TRANSACTIONS AND PROCEEDINGS

AND

REPORT

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA.

VOL. IV.

(FOR 1880-81.)

ISSUED JANUARY, 1882.

Adelaide:

G. ROBERTSON, 103, KING WILLIAM STREET.

Parcels for transmission to the Royal Society of South Australia, from Europe and America, should be addressed "per Mr. W. C. Rigby, care Messrs. Thos. Meadows & Co., 35, Milk Street, Cheapside, London."

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ERRATA.

p. 110, line 3—for *vulbosa* read *bulbosa*.

p. 112, last line—for *asperatus* read *exasperatus*.

p. 133, line 18—for *principal* read *principle*.

SOME OBSERVATIONS ON THE

PROPAGATION OF CYMODOCEA ANTARCTICA *(Endl.)*

By J. G. O. Tepper, F.L.S., London; Memb. Bot. Verein, Brandenburg; Corr. Memb.

[Read December 7, 1880.]

Plate I.

The remarkable plant, which forms the subject of this paper, belongs to the order of Naiadeæ among Monocotyledons, and assists in considerable numbers to form the submarine meadows near Ardrossan and elsewhere in the Gulf of St. Vincent. They extend from just below low-water mark of spring tides to considerable depths beyond.

The principal plant of these meadows, during the months of September, October, and November, is another of the same order, viz., *Posidonia australis*, flowering copiously during the first two months, and fruiting in the latter, the seeds being ripe and shed in December. During life it resembles some of the Cyperaceæ, especially *Lepidosperma*, in general form of leaf, stalk, flower, except that the leaves are rounded at the apex, and are not stiff, but the fruits are much larger. A third associate is *Zostera nana*, which is much smaller and grass-like.

All three are found among the refuse masses of marine vegetation fringing the beaches, the main bulk of which is supplied by *Posidonia*, and are popularly included among "sea-weeds."

While the two last-named plants much resemble each other in general outline, the first, *Cymodocea antarctica*, is very different in this respect, and easily recognised. Its creeping main stem is held fast in and below the soft mud by very numerous slender rootlets, and sends up from its joints secondary upright stems in succession. These are very slender, like thin whipcord, and consist, as well as the long thin branches, of short joints or rings, caused by the successive dropping off of the leaves. These again divide into numerous branchlets, each carrying a tuft of crowded leaves, with concave semilunar extremities (figs. 1 and 5); a short appendage to the stalk (about one-fourth of an inch), fitting closely to its upper or inner side, with projecting lateral points (fig. 5), renders its base double, and thus strengthens it. About one-eighth of an inch below the upper end of this appendage is a hinge-like joint in the leaf, allowing it free and easy motion at right angles to its axis. The plant attains a height of one and a half to three feet, moving gracefully with the swell of the waves, and overtops greatly its congeners at this stage, predominating in patches of varying extent during the greater part of the year.

All this has no doubt been frequently observed by any one who frequents our coasts, but that the mode of propagation of a plant occurring in such numbers should be wrapt in uncertainty appears strange. But before giving my own observations, which perhaps may advance the knowledge thereof a trifle, let me state how my attention was turned towards the subject.

When commencing to collect plants last year little was known to me about native botany till supplied with the correct names and other desired information by Baron F. von Mueller, whose great kindness and courtesy it is with the greatest pleasure I again acknowledge. Being directed by him to turn my attention to the shore, specimens of the three species were in due course obtained and identified, but only by the leaves. Later, in December, certain *fruits* were found thrown upon the beach by the waves, somewhat resembling in general arrangement the tufts of *Cymodocea*, and were mistaken for them.

Having, however, forwarded some of these seeds to the Botanical Society of Brandenburg, Berlin, in the early part of October last, I received a letter of acknowledgment from Prof. P. Ascherson, Sec. of the Society, stating that they were really those of *Posidonia australis*, and remarking that—"The real "fruit of *Cymodocea* remains still unknown, and it would be of "great merit if you could succeed in finding it, as that would "elucidate the first formation of the young plants. The pistil "occurs in a kind of quadripartite, ray-like divided, horny cup "of a yellowish white colour, below which is an oval concavity. "The plant in this state is quite rare, as Baron v. Mueller only "found it once, and the Swedish botanist Agardh, in his work, "describes it as an algal (*Amphibolis zosterifolia*)." This being new to me, I at once sought for specimens, and succeeded in finding some half a dozen on the beach in the early part of October, and several more on subsequent occasions, but want of leisure prevented me for some time from seeking for them *in situ*.

On November 7th, the first opportunity occurred, which allowed me to follow the plant to its haunts; and I was greatly pleased to find my previous surmises to a large extent confirmed, which were—(1) That *Cymodocea* is an annual, or at most a bi-annual; (2) that it bears no seed proper, but is propagated chiefly, if not exclusively, by means of germs. By this is meant that the plant does not at all develop a fruit proper, nor does the seed ever become dissociated from its plant, but that the fertilised ovum at once germinates and develops into a new plant, which at maturity is detached, and begins an independent cycle of existence.

Let us see how facts bear out these ideas. First, as to the short-life duration of the individual. There are pretty large quantities of the plant washed ashore in September and October, mostly sterile portions of all sizes, but sometimes whole stems and roots, interspersed with a few of the germ-plants with the characteristic calyx-cups attached. Then, upon searching for the plants in localities where formerly miniature forests of them had been noticed, none could be discovered for some time, these places being thickly overgrown with flowering and fruiting *Posidonias;* but upon these being separated, young plants, three to four inches high, or less, were discovered in abundance. Pulling them up carefully, everyone was seen to be supplied with the quadripartite cup. Some only recently detached were still in a recumbent position; others, with two to four roots, several inches in length, and curved in irregular spirals (fig. 4); while between these, specimens were obtained in all stages, from the very root-bud onwards; but not one without the cup, or growing from an old caudex.

The cause of the death and decay of old plants, which are very much affected by parasitic weeds and zoophytes, seems to be that the stems and branches become extremely brittle in old age, and are liable to be broken off by very slight force; and as the underground procumbent stem is apparently not endowed with the property of producing fresh shoots, the destruction of the whole is inevitable. But this very property has been made available for the effectual propagation, continuation, and preservation of the species; for at a certain season (most probably between June and September) a limited number of branches develop sexual organs at their extremity, those of the feminine type being protected by a double set of sharp spines, of which the inner ones—closely investing the precious core—are placed alternately to the exterior ones, but only in one pair of five spines each, all separate, with a single short strong spine, or only a rounded little knob between. The exterior "wings," which may be said to represent either the calyx or the bracts of other plants, are spreading in a larger and a smaller pair, placed adjoining, not alternate. Of these the larger ones contain fourteen or fifteen spines, and the smaller nine or ten, all united at one-third of the distance from the centre (figs. 2 and 3). This structure, no doubt, serves to protect the organ of propagation from injury during its formation, the plant serving as food for fishes or other animals.

When arrived at maturity—*i.e.*, the breaking up of the plant—the new germ plants become detached at an oval joint immediately below the cup, and the latter being the portion of the greatest density retains the floating waif in an upright position, and soon proves its ultimate use by acting as a *grappling apparatus*, catching in the tangles of small algæ, &c.; preventing the removal of the young plants to places unsuitable for them, anchors them firmly in the soft mud, and thus ensures their prosperity and continuation, whilst the old ones are being destroyed by storms and currents.

Having examined numerous specimens, I can speak with confidence in respect of the latter stages of growth; but being too late in the field for this season I have neither seen flowers of either sex, nor found the cup-plants in connection with the parent. The remarks, as to these, are therefore only conjectural. Observations ought to be made at the proper time by dredging for the plants, the weather being too cold then for any other mode. Perhaps the above may induce members with the means at command to fill up the gaps in the life-history of *Cymodocea* as indicated, and thus set the question at rest.

EXPLANATION OF PLATE I.

Fig. 1. Mature germ-plant, nat. size. A., horny calyx-cup, or bracts.

Fig. 2. Side view of A. (enlarged)
- *a.* Base of ovary (below oval depression joined to the stalk), to which are fixed four rayed wings in adjoining pairs.
- *b.* The two inner spiny wings, opp. to interstices of the outer ones, alternating with two small projections.
- *c.* Core, from which the young stem arises.

Fig. 3. View of A. from above. (much enlarged)
- *a.* Large pair, with 14-15 rays, joined at base.
- *b.* Inner spines, always five, not joined.
- *c.* Small outer pair, with nine rays, joined at base.

Fig. 4. Showing spiral roots proceeding from between the wings.
- *a.* Roots.
- *b.* Hair-like fibres attached, generally from the exterior of the horny cup. Nat. size.

Fig. 5. Mature leaf, to show its peculiar structure (enlarged).
- *a.* Clasping stalk; inner and upper side.
- *b.* Hinge or joint of leaf.
- *c.* Projecting double part and leaf.

A LIST OF THE

CHARAS, MOSSES, LIVERWORTS, LICHENS, FUNGS, AND ALGALS

OF EXTRA-TROPICAL SOUTH AUSTRALIA.

[Extracted from "Supplementum Fragmentorum Phytographiæ Australiæ."]

[**Read April 5, 1881.**]

Messrs. Tenison Woods and Bailey in their paper "On some Fungi of New South Wales and Queensland," read before the Linnean Society, N.S.W., on Feb. 25, 1880, make the remark, somewhat unfortunately as the sequel will show, that, "whatever attention has been paid to the botany of Australia, we must admit that there are some departments of the science which have been comparatively neglected. These are notably the Mosses, Lichens, and Fungi." The authors of the above passages must have been unaware of the long-continued and patient efforts made by Baron F. von Mueller to collect material for the purpose of systematic investigation of these orders, and of the fact that this very material was then in the hands of the most accomplished specialists for identification. I am sure, that those gentlemen are innocent of any attempt to convey the impression, that Baron F. von Mueller has neglected any department of botanical science. His vindication is furnished by the lists of the terrestrial and oceanic cryptogams of Australia, which have been issued by him in the form of a supplement to his 11th volume of the Frag. Phyt. Austral.

The CHARACEÆ are enumerated by Dr. Alex. Braun, and include *Chara*, 10 species, and *Nitella*, 18 species. Of these, South Australia possesses three of the former, and four of the latter genus, one of which is restricted to the colony.

The MOSSES, which have been identified by Dr. E. Hampe, number for the whole continent 382 species. In this list, the geographical distribution of the species is not indicated; but this omission, so far as regards South Australia, has been communicated to me by Baron F. von Mueller. The specimens, on which this list of 36 species is based, were gathered by the Baron "during the early days of colonisation in South Australia. This number is exceedingly small in proportion to what is known of Mosses from the south-eastern regions of Australia. Hampe's enumeration of Continental Australia mainly from my collections, written on my request, and finished just before his lamented death, reaches 382 species; but nearly the whole of these came from the moist forest glens and alpine regions of Victoria and New South Wales, where particularly the damp fern-tree gullies with their dense shade are rich in bryologic forms. Nevertheless, it must be borne in mind, that when about 30 years ago I was carrying on my unaided researches in South Australia, the means of travelling were then not so easy as now, and I was unable to reach every locality promising for mosses and other Acotyledonous plants. Thus, probably a good many of the Victorian and Tasmanian Mosses will yet be traced into South Australian territory; though it is only with *Hymenophyllum*, *Trichomanes*, and numerous other ferns (not extending into South Australia), that a rich moss flora commences. Even in North Australia (Arnhem Land and Carpentaria) I found during more than 12 months' travels in lines extending over 5,000 miles only three (!) species of Mosses."—F. von Mueller, *in litteris*.

The LIVERWORTS are enumerated by Dr. C. M. Gottsche. The total number of species is 169, distributed in 36 genera. Of these South Australia possesses six species in as many genera —a paucity of forms attributable to the excessive dryness of our climate.

The LICHENS, 112 in number, are enumerated by Dr. A. von Krempelhuber. South Australia is credited with 10 species, one of which is restricted.

The FUNGS have been dealt with by Dr. M. C. Cooke. The total species recorded from Australia is 925, of these 86 are known to inhabit South Australia. The localities given are extracted chiefly from Mr. Berkeley's paper on Australian Fungi, Proc. Lin. Soc., vol. xiii., pp. 156 et seq., 1872.

