gill is elongate-lamellar with a well-rounded tip, and appears to belong undoubtedly to the Lestid type of gill.

The second specimen is represented by CD. The head lies sideways just below C. It is badly crushed and partly lost. Part of the chitin of the eyes and labial mask is still visible. The thorax of this larva is overlain by that of the other, and the two cannot be definitely distinguished. But the posterior half of the abdomen is clearly visible, projecting obliquely downwards in both Specs. 20*a* and 20*b*. The gills in this specimen are better preserved than in AB, the outlines of the two of them being very distinct. A large part of the chitin at the base of one, and a small piece at the tip of the other, are still clearly visible.

There can be little doubt that these larvæ belong to the Lestidæ, and differ very little from those of the present day. As the Lestidæ are chiefly represented in Australia by the large genus *Austrolestes*, the name AUSTROLESTIDION DUARINGÆ is proposed for the two specimens under discussion.

TYPES :—Specs. 20*a* and 20*b* (counterparts) (Plate 1, fig. 6). (B. D. Coll.)

SUMMARY OF DUARINGÆ RESULTS.

The discovery of the fossil larvæ above described is in no way remarkable, in view of the admitted antiquity of the Lestidæ. The most interesting point about the fossils (if the above interpretation of the parts be correct) is the greater length of the scape of the antennæ compared with that of recent larvæ (with the exception of *Synlestes*). This bears out the generally accepted belief that, in the Odonata, the antennæ have undergone progressive reduction in

correlation with the increase in the size and efficiency of the compound eyes. The long scape in *Synlestes* is to be attributed to hypertrophy; our larvæ exhibit a scape of intermediate length, which may be accepted as indicating the ancestral form. The length and narrowness of the gills is also an interesting point, since it shows us that *Austrolestes cingulatus*, Burm, generally regarded as the most archaic member of the genus, still possesses gills closest in form to those found on the fossil larvæ.

PLATE 1.

- Fig. 1. Mesogereon neuropunctatum, *sp. nov.* Ipswich. ×3
 2. Mesogereon neuropunctatum : Restoration of wing ×·75
 3. Ademosyne Olliffi, *Handlirsch* Ipswich. ×10
 4. Mesorthopteron locustoides, *sp. nov.* Ipswich. ×3
 5. (?) Mesorthopteron locustoides, *sp. nov.* Ipswich. ×3
 6. Austrolestidion duaringæ, *sp. nov.*... .. Duaringa Bore. ×3
 7. Mesorhynchophora Dunstani *sp. nov.* St. Peter's. ×4·5
 8. Ademosyne Olliffi, *Handlirsch* Ipswich ×10

Fig. 2.

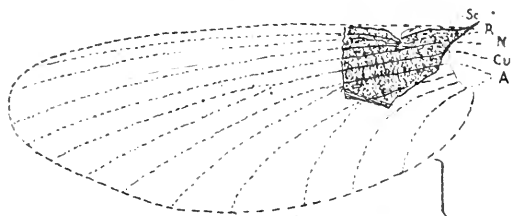


Fig 3



Fig. 8



Fig. 1.

x 3

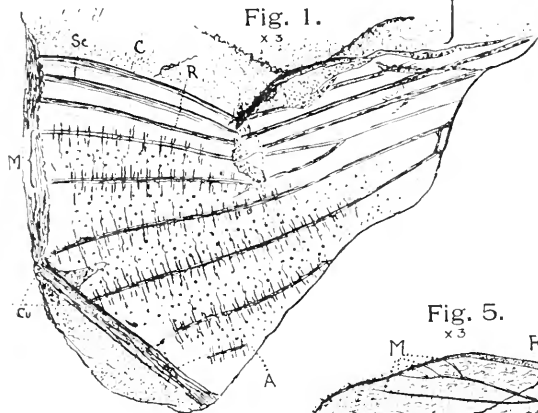


Fig. 4.

x 3

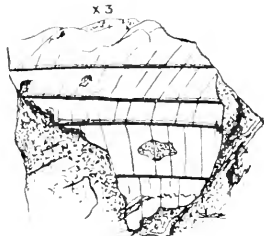


Fig. 5.

x 3

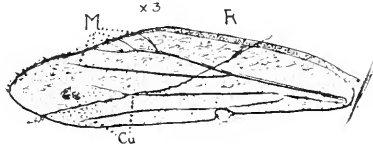


Fig. 7.

x 45

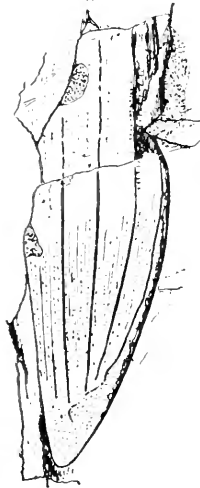


Fig. 6.

x 3

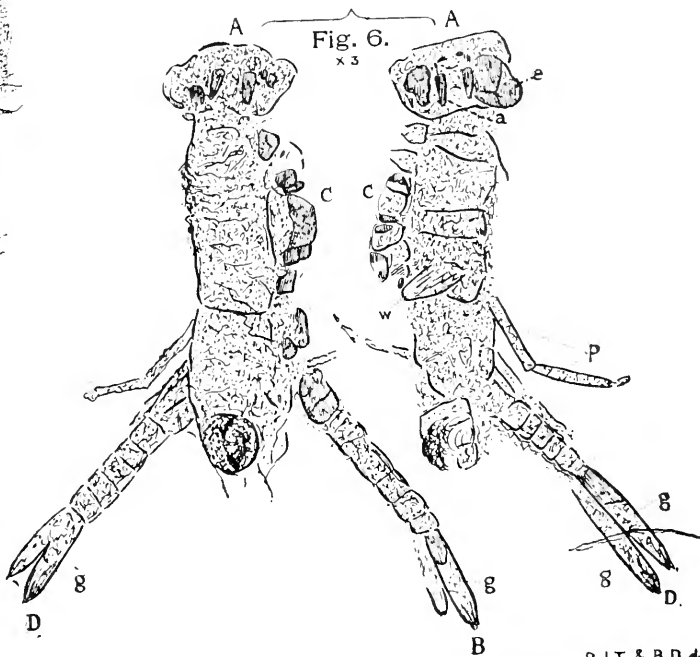


PLATE 2.

- Fig. 1. *Austromylacrites latus*, *sp. nov.* Ipswich. ×3
 Missing portion of tegmen restored.
2. *Mesochorista proavita*, *sp. nov.* Ipswich. ×4.5
3. *Mesorthopteron locustoides*, *sp. nov.*... .. Ipswich. ×3
4. *Mesorthopteron locustoides* : Restoration of hindwing ×1.5
5. *Mesorthopteron locustoides* Ipswich. ×3
6. *Mesorthopteron locustoides* : Restoration of forewing ×1.3
7. *Mesojassus ipsviciensis*, *sp. nov.* Ipswich. ×4.5
8. *Ademosyne congener*, *sp. nov.* Ipswich. ×8

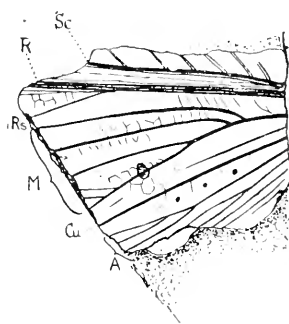
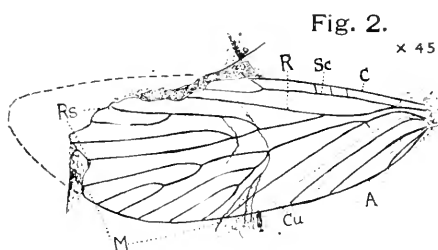
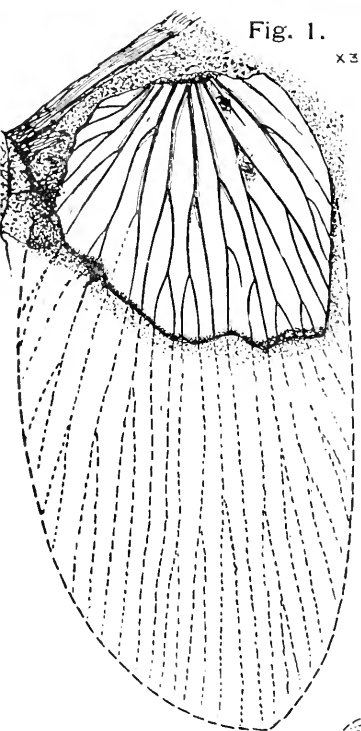