The ALGALS have been compiled by Dr. W. O. Sonder, and consist of 1,056 species; 273 for South Australia.

Thus the total of species of these indices is 2,672, 418 for this colony; but our illustrious Honorary Member promises early additions to these lists from material already under examination. *Ralph Tate.*

[Species whose names have an asterisk prefixed are restricted to South Australia.]

ORDER CHARACEÆ.

CHARA.

australis, *R. Br.*

*contraria, *Al. Braun*, *var.* Behriana.

var. australis. Cudnaka.

fragilis, *Desv.*, forma laxa, macrophylla. R. Torrens.

Nitella.

*æmula, *Al. Braun.* Mount Barker.
congesta, *Al. Braun.*
gelatinosa, *Al. Br.*, *var.* cladostachya. R. Torrens.
Lhotzkyi, *Al. Br.* R. Torrens.

ORDER MUSCI FRONDOSI.

FUNARIACEÆ.

Amphoritheca.

clavæformis, *Hampe et C. Mueller.* Torrens River.

Funaria.

subnuda, *Taylor.* Barossa Range.
hygrometrica, *Hedwig.* Common.

POTTIACEÆ.

Pottia.

inflexa, *C. Mueller.* Gawler River.

Anacalypta.

cæspitulosa, *Hampe et C. M.* Mount Lofty Range.

Barbula.

crassinervis, *Taylor.* Gawler River.
australasiæ, *Hook. et Grev.* Barossa Range, Rivoli Bay, Mount Gambier.
torquata, *Taylor.* Mount Gambier.
subtorquata, *Hampe et C. M.* Mount Gambier.
calycina, *Schwægrichen.* Mount Lofty and Barossa Ranges.
breviseta, *Hampe et C. M.* Mount Gambier.

WEISSIACEÆ.

Weissia.

nudiflora, *Hampe et C. M.* Bugle Range.

Ceratodon.

convolutus, *Reinhardt.* Adelaide.

BLINDIACEÆ.

Dicranum.

leptocephalum, *C. Mueller.* Mount Gambier.

BARTRAMIACEÆ.

Bartramia.

strictifolia, *Taylor.* Barossa Range.
affinis, *Hooker.* Mount Lofty Range.

GRIMMIACEÆ.

Grimmia.

crispatula, *Hampe et C. M.* Fifth Creek, Mount Lofty.

leiocarpa, *Taylor.* Barossa Range.
callosa, *Hampe et C. M.* Brownhill Creek; Barossa Range.
pygmæa, *C. Mueller.* Adelaide.

BRYACEÆ.

BRYUM.

campylothecium, *Taylor.* Mt. Lofty Range; Lyndoch Valley.
argenteum, *Linné.* Adelaide.
erythrocarpoides, *C. Mueller.* Cataracts, Mt. Lofty Range.
Gambierense, *C. Mueller.* Mount Gambier.
cupulatum, *C. Mueller.* Brownhill Creek.
pyrothecium, *Hampe et C. M.* Mount Gambier.

BRACHYMENIUM.

Preissianum, *Hampe.* Rivoli Bay.

POLYTRICHACEÆ.

POLYTRICHUM.

juniperinum, *Hedwig.* Mount Lofty Range.

DAWSONIA.

appresa, *Hampe.* Onkaparinga.

LESKEACEÆ.

LESKEA.

homomalla, *Hampe.* Mount Lofty Range.

HYPNACEÆ.

HYPNUM.

hastatum, *C. Mueller.* Fifth Creek.

GAMOPHYLLEÆ.

CONOMITRIUM.

Muelleri, *Hampe.* Murray River.

FISSIDENS.

basilaris, *Hampe et C. M.* Barossa Range.
pungens, *Hampe et C. M.* Barossa Range.

HYPOPHYLLOCARPÆ.

HYPOPTERYGIUM.

Novæ Zealandiæ, *C. Mueller.* Mount Gambier crater.

RHACOPILUM.

convolutaceum, *C. Mueller.* Fifth Creek (Mt. Lofty Range).

ORDER MUSCI HEPATICI.

LOPHOCOLEA.

heterophylloides, *Nees.* Fifth Creek (Mt. Lofty Range).

Symphyogyna.

rhizobola, *Nees.* Mount Lofty Range.

Targionia.

Michelii, *Corda.* Barossa Range.

Anthoceros.

lævis, *Linné.* Mount Lofty.

Fimbraria.

Drummondi, *Taylor.* Barossa Range.

Marchantia.

polymorpha, *Linné.*

ORDER LICHENES.

Cladonia.

aggregata, *Eschweiler.*
retipora, *Flœrke.*

Heterodea.

Muelleri, *Nylander.*

Usnea.

barbata, *Acharius.*

Ramalina.

pusilla, *Le Prev.*

Parmelia.

subprolixa, *Nylander.*
convoluta, *Krempelhuber.* Central Aust.

Physcia.

chrysopthalma, *Candolle.*
parietina, *Notaris.*

Lecidea.

*plana, *Krempelhuber.*

ORDER FUNGI.

SUB-ORDER HYMENOMYCETES.

Agaricus.

(Collybia.)

radicatus, *Relhan.* Fifth Creek, Adelaide.

(Omphalia.)

*pyxidatus, *Bulliard.* Bugle Ranges.
*fibula, *Bulliard.* Bugle Ranges.

(Flammula.)

penetrans, *Fries*. Fifth Creek.

(Naucoria.)

*frusticola, *Berkeley*. Mount Lofty Range.

(Galera.)

*hypnorum, *Batsch*. R. Torrens.

(Psalliota.)

campestris, *Linne*.

(Stropharia.)

semiglobatus, *Batsch*.

(Hypholoma.)

dispersus, *Fries*. Mount Lofty Range.
fascicularis, *Hudson*. Macclesfield.

(Psathyra.)

*Sonderianus, *Berkeley*. Fifth Creek.

(Panæolus.)

*phalænarum, *Bulliard*. Adelaide.

(Psathyrella.)

*trepidus, *Fries*. Adelaide.

COPRINUS.

stercorarius, *Fries*. Sixth Creek.

RUSSULA.

fragilis, *Fries*. Adelaide.

LENTINUS.

*subnudus, *Berkeley*. Adelaide
exilis, *Klotzsch*. Adelaide.

SCHIZOPHYLLUM.

commune, *Fries*.

LENZITES.

*abietina, *Fries*. Adelaide.

POLYPORUS.

(Pleuropus.)

sanguineus, *Meyer*. Kaiserstuhl, and many other places.

(Anoderma.)

*corrivalis, *Berkeley*. Adelaide.
cinnabarinus, *Fries*. Mount Lofty Range.

(Placoderma.)

igniarius, *Fries*. Adelaide.
carneus, *Nees*.
portentosus, *Berkeley*.

(Inoderma.)

scruposus, *Fries.* Adelaide.

(Resupinaria.)

*corticola, *Fries.* Adelaide.

TRAMETES.

*fibrosa, *Fries.* Adelaide.
*ungulata, *Berkeley.* Adelaide.
*epitephra, *Berkeley.* Adelaide.
lactinea, *Berkeley.* Adelaide.
occidentalis, *Fries.* Adelaide.

DÆDALEA.

tenuis, *Berkeley.*
*Hobsoni, *Berkeley.*
*aulacophyllus, *Berkeley.*
*Schomburgkii, *Berkeley.*

HEXAGONA.

polygramma, *Montagne.* Adelaide.
decipiens, *Berkeley.* Adelaide.
subtenuis, *Berkeley.* Adelaide.

FAVOLUS.

*hispidulus, *Berk. et Curtis.* Adelaide.

IRPEX.

flavus, *Klotzsch.*

PHLEBIA.

*hispidula, *Berkeley.* Adelaide.

KNEIFFIA.

*Muelleri, *Berkeley.* Adelaide.

STEREUM.

illudens, *Berkeley.* Fifth Creek.
hirsutum, *Fries.* Fith Creek.
purpureum, *Fries.*

PENIOPHORA.

*tephra, *Berk. et Curtis.* Adelaide.

CORTICIUM.

arachnoideum, *Berk. et Broome.* Adelaide.

CLAVARIA.

*paludicola, *Libert.* Mount Lofty on *Osmunda.*

CLAOCERA.

guepinoides, *Berkeley.* Fifth Creek.

TREMELLA.

lutescens, *Persoon.* Fifth Creek.

HIRNEOLA.

polytricha, *Fries.* Adelaide.

SUB-ORDER GASTEROMYCETES.

ASEROE.

rubra, *Labillardière.* Lake Gilles.

XYLOPODIUM.

australe, *Berkeley.* Murray Desert.

BATTARREA.

*Muelleri, *Kalchbrenner.* Ardrossan.

GEASTER.

fimbriatus, *Fries.* Brownhill and Fifth Creeks.
minimus, *Schweinitz.* Fifth Creek.
*striatulus, *Kalchbrenner.*

LYCOPERDON.

australe, *Berkeley.* Fifth Creek.

POLYSACCUM.

marmoratum, *Berkeley.*

SCLERODERMA.

geaster, *Fries.*
vulgare, *Fries.*

CYATHUS.

Colensoi, *Berkeley.*

SUB-ORDER CONIOMYCETES.

ÆCIDIUM.

Goodeniacearum, *Berkeley.*

UROMYCES.

*puccinioides, *Berk. et F. M.* Holdfast Bay on *Goodenia.*

PUCCINIA.

Chondrillæ, *Corda.*
aucta, *Berk. et F. M.* Port Lincoln on *Lobelia.*
graminis, *Persoon.*
straminis, *Fuckel.*

MELAMPSORA.

Lini, *Tulasne.* R. Murray on *Linum marginale.*

Ustilago.

bromivora, *Tulasne.* R. Murray on *Bromus arenarius.*
bullata, *Berkeley.* R. Murray.
marmorata, *Berkeley.* Mount Gambier on *Isolepis prolifera.*

Tilletia.

Caries, *Tulasne.* (Fœtid smut) on cereals.

SUB-ORDER HYPHOMYCETES.

Isaria.

graminiperda, *Berk. et F. Mueller.* MacDonnell Bay.
fuciformis, *Berkeley.* Mount Gambier on cereals.

Aspergillus.

glaucus, *Link.*

Cladosporium.

herbarum, *Link.*

Sepedonium.

chrysospermum, *Link.*

Trichoderma.

viride, *Persoon.*

Oidium.

Tuckeri, *Berkeley.* On vines.

SUB-ORDER ASCOMYCETES.

Peziza.

cochleata, *Linné.* Adelaide.
rutilans, *Fries.*

Hypocrea.

*cerebriformis, *Berkeley.* Adelaide.

Hypoxylon.

*sclerophæum, *Berk. et Curtis.* Adelaide.
concentricum, *Greville.* Adelaide.

ORDER ALGÆ.

SUB-ORDER FUCOIDEÆ.

FUCACEÆ.

Sargassum.

(Phyllotricha.)

linearifolium, *Agardh.*
muriculatum, *J. Ag.*
Sonderi, *J. Ag.*
heteromorphum, *J. Ag.*

(Schizophylla.)

decipiens, *Ag.*
varians, *Sond.* Holdfast Bay, Port Gawler, Guichen Bay.

(Heterophylla.)

biforme, *Sond.* Lefevre's Peninsula.
ensifolium, *Ag.* Holdfast Bay.
lacerifolium, *Ag.* Holdfast Bay, Guichen Bay.

(Carpophylla.)

carpophyllum, *J. Ag.* St. Vincent's Gulf.

(Cymosa.)

spinuligerum, *Sond.* St. Vincent's Gulf.
*vulgare, *Agardh.* St. Vincent's Gulf.

TURBINARIA.

vulgaris, *var.* conoides, *J. Ag.* Fowler's Bay.

PHYLLOSPORA.

comosa, *Agardh.* Rivoli Bay.

SCABERIA.

Agardhii, *Grev.* Guichen Bay, Spencer's Gulf.

CAULOCYSTIS.

cephalornithos, *Aresch.* MacDonnell Bay.
uvifera, *Aresch.* Port Gawler, Holdfast Bay, Encounter Bay.

CYSTOPHORA.