Fig. 4. x15

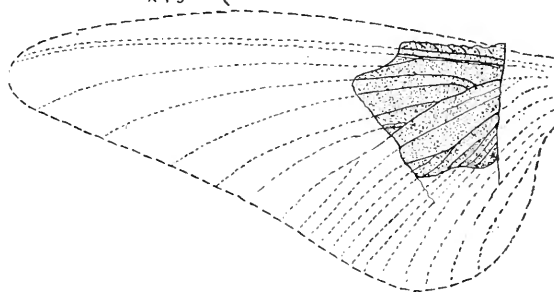


Fig. 7. x45



Fig. 8. x8

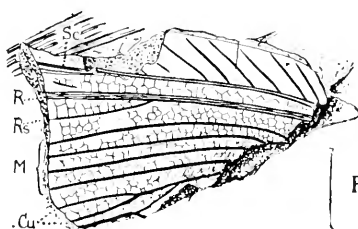


Fig. 6. x15

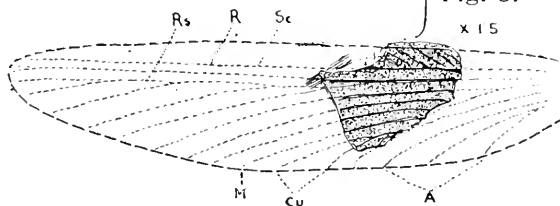


PLATE 3.

| | | | | | | |
|---------|--|----|----|----|--------------|-------|
| Fig. 1. | <i>Euporismites Balli</i> , <i>sp. nov.</i> | .. | .. | .. | Goodna. | × 4.5 |
| 2. | <i>Etheridgea petrica</i> , <i>sp. nov.</i> | .. | .. | .. | St. Peter's. | × 4.5 |
| 3. | <i>Metrorhynchites sydneyensis</i> , <i>sp. nov.</i> (mould) | .. | | .. | St. Peter's. | × 4.5 |
| 4. | <i>Metrorhynchites sydneyensis</i> , <i>sp. nov.</i> (cast) | .. | | .. | St. Peter's. | × 4.5 |
| 5. | <i>Elaterites wianamattensis</i> , <i>sp. nov.</i> (cast). | .. | | .. | St. Peter's. | × 4.5 |
| 6. | <i>Dunstania pulchra</i> , <i>sp. nov.</i> | .. | .. | .. | Ipswich. | × 4.5 |

Fig. 1

x 45

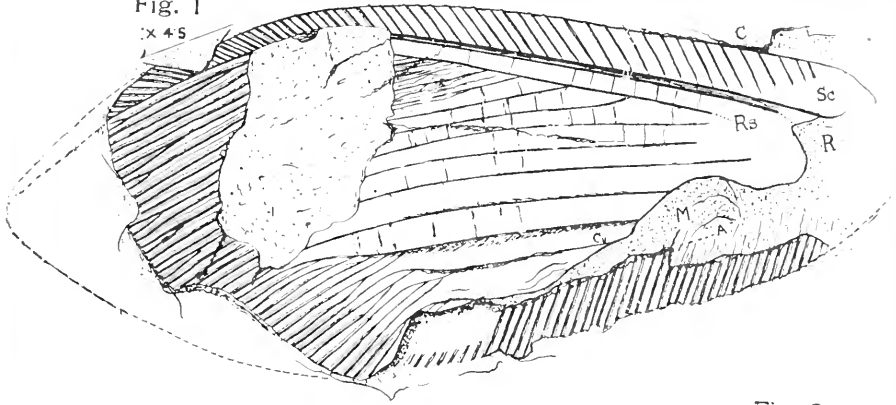


Fig. 5.