Platylobium, *Ag.* Port Adelaide, Lacepede to MacDonnell Bays.
pectinata, *Ag.* St. Vincent's Gulf.
racemosa, *Harvey.* Fowler's Bay, Spencer's Gulf, Lacepede Bay.
retorta, *J. Ag.* St. Vincent's Gulf, Lacepede Bay.
retroflexa, *J. Ag.* Rivoli Bay.
dumosa, *J. Ag.* Encounter Bay.
siliquosa, *J. Ag.* Encounter Bay.
torulosa, *J. Ag.* Encounter Bay.
botryocystis, *Sond.* St. Vincent's Gulf.
Brownii, *J. Ag.* St. Vincent's Gulf.
monilifera, *J. Ag.* St. Vincent's Gulf.
subfarcinata, *Ag.* Holdfast Bay, Encounter Bay.
polycystidea, *Aresch.* Spencer's Gulf, Holdfast Bay.
var. microcystis, *Sond.* MacDonnell Bay.

ACROCARPIA.

paniculata, *Aresch.* Lacepede Bay, MacDonnell Bay.

CYSTOPHYLLUM.

onustum, *J. Ag.* Holdfast Bay.

muricatum, *J. Ag.*
*australe, *Sond.* Holdfast Bay.

FUCODIUM.

gladiatum, *J. Ag.*

HORMOSIRA.

Banksii, *Decaisne.*

CARPOGLOSSUM.

confluens, *J. Ag.* Port Adelaide, Encounter and Lacepede Bays.

MYRIODESMA.

integrifolium, *Harvey.* Holdfast Bay.

DURVILLÆA.

potatorum, *Aresch.*

SPLACHNIDIUM.

rugosum, *Greville.*

SPOROCHNACEÆ.

CARPOMITRA.

inermis, *Kuetz.* Port Lincoln, Rivoli Bay.

BELLOTIA.

Eriophorum, *Harvey.* Encounter Bay.

NEREIA.

australis, *Harvey.* Lefevre's Peninsula.

SPOROCHNUS.

comosus, *Ag.*
radiciformis, *Ag.*

LAMINARIACEÆ.

MACROCYSTIS.

Duebenii, *Aresch.* Rivoli Bay.
*latifolia, Bory. Yorke's Peninsula.

ECKLONIA.

radiata, *J. Ag.*
var. exasperata, *Harv.* Lacepede Bay.

DICTYOTACEÆ.

HALISERIS.

australis, *Sond.* Lefevre's Peninsula.
Muelleri, *Sond.* Lefevre's Peninsula.

PADINA.

Pavonia, *Gaillon.*

ZONARIA.

Diesingiana, *J. Ag.* Lefevre's Peninsula.
Turneriana, *J. Ag.*

LOBOSPIRA.

bicuspidata, *Aresch.* Port Adelaide, Spencer's Gulf.

TAONIA.

australasica, *Sond.* Lefevre's Peninsula.

CUTLERIA.

multifida, *Greville.* Lefevre's Peninsula.

DICTYOTA.

paniculata, *J. Ag.* Encounter Bay.
furcellata, *J. Ag.*
linearis, *J. Ag.* Lefevre's Peninsula.

STILOPHORA.

rhizodes, *J. Ag.* Holdfast Bay.
australis (Spermatochus), *Kuetz.* Lefevre's Peninsula.

ASPEROCOCCUS.

sinuosus, *Bory.* Holdfast Bay.

HYDROCLATHRUS.

cancellatus, *Bory.* Holdfast Bay.

CHORDARIACEÆ.

LIEBMANNIA.

australis, *Harvey.*

LEATHESIA

umbellata, *Meneg.* Holdfast Bay.

ECTOCARPACEÆ.

SPHACELARIA.

paniculata, *Lgb.* Encounter Bay.

ECTOCARPUS.

siliculosus, *Lgb.*

DESMOTRICHUM.

*plumosum, *Kuetz.* Port Adelaide.

SUB-ORDER FLORIDEÆ.

CERAMIACEÆ.

CALLITHAMNION.

nodiferum, *J. Ag.* (simile, *Harv.*)
harrowioides, *Sond.* St. Vincent's Gulf.
*ægagropilum, *Agardh.*

BALLIA.

Brunonis, *Harv.* Guichen, Rivoli, and Encounter Bays, St. Vincent's Gulf.

Robertiana, *Harvey*. Guichen Bay.
Mariana, *Harvey*. Rivoli Bay.
scoparia, *Harvey*. Fowler's Bay.

GRIFFITHSIA.

monilis, *Harvey*.
corallina, *Agardh*. Lefevre's Peninsula.
Sonderiana, *J. Ag*. MacDonnell Bay.
elongata, *J. Ag*.

PTILOTA.

striata, *Harvey*. St. Vincent's Gulf.

CROUANIA.

insignis, *Harvey*.

DASYPHILA.

Preissii, *Sond*. Fowler's Bay, Encounter Bay.

PTILOCLADIA.

pulchra, *Sonder*.

HALOPLEGMA.

Preissii, *Sonder*. Fowler's Bay.

CERAMIUM.

diaphanum, *Lgb*.
rubrum, *Agardh*.

CENTROCERAS.

clavulatum, *Agardh*.

CRYPTONEMIACEÆ.

HALYMENIA.

Muelleri, *Sonder*. Lefevre's Peninsula.

POLYOPES.

constrictus, *J. Ag*.

PRIONITIS.

microcarpa, *J. Ag*. Encounter Bay.

CRYPTONEMIA.

elata, *Harvey*. Denial Bay.

THAMNOCLONIUM.

codioides, *J. Ag*. Lefevre's Peninsula.
proliferum, *Sond*. Encounter Bay.

GIGARTINEÆ.

GIGARTINA.

flabellata, *J. Ag*.
disticha, *Sond*. Fowler's Bay.

livida, *J. Ag.*
Wehliæ, *Sond.* MacDonnell Bay.
Radula, *J. Ag.* MacDonnell Bay.
flagelliformis, *Sond.* Fowler's Bay.

CALLOPHYLLIS.

Lambertii, *Hook.* and *Harv.* Guichen Bay, Rivoli Bay.
*corvicornis, *Sond.* Encounter Bay.
coccinea, *Hook.* and *Harv.*, *var.* microcarpa, *Zanard.*

SPYRIDIEÆ.

SPYRIDIA.

filamentosa, *Harvey.*
opposita, *Harvey.*
*squalida, *J. Ag.*
*dasyoides, *Sond.* Holdfast Bay.

ARESCHOUGIEÆ.

ARESCHOUGIA.

dumosa, *Harvey.* MacDonnell Bay, Encounter Bay.
congesta, *J. Ag.*
Laurencia, *Hook.* and *Harv.* Fowler's Bay, Lacepede Bay, MacDonnell Bay
ligulata, *Harvey.* Holdfast Bay.

ERYTHROCLONIUM.

angustatum, *Sond.* Lefevre's Peninsula.
Muelleri, *Sond.* Lefevre's Peninsula.

THYSANOCLADIA.

Harveyana, *J. Ag.*

CHAMPIEÆ.

CHYLOCLADIA.

Muelleri, *Sond.* Lefevre's Peninsula.
multiramea, *Sond.*

CHAMPIA.

parvula, *Agardh.*
Tasmanica, *Harvey.* Holdfast Bay, MacDonnell Bay.
var. gracilis, *Harv.* St. Vincent's and Spencer's Gulfs.

RHODYMENIACEÆ.

HYMENOCLADIA.

dactyloides, *J. Ag.* Fowler's Bay.
Usnea, *J. Ag.* Encounter Bay.
polymorpha, *Harvey.* Fowler's Bay.
conspersa, *J. Ag.* MacDonnell Bay.

Chrysymenia.

obovata, *Sond.* Spencer's Gulf, MacDonnell Bay.

Rhodymenia.

linearis, *J. Ag.*

Plocamium.

Preissianum, *Sond.* Guichen Bay, Fowler's Bay.
angustum, *J. Ag.* Rivoli Bay, MacDonnell Bay.
costatum, *J. Ag.* Guichen Bay.
nidificum, *Harvey.* St. Vincent's Gulf.
Mertensii, *Greville.*
procerum, *J. Ag.* St. Vincent's Gulf.
dilatatum, *J. Ag.* MacDonnell Bay.

Rhodophyllis.

blepharicarpa, *Harv.* Fowler's Bay.
ramentacea, *Agardh.*
Gunnii, *Harvey.*

SQUAMARIACEÆ.

Peyssonnelia.

Novæ Hollandiæ, *Kuetz.*
australis, *Sonder.* Port Adelaide.

CORALLINACEÆ.

Melobesia.

membranacea, *Lamx.* Lefevre's Peninsula.
farinosa, *Lamx.* Lefevre's Peninsula.
Patena, *Hook.* and *Harv.* Rivoli Bay.

Mastophora.

Lamourouxii, *Decaisne.*

Amphiroa

galaxauroides, *Sond.* Port Lincoln.
charoides, *Lamx.* Spencer's Gulf.
stelligera, *Lamx.* Rivoli Bay.

Arthrocardia.

Wardii, *Aresch.*

Jania.

micrarthrodia, *Lamx.* Spencer's Gulf, Rivoli Bay.

Corallina.

pilifera, *Lamx.* Port Adelaide.
Cuvieri, *Lamx.*
var. crispata, *Aresch.* St. Vincent's Gulf.
var. subulata, *Aresch.* Port Adelaide.

SPHÆROCOCCOIDEÆ.

NIZYMENIA.

australis, *Sonder*. Encounter Bay, MacDonnell Bay.

PHACELOCARPUS.

alatus, *Harvey*. Encounter Bay.
Labillardierii, *Endl*. MacDonnell Bay, Rivoli Bay, Port Adelaide.
apodus, *J. Ag*. MacDonnell Bay.
sessilis, *Harvey*. MacDonnell Bay.

CURDIÆA.

laciniata, *Harv*. Port Adelaide, Encounter Bay, MacDonnell Bay.

MELANTHALIA.

concinna, *Harv*. Encounter, Guichen, and Rivoli Bays.
obtusata, *Mont*., *et var*. intermedia, *Harv*. MacDonnell Bay, Port Adelaide.

GRACILARIA.

confervoides, *Greville*.

DICRANEMA.

Grevillei, *Sond*. Encounter Bay, MacDonnell Bay.

STENOCLADIA.

furcata, *J. Ag*. St. Vincent's Gulf.

DELESSERIEÆ.

NITOPHYLLUM.

Curdieanum, *Harvey*. MacDonnell Bay.
erosum, *Harvey*. MacDonnell Bay.
pristoideum, *Harvey*. MacDonnell Bay, Encounter Bay.
polyanthum, *J. Ag*.
minus, *Sond*. Guichen Bay. MacDonnell Bay.

DELESSERIA.

frondosa, *Harvey*. MacDonnell Bay.
revoluta, *Harvey*. MacDonnell Bay.
imbricata, *Aresch* (Chauvinia, *Harv*.). MacDonnell Bay, Encounter Bay.
coriifolia, *Harv*. Fowler's Bay, MacDonnell Bay.

CHÆTANGIEÆ.

ACROTYLUS.

australis, *J. Ag*. Encounter, Guichen, and MacDonnell Bays.

GELIDIEÆ.

PTEROCLADIA.

lucida, *J. Ag*. Holdfast Bay.

GELIDIUM.

acrocarpum, *Harv.*, (partim). MacDonnell Bay.
corneum, *Grev.* MacDonnell Bay, Fowler's Bay.
asperum, *Harv.* Rivoli Bay.
glandulifolium, *Hook.* and *Harv.* MacDonnell Bay.

HYPNEACEÆ.

HYPNEA.

episcopalis, *Hook.* and *Harv.* Fowler's Bay.
var. rigens, *Sond.* Holdfast Bay.
seticulosa, *Ag.* Spencer's Gulf, Lefevre's Peninsula.
cenomyce, *J. Ag.* Holdfast Bay.

MYCHODEA.

membranacea, *Harvey.*
carnosa, *Harvey.*
hamata, *Harv.* Port Adelaide, Encounter, Guichen, and MacDonnell Bays.
chondroides, *Kuetz.* (nigricans, *Harv.*). Fowler's Bay.
*gracilaria, *Sond.* (Acanthococcus). Lefevre's Peninsula.
foliosa, *Harv.* Encounter Bay, Port Lincoln.