x 45



Fig. 4.

x 45

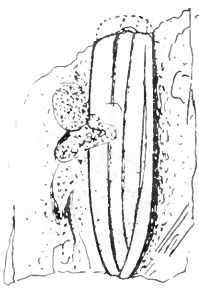


Fig. 3.

x 45



Fig. 2.

x 45

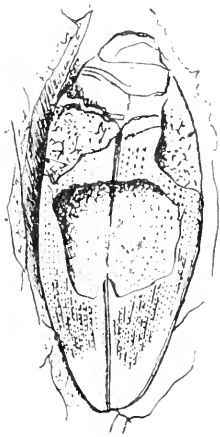
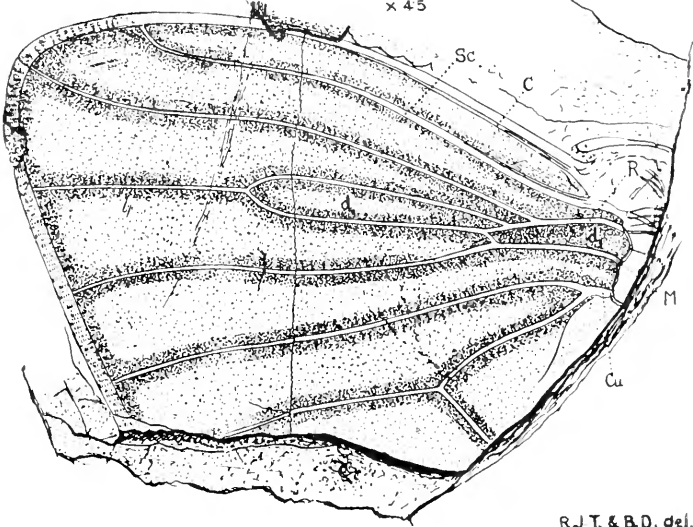


Fig. 6.

x 45



R.J.T. & B.D. del.

PLATE 4.

- Fig 1. *Ademosyne Cameroni, sp. nov.* Ipswich. × 8
2. *Mesophlebia antinodalis, sp. nov.* Ipswich. × 4·5
With suggested restoration of basal portion of wing.
3. *Ademosyne australiensis, sp. nov.* Ipswich. × 6
4. *Ademosyne angusta, sp. nov.* Ipswich. × 6
5. *Ademosyne obtusa, sp. nov.* Ipswich. × 6
6. *Mesothoris clathrata, sp. nov.* Ipswich. × 5
7. *Ulomites Willecoxi, sp. nov.* Ipswich. × 5

Fig 7
x 5



Fig 6
x 5

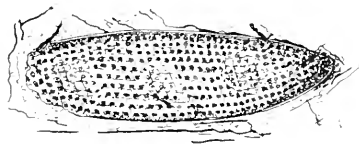


Fig 3
x 6.

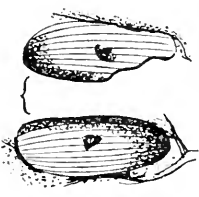


Fig 4
x 6.



Fig 5
x 6.