SOLIERIEÆ.

GELINARIA.

ulvoidea, *Sond.* Fowler's Bay.

RHABDONIA.

nigrescens, *Harvey.*
robusta, *Grev.* (Soliera australis, *Harv.*). Lefevre's Peninsula.
mollis, *Harvey.* MacDonnell Bay.
verticillata, *Harv.* Encounter Bay, Port Adelaide.

WRANGELIEÆ.

WRANGELIA.

myriophylloides, *Harvey.* MacDonnell Bay, Fowler's Bay.
velutina, *Harv.* MacDonnell Bay, Guichen Bay.
Halurus, *Harv.* MacDonnell Bay.
crassa, *Hook.* and *Harv.* MacDonnell Bay.
Wattsii, *Harv.* MacDonnell Bay.
clavigera, *Harvey.* Port Lincoln.
princeps, *Harvey.*

CHONDRIEÆ.

CŒLOCLONIUM.

opuntioides, *Harvey.* Fowler's Bay.

CORYNECLADIA.

australasica, *Sond.* Encounter Bay.
clavata, *J. Ag.* Lefevre's Peninsula.

LAURENCIA.

filiformis, *Agardh.*
Forsteri, *Greville.*
arbuscula, *Sond.* (heterocladia, *Harvey*). Fowler's Bay, MacDonnell Bay.
cruciata *Harvey.* Fowler's Bay.
obtusa, *Lamx.* Holdfast Bay.
Tasmanica, *Hook.* and *Harv.* Holdfast Bay.
elata, *Harvey.* Port Adelaide.
luxurians, *J. Ag.* Fowler's Bay.

ASPARAGOPSIS.

armata, *Harvey.*

LEPTOPHYLLIS.

conferta, *J. Ag.* Encounter Bay, Guichen Bay.

RHODOMELEÆ.

DICTYURUS.

quercifolius, *J. Ag.* (Thuretia, *Harv.*). Port Adelaide, MacDonnell Bay.

AMANSIA.

pinnatifida, *Harvey.* Fowler's Bay.
linearis, *Harvey.* MacDonnell Bay, Guichen Bay, Glenelg.

POLYZONIA.

Sonderi, *Harvey.* MacDonnell Bay.
incisa, *J. Ag.* MacDonnell Bay.

VIDALIA.

spiralis, *J. Ag.* Fowler's Bay.

LENORMANDIA.

Muelleri, *Sond.* Rivoli Bay, MacDonnell Bay.

JEANNERETTIA.

lobata, *Hook.* and *Harv.* Lefevre's Peninsula.

POLLEXFENIA.

pedicellata, *Harv.* Fowler's Bay, Spencer's Gulf, Lefevre's Peninsula.

SARCOMENIA.

delesserioides, *Sond.* Guichen Bay, Port Adelaide.

DICTYMENIA.

tridens, *Grev.* MacDonnell Bay, Lefevre's Peninsula.
Harveyana, *Sond.* Lefevre's Peninsula, Encounter Bay.

TRIGENEA.

australis, *Sond.* Fowler's, Encounter, and MacDonnell Bays.

RYTIPHLÆA.

australasica, *Mart.* Lefevre's Peninsula, MacDonnell Bay.
elata, *Harv.* Fowler's Bay, Lefevre's Peninsula, MacDonnell Bay.

BOSTRYCHIA.

mixta, *Hook. fil.* and *Harv.* St. Vincent's Gulf.

POLYSIPHONIA.

Hystrix, *Harvey.*
Havanensis, *Mont.*
Cladostephus, *Mont.* Lefevre's Peninsula, Encounter Bay.
versicolor, *Hooker* and *Harvey.*
nigrita, *Sond.* Spencer's Gulf, Lefevre's Peninsula.
cancellata, *Harvey.*
frutex, *Harvey.*

DASYA.

Gunniana, *var.* Laurenciana, *Harvey.*
villosa, *Harv., et var.* macroura, *Harv.*
naccarioides, *Harvey.*
elongata, *Sonder.*
wrangelioides, *Harvey.* Fowler's Bay.
hormoclada, *J. Ag.*
*Curdieana, *Harvey.*

SUB-ORDER ZOOSPERMEÆ.

SIPHONACEÆ.

CAULERPA.

remotifolia, *Sond.* Lefevre's Peninsula.
scalpelliformis, *Ag.* Port Lincoln, Guichen Bay, MacDonnell Bay.
abies marina, *J. Ag.*
Sonderi, *F. v. Mueller.* Guichen Bay.
Brownii, *Endl.* (furcifolia, *Harv.*). MacDonnell Bay.
hypnoides, *R. Br.* Fowler's, Guichen, and MacDonnell Bays.
Muelleri, *Sonder.* Rivoli Bay.
sedoides, *Ag.* Guichen Bay, MacDonnell Bay.
simpliciuscula, *Ag.* Rivoli Bay, Lefevre's Peninsula.
cactoides, *Ag.* Holdfast Bay.

CODIUM.

tomentosum, *Ag.*
Muelleri, *Kuetz.* Lefevre's Peninsula.
Bursa, *Ag.* Lefevre's Peninsula.

BRYOPSIS.

plumosa, *Lamourx.*

DASYCLADEÆ.

POLYPHYSA.

Peniculus, *Lamourx.* Port Lincoln.

VALONIACEÆ.

MICRODICTYON.

Agardhianum, *Dec.* Lefevre's Peninsula.

APJOHNIA.

lætivirens, *Harv.* Port Lincoln, MacDonnell Bay.

ULVACEÆ.

PORPHYRA.

laciniata, *Agardh.*

ULVA.

latissima, *Agardh.*
rigida, *Harvey.*
* australis, *Aresch.* Port Adelaide, St. Vincent's Gulf.
lætivirens, *Aresch.*
Lactuca, *L.* Port Adelaide, Rivoli Bay.

ENTEROMORPHA.

compressa, *Greville.*
*clathrata, *Lk.* Lefevre's Peninsula.

CONFERVACEÆ.

CLADOPHORA.

prolifera, *Roth.*
*gossypina, *Keutz.* Port Adelaide.
*Tietkensi, *Sonder.* Denial Bay.

CHÆTOMORPHA.

valida, *Hooker* and *Harvey.*

CONFERVA.

*floccosa, *Kuetz.* Adelaide.

RHIZOGONIUM.

*Muelleri, *Martens.*

ZYGNEMACEÆ.

SPIROGYRA.

*decimina, *Kuetz.* Adelaide.

OSCILLARIACEÆ.

RIVULARIA.

nitida, *Agardh.* Rivoli Bay.

HETERACTIS.

*pruniformis, *Kuetz.* Adelaide.

OSCILLATORIA.

*limosa, *Agardh.* Lefevre's Peninsula.

The Papilionidæ of South Australia.

By J. G. O. Tepper, F.L.S., London; Memb. Bot. Verein, Brandenburg; Corr. Memb.

[Read April 5, 1881.]

Plates II. and III.

In a paper entitled "Insects of South Australia," published in the Transactions of the Royal Society for 1878-9, thirteen genera of Papilionidæ (including *Synemon*) with twenty-six species were mentioned as then known to me. Since then four species of *Hesperilla* have been added, presenting a total of only thirty for so large and varied an area as the Counties of Adelaide, Sturt, Barossa, Light, and Ferguson present; though it is not assumed that there may not exist others in such parts as the author has not visited. Coloured figures of specimens, mostly in my possession (or were so) have been submitted to the Hon. W. McLeay, Sydney, who identified the majority as previously described, but was not certain whether the others were new or not.

The object of this paper is to present as complete a list as I can of the family, with short notes and short descriptions of those deemed new.

The scarcity of Papilionidæ in respect of number of genera and species over so large an area is very striking. The causes are principally two:—The great dryness generally during their season of flight, with occasional severe droughts, by means of which their reproduction is much interfered by; and, destructive bush-fires, which destroy them and their food-plants wholesale over square miles of waste land.

The sombreness of their general coloration is also as remarkable. Brick-red, various shades of brown, white, and black are the most frequently occurring tints among the larger species; yellow (except in one species) and orange appear in patches; blue only in small dots (except in Lycænidæ). The cause for this seems to be that this particular coloration, agreeing with the prevailing tints of their surroundings, affords the insects efficient protection. Thus brick-red and brown tints prevail in those species principally that habitually fly near the ground composed of red clays, &c.,

where they settle when pursued. Frequently I have had to examine the spot carefully for some minutes, upon which one of these butterflies had been seen to settle, before its whereabouts could be discovered. Another instance of such co-relation is, that in the earlier part of the season brighter and duller coloured individuals of the same species appear indiscriminately; but later on, only the latter are about, which seems to prove that they were better protected. The white and black tinted species blend harmoniously with the profuse white clusters of the Eucalypti flowers, which they frequent. The yellow *Terias* and the bluish species of *Cupido* fly chiefly close to the ground, and frequent preferentially flowers of their own hue; for the former several yellow-flowered composits, for the latter the blue *Wahlenbergia gracilis*, *Dampiera rosmarinifolia*, &c., which are very abundant. When resting upon such flowers they are almost wholly concealed by the blending of their colours, and this, no doubt, contributes considerably to their safety from birds, &c. The Papilionidæ occur much more frequently where there is surface-water or moisture in the soil, than where such is not the case. Thus, they are much more abundant in the gullies of wooded ranges than in the dry shrubless plains; and along the sea-coast of Yorke's Peninsula far more are met with than a mile or two inland. In fact, during a walk for miles in the mallee scrub, at the best part of the season, one can scarcely ever catch a glimpse of any. During the hot north-west winds, I have frequently found them collected in numbers in hollow trees, under overhanging stones, or other shady places, which afford them some protection against the fierce blasts—some as lively as ever, some already so weak as scarcely to be able to rise or move, while some actually have succumbed to the heat.

Papilio Erithonius, Cramer.

Ref.—Angas, S. Aust. Illustrated, pl. 37, fig. 1.

This is the largest and one of the rarest of our butterflies. It measures $3\frac{5}{8}$ to $3\frac{3}{4}$ inches in span, is black with a broad yellow band contiguous through the middle of both pairs of wings, a series of yellow spots along their whole margin, two red spots partly surrounded by a blue ring on the opposite sides of the posterior wings, while all the darker parts of both pairs are dotted over with innumerable blue specks, form its principal distinction. It flies usually high, frequenting the flowers of the higher Eucalypts for their nectar, but sometimes descends to lower levels when attracted by the profuse blooming of lower trees and shrubs (*Bursaria spinosa* and *Melaleuca* species). I have captured it in the open glades of the Barossa hills. Reedbeds, near Adelaide (*Angas*).

Pieris Aganippe, Donovan.

Ref.—Insects of New Holland, t. 29, 1805. Prod. Zool. Victoria I., t. 10.

This species occurs in the Barossa hills, often in great numbers in spring and early summer. It seems to be especially attracted by *Myoporum* sp., which grows into tall shrubs near the summits of the hills, over and around which scores have been observed at the same time. I have taken it occasionally on Yorke's Peninsula. Kangaroo Island (*Boisduval*).

Pieris Harpalyce, Donovan.

Pl. III., fig. 4.

Ref.—Ins. New Holl., t. 18, f. 1. Prod. Zool. Vict. I., t. 9.

A species, to which the name is doubtfully applicable, occurs with *P. Aganippe* in the Barossa hills, and has similar habits to it.

Pieris Argenthona, Fabr.

Ref.—Angas, S. Aust. Illus., t. 37, f. 2.

Hab.—Vicinity of the Lakes and the Coorong (*Angas*).

Pieris Teutonia, Fabr.

Ref.—Donovan, Ins. New Holland, t. 17, f. 1.

Has been captured at Nuriootpa, Co. Light, feeding on the flowers of *Eucalyptus odorata*, but is not of frequent occurrence.

Terias Smilax, Donovan.

Pl. III., fig. 7.

Ref.—Ins. New Holl., t. 20, f. 3; Angas, S. Aust. Illust., t. 37, f. 6.

This butterfly is citron yellow, with the tips of the anterior wings dark brown, 1¼ inches in span. The underside is uniformly pale yellow without any other mark. It flies low, and only frequents grassy spots in October and November. It was very numerous years ago near Lyndoch, Co. Adelaide, but rather rare now, and it has been noticed occasionally at Ardrossan, Y.P.