Fig 2
x 4.5

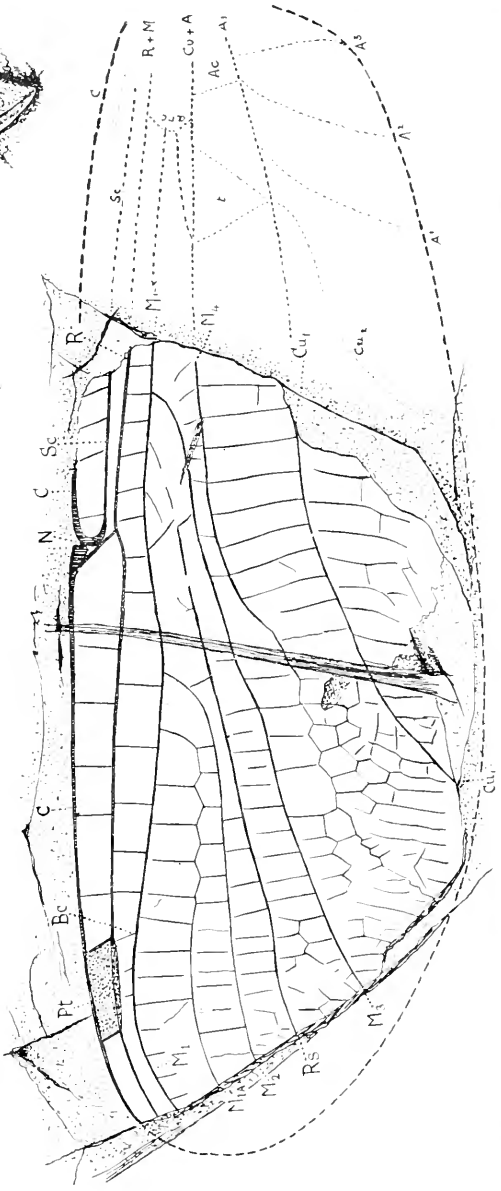


Fig 1.
x 8

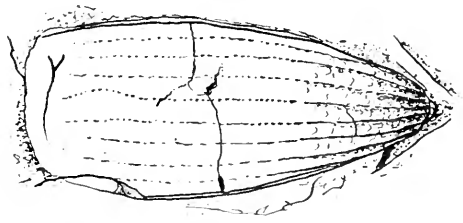


PLATE 5.

| | | | | | | |
|---------|---|----|----|----|----------|-----|
| Fig. 1. | <i>Ademosyne major</i> , <i>Handlirsch</i> | .. | .. | .. | Ipswich. | ×10 |
| 2. | <i>Mesomantidion queenslandicum</i> , <i>sp. nov.</i> | .. | .. | .. | Ipswich. | ×3 |
| 3. | <i>Ademosyne minor</i> , <i>Handlirsch</i> | .. | .. | .. | Ipswich. | ×10 |
| 4. | <i>Ademosyne punctata</i> , <i>sp. nov.</i> | .. | .. | .. | Ipswich. | ×10 |
| 5. | <i>Etheridgea australis</i> , <i>Handlirsch</i> | .. | .. | .. | Ipswich. | ×10 |
| 6. | <i>Ademosyne major</i> , <i>Handlirsch</i> | .. | .. | .. | Ipswich. | ×12 |

Fig. 5.
x 10

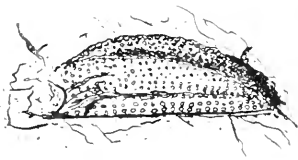


Fig 6
x 12

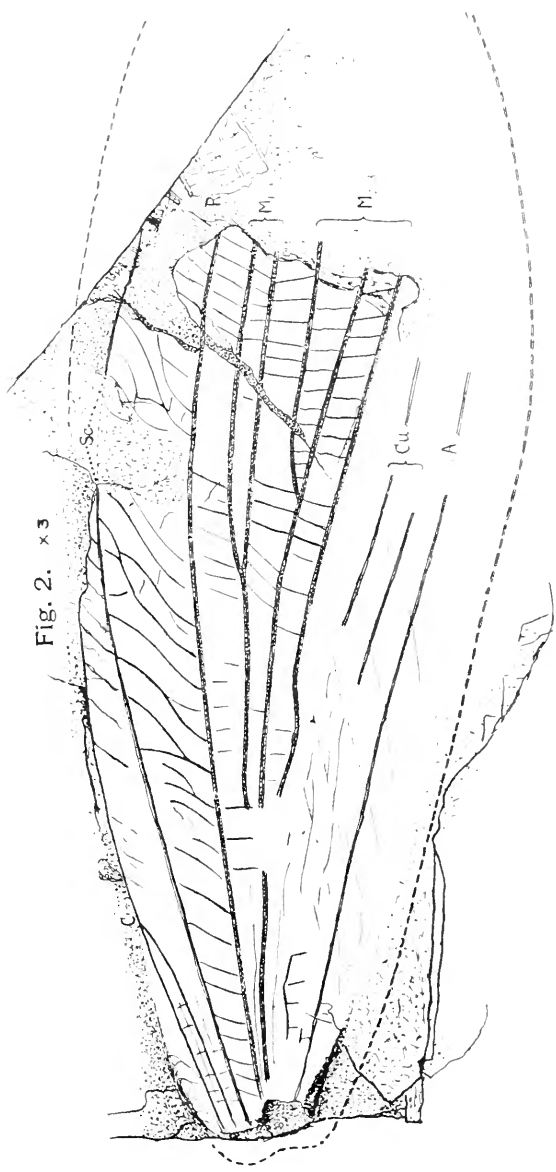
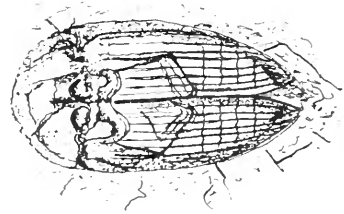