Pyrameis Itea, Fabr.

Ref.—Donovan, Insects New Holl., t. 26, f. 1; Angas, S. Aust. Illust., t. 37, f. 4.

This species has frequently been mistaken for the European "red admiral" by superficial observers. The base of its anterior and the larger part of its posterior wings are dark reddish-brown; a broad light-yellow band nearly crosses the middle of the former, beyond which they are deeply black excepting three small yellow spots. A narrow black band seams the posteriors, margined yellowish-white; near the edge of the brown are four small "eye" spots, with blue in the centre.

The span of the female is $2\frac{3}{16}$ inches; the male is considerably smaller. In the whole it is rare, but on one occasion I saw dozens at Salt Creek, Monarto, Co. Sturt, which forms a rocky gully with permanent waterholes surrounded with rushes (*Scirpus nodosus*). A few have been observed along the sea-coast of Yorke's Peninsula.

Pyrameis Cardui, Linné.
Pl. III., fig. 8.

Junonisa vellida, Fabr.

Ref.—Donovan, Insects N. Holl., t. 25, f. 3; Angas, S. Aust. Illust., t. 37, f. 5.

Xenica Klugii, Guerin.

Ref.—Zool. Voy. Coquille, t. 17, f. 2 (1829).

The last three species are the most numerous of the family, and are found from September to April or May flitting about everywhere, and in all parts of the province that I have visited. Their eggs are glued to stalks of grasses, and are hatched about June or July. It appears that they, in common with other lepidopters, have two hatching seasons in the year, the second being in February and March—at least in those months another flight of them takes place.

Heteronympha Merope, Fabr.

Ref.—Angas, S. Aust. Illust., t. 37, f. 3.

Is the second in size and the highest in colouring of the butterflies in the province. It seems to be rare, and I have not been able to learn anything about its transformation. Its principal colour is a light red or orange, the apical half of the anterior wings velvety-black, with two larger irregular yellow spots near the upper and lower side, and a smaller one in the middle near the margin, which is brown. A waved band of the chief colour, connected by a line along the central nerve with semi-lune joining the inner red field, completes the ornamentation of the first pair of wings. The posterior wings are margined with black; within the red field are three black zigzag lines, and a straight line along the middle nerve. An eye spot is near the middle of the lower edge. The insect has been captured at Lyndoch, Co. Adelaide, and seen at Ardrossan, Co. Ferguson.

Danais Chrysippus, Linné.

Has only been noticed in late years. Dr. Berge says its home is the Ionian Isles and the shores of the Mediterranean. It seems, therefore, to have been introduced, but how? when? and where? Yet undoubtedly it thrives in its new home. Several specimens were caught in my garden at Nuriootpa, Co.

Light. [*D. Erippus*, Cram., an allied species of American origin, is now common about Adelaide, and during the present winter has been noticed at Gawler.—Ed.]

Lycæna discifer, Herr. Schäff.

Pl. II., figs. 14, 15.

Ref.—Stett. Ent. Zeit. 1869, p. 72, t. 4, f. 21.

The two sexes of this species are distinguished by rather dissimilar colours, as are shown by fig. 14 male, and fig. 15 female. It frequents the flowers of low shrubs, &c., and has been observed at Nuriootpa, Co. Light, and at Ardrossan, Yorke's Peninsula, but nowhere numerously.

Cupido bœtica.

Pl. II., fig. 11.

This is one of our commonest species, and occurs in moderate numbers in all parts of the province visited by me. Its principal distinction, besides the pale blue and brownish-grey tint of the upper side of both wings, is a rather long silky appendage to the lower part of the posterior wings, which are also marked by two black spots in a white band near the margin. The most notable markings, on the under side, are a broad white band across both wings, two black eye spots right and left of the base of the appendage, bordered outwardly by a narrow semicircle of metallic blue, inwardly with yellow, and numerous narrow, but distinct, bands to the very base. The male is smaller, and marked less conspicuously than the female.

Cupido agricola, Doubleday et Hew.

Pl. II., fig. 8.

Ref.—Genera Diurnal Lepid., t. 76, f. 4.

Is also found in most localities. Its size is much less than *C. bœtica,* and its colour a uniform dark brown, margined with white and brown alternately.

Cupido œneus, *spec. nov.*

Pl. II., fig. 9.

This is one of the largest species of the genus in the province, and is not less than one and a half inches in span. The basal parts of the upper side of the wings are of a fine changing purplish-blue, the apex of the anterior and the edges of both wings of bright bronze colour ; the margin of the anteriors is black, with white fringe ; the posteriors have the inner corner deeply scalloped, and a small appendage attached, near to which two dark spots occur, edged with white, produced as a white line along the margin ; fringe white. The under side is of delicate tan colour, the margin edged with a fine dark line. Two rows of small white ovals converge slightly from the lower corner near margin. Three other similar rows occupy the space from the inner one mentioned first to the base along medial line. Two small velvety-black spots mark the lower corner near the margin of the under side of the posterior wings, which are also beset with numerous sub-concentric ring-bands similar to those of the anteriors. The male is a little smaller than the female, and its markings somewhat modified. A specimen of one in my possession shows a circular whitish spot on the left anterior wing, only, towards the middle of the margin. This species is also one of the commoner, and has been noticed in the Counties Adelaide and Light. The specific name refers to the colour of the wings.

Cupido simplexa, *spec. nov.*

Pl. II., fig. 10.

Is fully as large as the preceding species, but the blue extends over a larger portion of the wings, the remainder being a greyish-black, and no other marks present superiorly. The under side is of a delicate grey, with scarcely traceable darker tinted oval spots. The anterior wings show a larger and a smaller black spot, with indistinct outlines, near the lower corner. The specimen was captured at Monarto, Co. Sturt, frequenting open bushy parts in early summer. The name is in allusion to the plain colouring of the wings by comparison with *C. œneus*.

Cupido delicata, *spec. nov.*

Pl. II., fig. 12.

This *Cupido* is only slightly above one inch in span, the male even less. A most delicate light purplish-blue overspreads the greatest part of the wings, which are edged narrowly with a light grey; the thorax is bluish-black. The under side of all the wings is light grey, the fringe included, but edged with a fine dark line. A double row of small oval spots, brownish bordered with greyish-white, is near the margin of both pairs of wings, and a faint mark in the centre of the anteriors. Another row of dots, directed obliquely towards inner edge, and traces of a third nearer the base, mark the posterior wings, The male only has a small appendage, and a faint black spot near it. *C. delicata* has been captured at Nuriootpa. The specific name is given in reference to its delicate shading.

Cupido fasciola, *spec. nov.*

Pl. II., fig. 13.

The *C. fasciola* is smaller than the foregoing, and has been obtained from the same locality. The purplish-blue is disposed along the principal nerves, remainder dark bronze. The margin of the wings of the female is fringed with black and white alternately; the lower corner of posteriors is scalloped and marked with three semi-lunar black spots (central one largest), inner edge of same bordered with white. The underside of all the wings is light brown, edged by a sharply defined dark line, succeeded by brown and white zigzag lines; the black spot above is reproduced below. Parallel but disjointed white lines, bordering dark brown spots, form an almost continuous band across both wings; another and similar set is nearer the base, and between them an oval spot of similar tints. The male is smaller and darker in hue, and without the black and white fringe of the female, which latter has the white much more abundantly arranged in patches and bands. The appellation refers to the numerous bands of the underside.

Cupido adamapuncta, *spec. nov.*

Pl. II., fig. 16.

This species is smaller still than the preceding, not quite seven-eighths of an inch in span, and occurs at the same locality. Its colour is a clear bronze brown, traces of the changing blue appearing only near the base of the wings and the upper side of the body; two lighter coloured spots near the outer edge mark the anterior wings, and two round black spots, near the margin at the inner corner, the posteriors. The underside is of a delicate tan colour, two rows of bead-like, brown and white coloured spots form a double band along the margin and a similar coloured bar near the centre mark the anterior wings, while the posterior ones present a succession of four or five similar bands, but fainter in tint. Two small eye spots opposite the black ones on the upper surface, but glittering like diamonds set upon black velvet, are the chief characteristic of this rare insect.

Cupido *(sp. indet.)*

Pl. II., fig. 3.

The Cupido sp., fig. 3, is the smallest in the province known to me, and occurs in the same locality as the former—all along the foot of the Barossa Ranges in bushy parts. It is of a pale blue and blackish-grey superiorly, the wings rather long and narrow. It is not numerous, and frequents flowers of *Bursaria spinosa*, and other shrubs in spring and summer.

Ogyris otanes, Felder.

Pl. III., fig. 1.

Ref.—Reise Novara, Lepidopt. II., p. 217, t. 28, f. 1-3, 1865.

Only the female of this species is represented by fig. 1, t. 3, as the male is of the same general colour and outline, but is about one-third smaller and devoid of the yellow spots on the anterior wings, which, however, in a somewhat modified form, are reproduced on the underside. The underside, beside some convolute markings, presents a metallic blue eye spot, rather irregular. It has been principally captured in the scrubby sandhills, frequenting the flowers of *Bursaria spinosa*, *Calycothrix tetragona*, &c. Individuals closely resembling the males have been occasionally noticed in the scrubs near Ardrossan, Y.P., upon blooming *Melaleuca acuminata*, but as no females have been observed, the species or variety is uncertain.

Hesperilla bifasciata, *spec. nov.*

Pl. II., fig. 4.

This *Hesperilla* is known to me by one specimen only; it was captured near Lyndoch some fifteen years ago, and I have not been able to obtain another. Its colour is a clear brown, with four oval yellow spots near the margin, three near the base, and a semi-lunar one between them near the edge. A double band—the outer white, the inner yellow—margins the posterior wings, and a small round yellow spot is near their base.

Hesperilla trimaculata, *spec. nov.*

Pl. II., fig. 1.

This occurs in open grasslands at Monarto, County Sturt, and is figured from a specimen in my possession captured there. It is of about the same tint as the preceding, but a little larger, being $1\frac{5}{8}$ inches in span. The anterior wings are marked with three small yellow spots (that next the apex sometimes divided) forming a triangle; a narrow black bar from the lower edge upward halfway arross between the lower and the basal spot, and a small round black spot in the same direction as the bar near the upper edge. The underside is of a lighter hue; the innermost spot is reproduced, and so is that at the end of the black bar (next the margin), but extended downwards into a bar; the posterior wings have four white round spots surrounded by black; one, the larger, a little beyond the first-third of the distance from the base, the others a little beyond the middle from thence to the margin. Hairs of underside of body light yellow.

Hesperilla quadrimaculata, *spec. nov.*

Pl. II., fig. 2.

This species occurs at Ardrossan and Yorke Valley, Yorke's Peninsula, and is about the same size as the preceding. Its colour is a uniform blackish-brown, except the central and inner parts of the posterior wings, which are reddish with indistinct edges; three angular light yellow spots in a line equi-distant from the margin, and one at the apex of the central cell, mark the upper side of the anterior wings. The under side is yellowish brown, the spots are reproduced, but that next the apex of the wing only as a minute dot. The posterior wings show three minute round black dots in a line, and encircled by black, a small round silver-white spot nearer the base. The upper part of the body is of the same tint as the wings, but rather darker; the hairs and scales on the underside pale to orange yellow in various shades. It flies in November.

Hesperilla atralba, *spec. nov.*

Pl. II., fig. 5.

This species, which occurs with the foregoing, is considerably smaller than it, and is almost black. Both pairs of wings are edged with a fine white line and fringe, separated by seven black spots in the first pair; the base of same is tinged brown; three rather large angular white spots, lightly tinged with a yellowish shade, are arranged in a semi-circular order, and form almost a band; between these and the apex are two similar ones, touching each other by one corner only. Near the middle of the posterior wings is a rather large oval greenish-yellow spot, and the part of the wings from it to the base is tinged lightly with the same hue. The underside of the anterior wings is also nearly black, the spots reproduced, an orange streak at the base along upper edge, the apex of wings grey, with indistinct darker marks. The underside of posterior wings is uniformly grey, with several transverse rows of faintly darker, irregular, ring-like marks. The upper part of the body is black, the lower grey. It flies low over the ground in grassy open places in the bush in March, and sips the juice of *Dampiera rosmarinifolia* and other low plants. The name is suggested by the coloration of the wings.