Fig. 2. x 3

Fig. 4.
x 10.

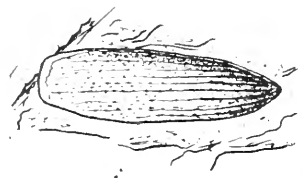


Fig. 3.

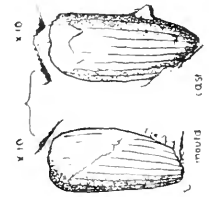


Fig 1
x 10

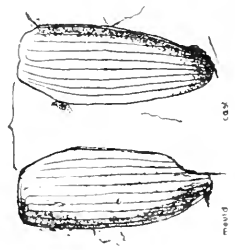


PLATE 6.

- Fig 1. *Notoblattites subcostalis, sp. nov.* St. Peter's. $\times 2$
2. *Ademosyne tumida, sp. nov.* Ipswich. $\times 8$

Fig. 1.
x 3.

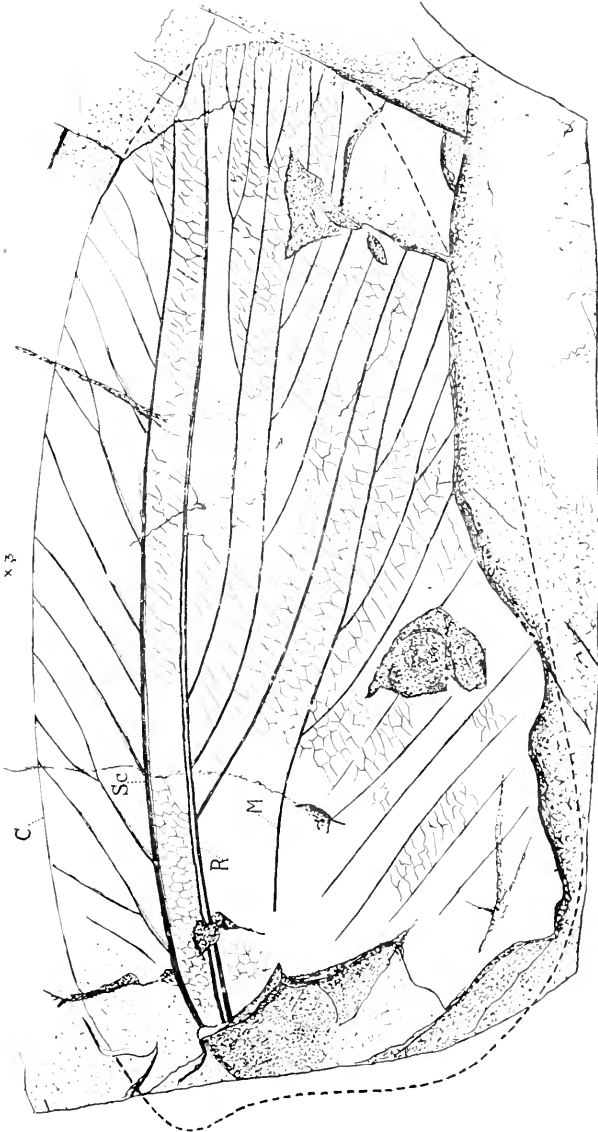


Fig 2.
x 8.

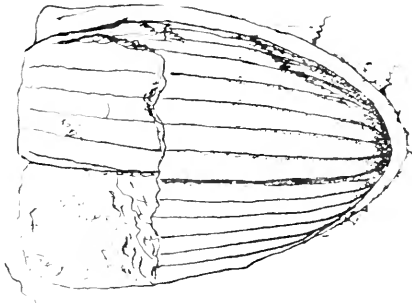


PLATE 7.

- Fig. 1. *Notoblattites subcostalis*, *sp. nov.* St. Peter's. $\times 75$
2. *Mesotitan giganteus*, *sp. nov.* St. Peter's. $\times 75$

Fig. 1.

x 75

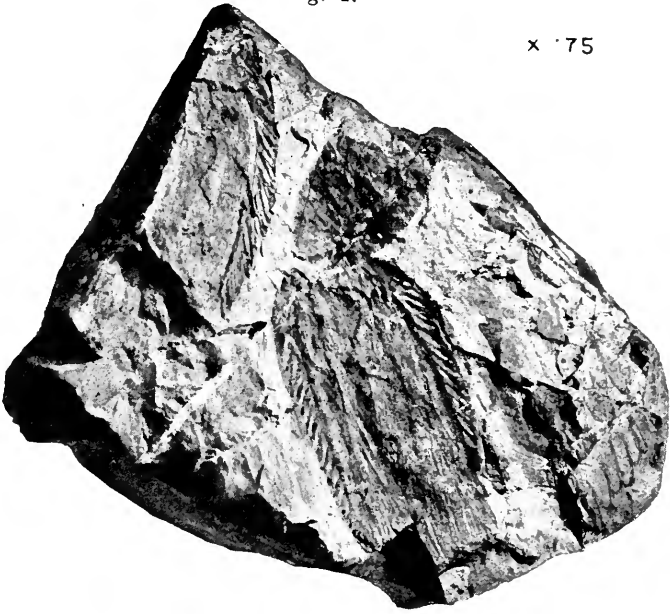
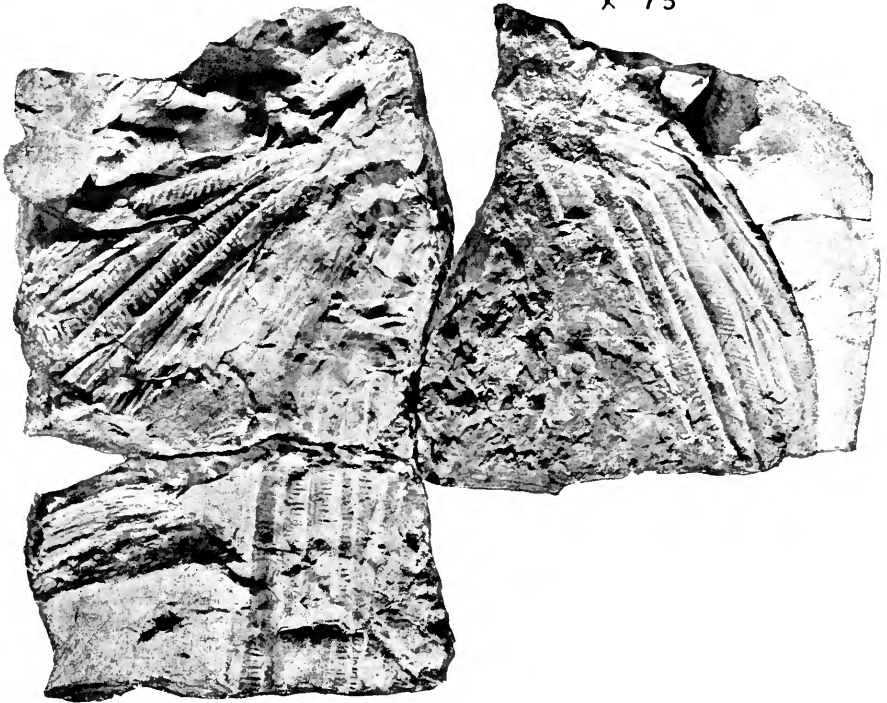