Hesperilla lutea, *spec. nov.*

Pl. II., fig. 6.

This is a small butterfly, with an expanse of wing of $1\frac{1}{4}$ inches. The prevailing colour of its upper side is blackish-brown; the narrow fringe is of dirty grey; the body black; the anterior wings show five small yellow spots, four of which are in a line nearly parallel with the margin, the fifth a little within near the upper edge; an indistinct large yellow spot near the middle marks the posterior pair. Underside of anterior wings blackish; the spots reproduced, except that next the apex; edge and apex dark yellow. The latter colour also tints the posterior wings, which have a small silver-white spot near the centre, surrounded by a fine black ring. The underside of the body is whitish-yellow. The figure is that of a male. It was captured in November at Ardrossan.

Hesperilla gracilis, *spec. nov.*

Pl. II., fig. 7.

This *Hesperilla* has been captured near Salisbury, Adelaide Plains, and is the smallest known to me. Its body is slender in proportion to its size; the thorax and head are black, the abdomen also, but the segments edged white. The upper side of the wings is of a uniform dark bronze brown; the anterior wings are marked with a white zigzag band near the margin, and a short white bar near the middle. The posterior wings are without any mark. The colour of the underside is much lighter; the anteriors marked with small white spots, the apical one being the reproduced end of superior band; the posterior wings are margined with black and white spots alternately; five white spots form an outer, one large and four minute ones a central, and one large and two small ones a basal band. The markings of the male are narrower than those of the female.

I append the genus *Synemon*, peculiar to Australia, to the Papilionidæ, although aware that it is placed by eminent entomologists among the Agaristidæ, because it appears to me that in the whole its species present in their appearance (as the venation of wings, the clubbed antennæ, their habit of flight, &c.) more affinity to the former than to the latter, and that the genus is a link that joins the Hesperidæ to the day-flying moths.

Synemon Theresa, Doubleday.

Ref.—Stokes, Discov. Austral. I., p. 517, pl. 3, fig. 6; Angas, S. Aust. Illus., t. 27, fig. 9; Butler, Illus. Lep. Het., p. 6, pl. 3, fig. 5.

Hab.—S. Australia (*Angas*).

Synemon mopsa, Doubleday.

Ref.—Stokes, Discov. Austral. I., p. 518, pl. 3, fig. 7; Butler, Illus. Lep. Het., p. 7, pl. 3, fig. 3.

Hab.—S. Australia (*Brit. Mus.*).

Synemon læta, Walker.

Pl. III., figs. 3*a*, 3*b*.

Ref.—Butler, Illus. Lep. Het., p. 6, pl. 3, fig. 4.

This is the commonest species of the genus, though nowhere numerous. The anterior wings are brown, thickly dotted with white specks, and darker and the markings more variable and indistinct. The posterior wings are black, with deep-red markings, viz., three spots near the margin, a zigzag band nearly across, a large irregular spot near the base. The bars and other markings are reproduced on the underside, but coloured orange, which also speckles the brownish remainder. Examples have been captured or seen at Nuriootpa, Co. Light, Lyndoch, County Adelaide, and Ardrossan, Yorke's Peninsula, and fly low among the grass in November and December. The female measures a little above 1¾ inches in span; the male a little less. The body of the former is much attenuated, and extends beyond the lower edge of the wings; that of the latter is considerably shorter.

Synemon scaria, Felder.

Ref.—Reise Novara, Lepidoptera.

S. scaria is much smaller than *S. læta*, and is known to me in a female alone, taken in November at Ardrossan, Yorke's Peninsula. The upper side of the anterior wings is brown, with mottled whitish bands, enclosing darker spaces; that of the posteriors is scarlet, with an interrupted black band along margin, and two small irregular black spots in the middle; the base of both wings is yellowish-brown. The underside of both is chiefly orange coloured, the darker spots reproduced with indistinct outlines. The apex and fringe is grey.

Synemon obscura, *spec. nov.*

Pl. III., fig. .

This species is distinguished by its general dark colour and obscure markings, especially the reddish spots of the posterior wings. It was captured near Lyndoch, Barossa, County Adelaide.

The illustrations of this and the following species are copies of drawings taken by myself fifteen years ago, of specimens in a collection which has since been scattered. No other examples have come under my observation.

Synemon livida, *spec. nov.*

Pl. III., fig. .

Occurs with the last, from which it is distinguished by its livid grey colour and different markings. Blackish lines along the main nerves and edging the margin, and five spots in a row along same, distinguish the anterior wings; the posteriors present a black line along middle nerve, joining a narrow black transverse band, and between this and the margin four indistinct black dots; all the part below the black band is coloured orange. The figure represents a female.

This concludes the list of Papiloinidæ of South Australia as far as personally examined. Of the larger ones it is very probably exhaustive, but less so of the smaller species, which resemble each other so much superiorly. As it is, I hope the foregoing may be useful as a basis for a monograph of the species of the family inhabiting the province.

Explanation of Plates.

[All the figures are drawn to the natural size, and as viewed from above, excepting figs. 2, 5, 6, and 7, Plate II., which represent the upper and under sides. In the Society's Library copies of vol. iv. of the Transactions, these plates are coloured.]

Plate II.

Fig. 1. *Hesperilla trimaculata.*
Fig. 2. *Hesperilla quadrimaculata.*
Fig. 3. *Cupido* sp.
Fig. 4. *Hesperilla bifasciata.*
Fig. 5. *Hesperilla atralba.*
Fig. 6. *Hesperilla lutea;* a male.
Fig. 7. *Hesperilla gracilis.*
Fig. 8. *Cupido agricola.*
Fig. 9. *Cupido œneus.*
Fig. 10. *Cupido simplexa.*
Fig. 11. *Cupido bœtica.*
Fig. 12. *Cupido delicata.*
Fig. 13. *Cupido fasciola.*
Fig. 14. *Lycæna discifer;* a male.
Fig. 15. *Lycæna discifer;* a female.
Fig. 16. *Cupido adamapuncta.*

Plate III.

Fig. 1. *Ogyris otanes;* a female.
Fig. 2. *Synemon scaria;* a female.
Fig. 3*a*. *Synemon læta;* a female.
Fig. 3*b*. *Synemon læta;* a male.
Fig. 4. *Pieris Harpalyce.*
Fig. 5. *Synemon obscura.*
Fig. 6. *Synemon livida;* a female.
Fig. 7. *Terias Smilax.*
Fig. 8. *Pyrameis Cardui.*

A Sketch of the Geology of the District around Manoora, Hundred of Saddleworth.

By Gavin Scoular, Corr. Member.

[Read April 5, 1881.]

Plate IV.

Superficial Accumulations.

A large reservoir at the Manoora Railway Station presents the following section :—Soil and subsoil, 10 ; clay, with some gravel, 5 ; waterworn pebbles of schist, nodules of iron peroxides, &c., intermixed with clay, 5 ; total, 20 feet.

Mr. F. Lindsay informs me that in a well he dug in these superficial deposits, on section 266, at about fifty yards east from the Railway Reservoir, a plenteous supply of water was struck at a depth of 35 feet, permanently rising in the well to the height of several feet. There can be little doubt but that the superficial deposits, which occupy the valley of the Upper Gilbert, are solely due to sub-aerial action ; and that the retentive properties the gravels have for water may be reasonably ascribed to the decomposition of the immediately subterposed fundamental clay-slates, which in their naturally inexposed position have acquired the character of an impervious clay, and thereby check the downward flow of the water permeating the superficial covering. It, thus, would appear that the collecting and retaining properties of the water-bearing area of the Upper Gilbert are solely confined to a narrow strip of recent deposits flanking the bed of the present water channel, and in no way is the supply of water derived from the fundamental rocks

Why sub-aerial superficial deposits should have become so extensively developed, in many parts, over the fundamental rocks in the valleys of the Upper Wakefield, Gilbert, and Upper Light, is because the flow of water in these streams, is now, and, for a long period past, has been only intermittent. Consequently, vegetation during the non-flowing periods sprang up and occupied every favourable spot in the empty and waterless channels ; and became a partial barrier to the onward passage of the sedimentary material brought down by floods, which otherwise would have been carried onward to the low-lands or out to the bed of the sea. In this way a periodical change in the currents and eddies of the streams would be set up ; one part of the channel would alternately become a natural obstruction to the passage of solid material, until the deposits assume the proportions we now witness.

Fundamental Rocks.

Form of the Ground.—On reference to a map of the Hundred of Saddleworth, it will be seen that the general trend of the River Gilbert through that Hundred is conformable with the direction of the Manoora range of hills on the west and the Steelton range on the east. In the neighbourhood of Manoora, the altitude of these hills is estimated at about 300 feet above the level of the township.

Both ranges owe their present outlines, in a most marked degree, to the nature and character of the fundamental rocks. The crest of the Steelton range, being traversed for many miles by an extensive, hard, and tough band of quartzite, leads me to infer that whilst the less durable clay-slate was removed by denusive agency, the more resistant quartzite better withstood the continuous ordeal of tear and wear.

The Manoora range contains two quartzite bands, which are composed of a fine material and apparently vary in their degree of induration; in consequence of which has arisen, under denusive action, that distinctive feature of the range—that of a confused chain of hummocky knolls. The quartzite bands of the Steelton range, on the other hand, has yielded more regularly to destructive agencies, and in this way has determined relatively greater uniformity of outline, which belongs to this range.

Nature of Strata.—The rocks occupying the western side of the district, at least in the neighbourhood where the sectional line intersects, have been subjected to anticlinal folding. A very fine section of the western limb of this fold, as represented in the quartzite band, is exposed in Kelsh's Quarry (section 310). Here the beds repose at the inclination of 80° to the west, the strike is mag. north. Another quarry has been opened on section 311, and developed to a considerable extent on the eastern member of the fold ; here the inclination of the beds is 85° east, strike also mag. north; estimated thickness of the band in each quarry 200 feet. The prevailing character of stone in both quarries is a fine-grained, slightly micaceous, quartzite; that from the western fold has a bluish-white tinge, whereas that from the eastern is chiefly of a light brown and approaching to pink. Heretofore the quarry situated in the western limb of the anticlinal fold has been most extensively developed, the excavation reaching from fifty to sixty feet in depth. None of the beds, however, present so close and compact a grain as those exhibited in the eastern quarry. Besides a considerable number of the beds approaching the foot and hanging walls of the band have a semi-slaty character and laminated structure, and are quite unsuitable for architectural use.

Another quartzite band is exposed in Lindsay's quarry in section 259, from which a considerable quantity of very fair building stone of a brownish colour has been removed. It is considerably harder in quality than those of the forementioned quarries.

The dip is 60° east, strike 10° west, and estimated thickness is 270 feet.

From this point east across the valley of the River Gilbert, on account of superficial covering no actual rock section is exposed until reaching Brauhn's flagstone quarry in section 43, which is rather over three quarters of a mile south of the line of my cross section. From this quarry a considerable amount of flagging must have been removed, for the excavation is already over thirty yards long by ten or more yards in width, and nearly the same in depth. The rock is of a dark grey colour, and it could be obtained in slabs extending to 150 feet superficial. The flags, though slightly inferior to those from Mintaro, are far superior to those from Willunga. The actual thickness of the beds I could not determine. The foot and hanging walls of the quarry, however, seem to be of as good material as that which is worked. The dip is 70° east, strike 5° west.

Following the line of strike north to the line of cross section, I saw only one natural exposure of clay-slate in a small gully, on the western side of Steelton Range, section 46. It immediately underlies the quartzite band, and though unable to ascertain its true dip, it evidently rests at a high inclination to the east. The flagstone series is at least 150 feet below the quartzite beds, and from the character of the beds here displayed I am led to infer that an intercalation of rubbly clay-slate intervenes between the flag beds and the overlying quartzites.

The quartzite band of the Steelton range is of great proportions where studied by me (sections 46, 39); and, indeed, seems to be extensively developed throughout the entire extent of the range. Though it does not occupy the crest of the range, it is nevertheless exceedingly hard, in places almost approaching the character of true quartz.