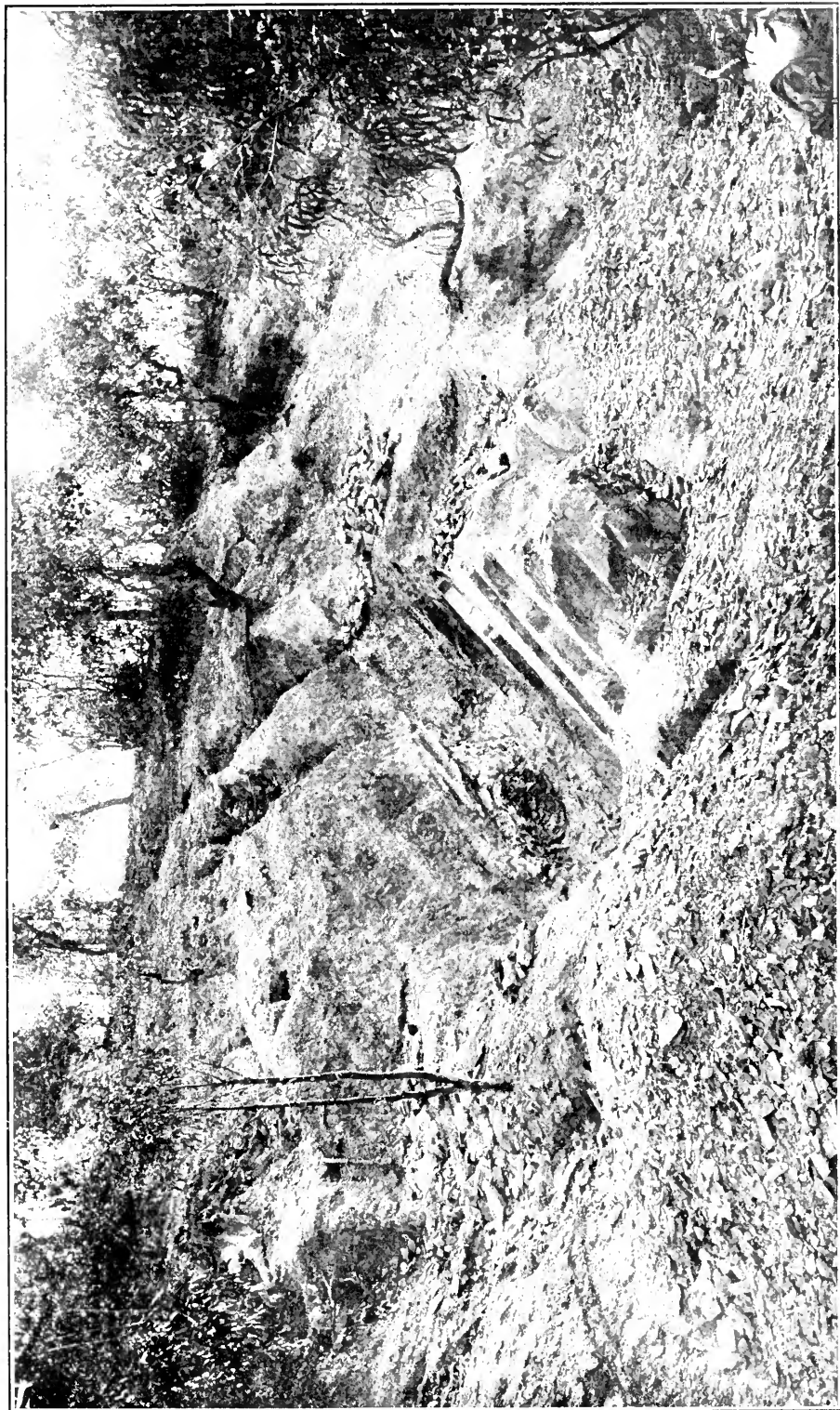
Fig. 2.

x 75





Denmark Hill Fossil Insect Quarry.



General View of Quarry and Denmark Hill.

ANTHONY JAMES CUMMING, Government Printer, Brisbane.