East from this point the country is occupied by a continuous series of clay-slate. In a cutting (section 1,001) on the main road leading from Steelton to Waterloo the slate rocks are exposed in an unusually hard and massive state, and have a dip of from 6° to 8° to the east. Thus, in a distance of somewhat less than one and a half miles the inclination of the beds are lowered fully 60°; and, moreover, the bedding has changed from that of a rubbly and ill-defined character to one more massive and regular. Though the slates are here of a hard nature, yet this quality can only be local. In a quarry about one and three-quarters of a mile north, in section 100, Hundred of Waterloo—perhaps on a slightly higher horizon in the series—the slate still retains its massive bedding, but has lost the characteristic hardness it exhibits in the cutting. It may be described as a laminated, comparatively soft, also compact stone, massive bedding, and jointed, producing slabs of great superficial area, and from what I observed from buildings erected of the stone in the neighbourhood, the beds are easily cut transversely into suitable blocks for the artisan. As an instance of these properties, a portion of one of the beds neatly dressed supplies the place of an ordinary lamp-post in front of the inn at Waterloo, which, including the portion in the ground, cannot be less than from 12 to 14 feet in length.

Explanation to Plate IV., Fig. 1.

Cross sectional line about 4° east. On the west nearly intersects south corner of Reserve in section 121, thence intersects Manoora Railway Station in section 266, passing on to the western boundary of the Hundred of Waterloo about four chains south of northern boundary of section 29. Datum line, surface of the ground in the valley of the Gilbert.

Horizontal scale—Three inches to four miles.

Vertical scale—Quarter of an inch to 200 feet.

Notes upon a Boring at Port Wakefield.

By Walter Rutt, Hon. Sec.

[Read December 7, 1880.]

The railway system of which Port Wakefield is the centre requires a large supply of good water for locomotive purposes. The supply from surface wells throughout the district, which extends from Wallaroo to Blyth, is not pure enough, and the dams which have been constructed to catch the surface drainage are unreliable, owing to the uncertain rainfall. From the direction of the dip of the strata of the ranges to the east of St. Vincent's Gulf, and from the position of the plain which forms its northern continuation, it was thought that fresh water would probably be obtained at a depth of 400 or 500 feet; and an 8-inch bore was accordingly commenced on 23rd September, 1879, at the eastern end of the Port Wakefield Station-yard, at a level of about 18 feet above low water of the Gulf. The machinery employed was similar to that frequently used for boring for oil in Pennsylvania, the tools being slung from a cable operated upon by a small engine working a drum. Where the material is hard, it is first pulverized, and then removed by a sand pump—a small quantity of water being kept constantly at the bottom of the hole to facilitate the working of the pump.

After traversing 12 feet of sand and shell, a succession of clay-beds was reached, alternating with layers of limestone and pebbles. At a depth of 34 feet, in one of these limestone beds, the first vein of water was encountered. As might have been expected, it was salt, and rose almost to the surface. At 56 feet, in a 10-foot bed of sand, gravel, and shell, a similar vein of salt water was found. This was followed by 6 feet of red sandy clay, below which was a quicksand, which extended almost without intermission to 211 feet, being a total thickness of 139 feet. As soon as the tool struck the quicksand the salt water rose in five minutes to within 40 feet of the surface. The hole was lined with iron pipes, jointed with screw collars, which were driven down as the bore was deepened; but the force of the water was such as frequently to overcome the pump. Work was stopped one Saturday in the white sand, which extends from 85 feet to 124 feet, and on the following

Monday morning the water was found to have risen 64 feet in the pipe, bringing with it, of course, a large quantity of sand. This was not cleared out until 5 p.m. on Tuesday, when the water rose again immediately to within 40 feet of the surface. From 124 feet to 131 feet there was found a layer of soft black clay, below which, on the 13th October, the quicksand was again met, now tinged brown with decayed wood, pieces of which were brought up in the pump. Upon entering this sand the water rose 50 feet in the pipe. The next day the pipe was cleaned out, but the sand again rose round the tools, which were so firmly jammed that it was found impossible to extricate them without raising the pipe. After two and a half days of unavailing efforts with screwjacks, which gave a lifting power of 84 tons, it was decided to abandon the hole, and to commence another about 2 feet distant from it. The pipes were left in, for fear of disturbing the strata and causing the pipes in the new bore to jam. When the work is completed, the additional necessary power will be applied, and the pipes, if possible, drawn.

On the 7th November a start was made with the new hole. Upon reaching the same depth (131 feet), the black salt water rose 72 feet in the pipe, but by hard work it was kept under, and the pipes driven through 29 feet of the sand into a layer of grey sandy clay containing ironstone. The lower portion of the quicksand was coarser, and also contained large ironstone pebbles in addition to the decayed wood found throughout. On piercing the five feet of grey clay, a fine grey quicksand was met at a depth of 155 feet, extending with slight modification for 50 feet, and containing near the bottom a layer of decayed wood three feet thick. The water in this sand was brown and salt, and rose to the sea level each time that it overcame the pumps. On one occasion it lifted the sand-pump and its contents—weighing 500lbs.—to a considerable height, and span it round as in a whirlpool. Thin layers of clay, ironstone, quicksand, and gravel were next traversed, and at 211 feet the pipes entered a black clay, and the quicksand was conquered after a nine weeks' struggle. Underlying eight feet of this clay was a layer of ironstone and hard black rock, only two feet thick, but sufficient to prevent the farther driving of the eight-inch pipes. Beneath this rock lay nine feet of stiff brown clay, followed by one foot of grey sand, and 29 feet more of the clay. The sand—being enclosed between two impermeable strata—contained a strong vein of very salt water. Then followed 38 feet of white pipeclay, four feet of grey sandstone, and a thin shell of soft brown rock, beneath which were eight feet of very hard blue clay, passing at 310 feet from the surface into hard blue slate.

As 91 feet of the bore were now unlined, and the strong inflow of water from the grey sand was continually choking the hole with sand and clay, it was thought advisable to cease work until a supply of smaller pipes could be obtained, by means of which the lining could be continued to the bottom of the bore. A delay of some months was thus caused, and it was not till the 13th August, 1880, that work was recommenced, when the hole, which had filled up for a height of 80 feet, was again cleaned out, and a lining of $5\frac{5}{8}$in. pipes inserted through the 8in. pipes to the full depth of the bore. From that time to the present date (November 8th) 240 feet of the blue slate have been traversed, and the hole is now down 550 feet from the surface, the lining being carried to a depth of 495 feet, and completely cutting off the water, which at first caused great difficulty in driving the pipes, by choking the tools with clay and rock powder. The blue slate varied in hardness at different depths, the veins of quartz and ironstone with which it was intersected being wanting in places. At 480 feet a strong vein of the saltest water yet met with was encountered. For the last 30 feet there has been an increase in the quantity of quartz, both grey and crystallised, and a small proportion of a mineral supposed to be mundic, and a sample taken from one of the veins shows talc.

So far there is no sign that the expenditure will result in a supply of water suitable for locomotive, or indeed for any other purposes; and the depth at which it was hoped that fresh water would be obtained has already been exceeded. Samples of the borings, which accompany these notes, have been arranged in such a manner as to give a continuous section of the strata to a scale of half an inch to the foot. There is also a separate sample of the slate taken from near its commencement, and another from the lowest portion yet reached.

Postscript.—The bore was afterwards continued through the same rock with veins of white quartz, mundic, and talc. At 650 feet the proportion of quartz began to diminish, and ceased altogether at 705 feet, the rock being much softer. No alteration in the ground being discovered at 765 feet, the hole was abandoned.—W. R., Feb. 4, 1881.

Statement of Strata traversed by the Boring at Port Wakefield.

Depth in feet below Surface. From	To	Nature of Strata.	Remarks.
1	12	Grey sand and shell	
12	17	Red clay	
17	22	Yellow clay and pebbles	
22	27	Limestone and pebbles	
27	32	Pipeclay	
32	34	Red clay	
34	37	Limestone and pebbles	Heavy vein of salt water rising almost to surface
37	43	Red clay and pebbles	
43	46	Orange-coloured clay	
46	56	Yellow clay, gravel, and shell	
56	66	Sand, gravel, and shell	Heavy vein of salt water
66	72	Red sandy clay	
72	85	Yellow quicksand	Salt water rose within 40 ft. of surface
85	124	White quicksand	
124	131	Soft black clay	
131	140	Brown quicksand with much decayed wood	Black salt water rose to 60 ft. from surface
140	150	Coarse grey quicksand with large ironstone pebbles and decayed wood	
150	155	Grey sandy clay with ironstone	
155	192	Fine grey quicksand	Brown salt water rising to sea level
192	195	Decayed wood	
195	198	White quicksand	
198	205	Grey quicksand	
205	207	Black clay	
207	207¼	Ironstone	
207¼	210	Quicksand, grey	
210	211	Black sand and coarse gravel	
211	219	Black clay	
219	221	Ironstone and hard black rock	
221	230	Stiff brown clay	
230	231	Grey sand	Strong vein of salt water
231	260	Brown clay	
260	298	White pipeclay	
298	302	Grey sandstone	
302		A thin layer of soft brown rock	
302	310	Blue clay, very hard	
310	520	Hard blue slate with veins of quartz and ironstone	Varies in hardness, and in places the quartz and ironstone are wanting. A heavy run of very salt water was struck at 480 feet.
520	550	As above, with more quartz, grey and crystallised, and mundic	
550	705	As above, with quartz, mundic, and mica	
705	765	As above, but softer, and no quartz	

The Geology about Port Wakefield.

By Professor R. Tate, F.G.S., &c.

[Read July 4, 1881.]

Plate IV.

Having critically inspected the rock specimens obtained from the Port Wakefield bore, and having geologically examined the country in its vicinity, I venture to submit the subjoined notes on the correlation of the strata passed through in the sinking, and a geological section, generalising the stratigraphical phenomena, as a supplement to Mr. Rutt's account of the Port Wakefield sinking—one of the deepest which has yet been attained in this colony.

The site of the bore is on the south-east edge of an extensive salt marsh, having a general level of about 16 feet above low-water mark at Port Wakefield. Profusely strewn over the surface of the marsh are the common species of shells of our existing mud-flats, such as *Ampullarina Quoyana*, *Risella tæniata*, *Tellina deltoidalis*, &c. More decidedly marine species occur abundantly at lower depths, even in the shallow excavations made for drainage purposes. Above the edge of this elevated marine bed there is, at about one-quarter of a mile to the east of Port Wakefield, a fine example of an old beach, excavated to some six and eight feet in depth for ballast, which is highly charged with *Arca trapezia*, the valves often in apposition. Similar "Recent Marine Deposits" occur at various points on our shore line. (See Trans. Phil. Soc., II., p. lxviii. *et seq.*, 114.)

From the level of the salt marsh, there extends landward a gently inclined plain composed of red loam, which gives place to gravels, more or less angular, at the upper limit of the formation, at about 250 to 300 feet, where they abut against the flanks of scarped hilly ground. These beds, as seen at the surface, are identical with those constituting the Adelaide Plain, and to which I have applied the term "Pliocene Drift."

The rocks of the hilly ground of the Hummocks Range, as exposed in the line of railway between the South Hummocks and Kulpara Stations, are composed of mudstones, quartzites, and felspathic sandstones, the former chiefly constituting the main mass of the middle part of the series. They have a dip of about 40°, bearing a little south of true east.

The strata passed through in the Port Wakefield sinking I refer to:—

	THICKNESS IN FEET.
1. "Recent Marine," chiefly sands, containing sea shells of existing species to a depth of	66
2. "Pliocene Drift." Judging from lithological features, the upper 164 feet undoubtedly belong here. The underlying 100 feet, however, which consist of clays and carbonaceous muds, have no parallel in the more superficial deposits of the Pliocene Drift, to which our knowledge is limited. But in the absence of palæontological evidence to the contrary, they must be relegated to that period; though they have a strong resemblance to certain fluviatile Miocene deposits, which they may well do, as they were probably accumulated under similar conditions	264
3. "Pre-Silurian." Clay-slates, more or less micaceous, throughout to	435
Total ...	765

EXPLANATIONS TO SECTION, PLATE IV., FIG. 2.

The surface line represents the chief gradients on the railway, and therefore omits the minor undulations.

The section is in the line of true dip, bearing 8° S. of east. It traverses the cutting at the $11\frac{1}{2}$ milepost, and crosses the railway on the marsh at the fifth milepost from Port Wakefield. The horizontal scale is one inch to one mile, and the vertical one inch to 400 feet.

The horizontal distance between the extreme outcrops of the Pre-Silurian is $1\frac{1}{4}$ miles, and therefore with an average dip of 40° represents a vertical thickness of 3429·6 feet.

The lowest stratum exposed is a micaceous sandstone; then in the cutting at $13\frac{3}{4}$ miles there are thin-bedded quartzites, and coarse and fine-grained felspathic grits. Thence most of the section is occupied with mudstones—*i.e.*, argillaceous rock showing no lamination, exceedingly tough, but on exposure breaking up into cuboidal pieces. These mudstones have occasionally intercalated among them thin bands of quartzites and hard sandstones.

The uppermost stratum is a flinty quartzite, bedded and strongly jointed, having a thickness of 660 feet. It constitutes the flank of the Hummocks Range, and occupies the whole east front of the hill of the South Hummocks.

Passing over the summit level of the railway line, the Pre-Silurian rocks are hidden by a covering of loam, having a travertine crust, and no other rock exposures are seen for the rest of the distance to Wallaroo.

Further Observations on the Propagation of Cymodocea Antarctica.

By J. G. O. Tepper, F.L.S., London; Memb. Bot. Verein, Brandenburg; Corr. Memb.

[Read August 2, 1881.]

Plate V.

In a former paper read before the Society in November, 1880 (*vide* p. 1), I had the honour to describe the mature state of the above plant when commencing independent existence; also how and where the roots are formed. I also stated my conjectures regarding previous processes, not observed then, in so far that no real free seed was formed, but the seed as soon as formed germinated and grew into a plant attached to the two unsymmetrical pairs of basket-like spines, acting as a grappling apparatus to anchor the infant plant firmly till its roots appeared.

These conjectures, I am happy to say, appear by my recent observations to be verified.

In the early part of June, after a storm, detached young plants were for the first time in the season discovered among the weeds thrown up on the beach, and, after careful search, some few adhering to branchlets. At the end of the month hundreds of specimens had been found, and one specimen among them bearing two branchlets with what I presumed to be the sperm-tubes, or male organs.

The female buds develop before June at the apex of a branchlet concealed by its apical leaves, which at a later stage fall off. All parts of the flower seem to be persistent, and form the fruit unaltered. It comprises a peduncular joint of the average length of those forming the branch, but a little compressed in the same direction as the leaves. Where joined to the likewise compressed calyx, a double pair of bracts with cut margins is attached, which become dark-brown towards ripeness. The long diameter of the calyx is about one-eighth to three-sixteenths of an inch, while transversely it is only about half that, the former parallel to the width of the leaves. The very short free bracts adhere closely to the stiff green sepals, for as such I interpret the double pair of unsymmetrical thick leaves containing the previously described basket-like spines. The latter are exposed through the decay of the covering membrane. When fresh they are of the same green colour as the leaves, but become brown after death. A large and a small sepal face the surface of the opposite leaves, so that both the large ones are on one open side, and both the small ones on the other.

The next tier is occupied by four or five short conically blunt brownish processes. Two pairs are ranged on one side, occupying about one-third of the circumference, while the fifth single one stands opposite, and is mostly rudimentary. May they be considered as rudimentary filaments?

Immediately above the fifth process is situated a dark brown scale, investing about two-thirds of the central stalk; the edges delicately serrated or fringed, and a little larger than the processes opposite to the side left open by it. This seems to occupy the place of the petals or the floral scale of grasses.

From the centre rises the thin, rather soft stalk of the infant plant with the *axis of the leaves at right angles to that of the bearing* branchlet. The first and second joint are each occupied in very young specimens by a small scale-like leaf, seen in somewhat older ones to develop into lateral branches. Sometimes two appear on each joint. This is repeated at the summit near the growing bud, while one or two leaves quickly attain to their full size near the base.

When the calyx and bracts are carefully removed from the upper portion, a convex area of oval shape and light tint appears attached to the latter. In the centre, attached by an attenuated neck, depends a minute body of subovoid or kidney shape and bright yellow colour. This appears to me to be the real germ-nucleus, the representant of the seed in other plants, while the convex part above may be the lid of the ovary. Both these become absorbed at maturity, leaving an oval concave depression in the base of the superior detached part.

Removing the sepals, we find the part occupied by them and the other floral appendices much thickened, indicating the place where the future roots appear. In most cases the stalk of the immature young plant is very thin and soft, but specimens occur in which it attains a diameter equal to the full width of the leaves, and subquadrangular in shape.

Generally only one flower is borne by a branchlet, but in one instance two were developed as twins with separate peduncles. Mostly only one to three flowers were found on each large branch, while all the remainder were sterile; but in some cases six to ten occurred. The calyx-joint withers at once after the upper portion is detached, and drops off, leaving the bare branchlets without an indication of fruit.

The male flowers seem much more perishable, and therefore rarely cast up; Baron v. Mueller mentions that he had only seen one specimen. What I take for the male organs are spiral tubes as thick as a stout pin, about three-quarters to one inch long, and twisted spirally. They appear in pairs in the axils of very young leaves near the top of the plant, end in a blunt, conical point, and light brown in colour. When old they drop off, leaving black scars on the joint. The leaves of the branches on which they occur are much narrower and shorter than those of female or sterile branchlets. Only one specimen with two branchlets with them, but many sterile ones, has yet been found. P.S.—A fair number have been obtained, but are scarce in proportion to the female flowers.—Oct. 6.

Explanation to Plate V.

Fig. 1. Female flower with germ-plant, showing the flat side of flower and in the same plane as the leaves. *a.* Peduncular joint. *b.* Calyx (?) and bracts. *c.* Adjoining pair of large sepals (?). *d.* Small do. do. *e.* First, scale-like, pair of leaves. *f.* Young and immature part of young plant.

Fig. 2. Same; a more mature plant; transverse aspect. *a.* Apical leaves of mother branchlet, showing that the seedling is at right angles to its bearer. *b.* Mature form of leaf.

Fig. 3. Same; young plant detached from base "*c*," to show "*a*" the sub-ovoid germ or seed. *b.* Lid of ovary (?) or base style. *a* and *b* are absorbed before the young plant is detached. 1, 2, 3, nat. size.

Fig. 4. Same; enlarged. *a.* Germ nucleus, or remains of seed. *b.* Part from which the roots spring when detached after attaining maturity, to show which the sepals have been removed. *c.* Rudimentary filaments or styles. *d.* Floral scale (?). *e.* Young and rudimentary branchlets.

Fig. 5*a*. Branchlet showing (presumed) male organs, nat. size. 5*b*. Part of same enlarged. *a.* Scars of old sperm-tubes, generally in pairs. *b.* and *c.* Exhausted and broken tubes, proceeding in pairs from joints, and the axils of leaves. *d.* Mature sperm tube of spiral form. *e.* Budding do. 5*b* is the *reverse* aspect of the branchlet in 5*a*.

Mineralogical Notes from the Laboratory of the Wallaroo Smelting Works.

By T. C. Cloud, Assoc. Roy. School of Mines, F.C.S., F.I.C., Corr. Memb.

[Read September 6, 1881.]

In the course of my labours in connection with the preparation of a catalogue of South Australian minerals, I have found it necessary to submit certain specimens to a chemical examination, and in some instances to make a complete quantitative analysis. I have also in the course of my duties in the Laboratory of the Wallaroo Smelting Works been called upon from time to time to analyse minerals found in this colony and from other localities. As it will be some time yet before the catalogue of South Australian minerals is ready, I have thought it would not be uninteresting to the fellows of the Royal Society if the following notes were submitted at the present time. And I may be allowed to express the hope that by so doing I may obtain further assistance and matter for the catalogue. No particular order will be followed in these notes, but I shall select them as they occur in my note-book. One of the first South Australian minerals, which I had occasion to examine was

Atacamite.

This mineral is known to occur in three states of hydration containing in round numbers 12, 17, and 22 per cent. of water. I incline to the opinion that two if not all of these varieties occur in this colony; indeed, I believe I have them all in my collection, but want of time and opportunity has prevented me from establishing this fact for certain. As an example, however, of the first-named variety, I may instance the atacamite which occurs frequently in the mines on Yorke's Peninsula, and which was represented by unique specimens from the New Cornwall Mine. The form generally assumed by the mineral in this locality is that of the combination of the rhombic prism with the pyramid. In some instances the prism is very short or is entirely wanting, and it becomes difficult to distinguish the pyramid from an octahedron. The specimen employed for the analysis, the result of which is given below, was obtained from the Wallaroo Mine. The crystals were about ¼ inch long.

The analysis of this specimen yielded the following results (I), and for the sake of comparison I subjoin (II) the analysis of a specimen from Chili as quoted by Dana:—

	I.	II.
Copper	13·73	14·54
Chlorine	15·38	16.33
Cupric oxide	55·91	55·94
Water	13·51*	12·96
Insoluble silicious residue ...	1·47	·08
	100·0	99·85

* The water in this instance was obtained by difference.

Pistomesite.

This mineral occurs in large quantities at the Balhannah Mine, the waste tip being for the most part formed of it. When first obtained this mineral is of a yellowish-grey colour, but on exposure it assumes a bronze-coloured coating.

A preliminary examination showed that the mineral consisted of magnesic and ferrous and manganous carbonates, and at first I was inclined to think that it was Breunnerite, a ferriferous variety of Magnesite. A complete quantitative analysis showed, however, that the mineral had the composition of Pistomesite, with which it also agrees in its physical properties. The specimen for examination was selected from the centre of a large mass, and was free from the incrustation referred to above. The result of the analysis was as follows (I), No. II being the analysis of a specimen from Thurnburg quoted by Dana:—

	I.	II.
Ferrous oxide ...	33·31	33·92
Magnesia	20·66	21·72
Manganous oxide ...	3·49	—
Carbonic acid	42·52	43·62
	99·98	99·26

The hardness of the Balhannah specimen was 3·5, and the specific gravity 3·5, that of the Thurnburg specimen is given at 3·4.

Siderite.

The specimen examined was obtained from the Karkulto Mine; it was in the form of a largely crystalline mass, of a brownish-grey colour. Hardness 3·5, and specific gravity 3·9.

The analysis of this specimen yielded the following results (I). No. II, introduced for the sake of comparison, is the composition of a specimen from Mitterberg, Tyrol, quoted from Dana:—

	I.	II.
Ferrous oxide	51·75	51·15
Manganous oxide ...	1·56	1·62
Magnesia	7·31	7·72
Carbonic acid	39·38*	39·51
	100·00	100·00

* Obtained by difference.

The composition of the mineral as given above is represented by the formula 4 $FeCO_3 + MgCO_3$. From the composition of this specimen, and from that of others which have from time to time passed through my hands, it would appear that the siderite of this colony is chiefly of the magnesian variety.

Biotite.

This mineral is of very common occurrence in the Yorke's Peninsula Mines, the most notable being the Yelta Mine, where it occurs in large masses. I have not met with it in distinct crystals, but only in massive aggregations of cleavable scales. The colour is generally dark green to nearly black; thin laminæ are green by transmitted light.

The specimen selected for analysis was from the Yelta Mine. It had a specific gravity of 2·9.

The result of the analysis was as follows:—

	Dried at 100° C.
Silica	40·28
Alumina	11·30
Ferric oxide	5·24
Ferrous oxide	11·65
Magnesia	17·38
Lime	·82
Manganous oxide ...	·30
Potass	8·56
Soda	1·64
Water	1·95
Fluorine	trace
	99·12

Clay.

The following analysis is that of a specimen of clay obtained from Teatree Gully. It was pure white, free from stains of oxide of iron, and contained no coarsely intermixed foreign matter.

The analysis was made on the sample dried at 100° C. :—

Silica	55·32
Alumina	28·67
Magnesia	0·72
Lime	1·39
Ferric oxide...	1.31
Titanic acid	1·62
Alkalies, calculated as potass ...	1·48
Loss on ignition, chiefly water ...	9·95
	100·46

The alkalies consisted chiefly of potass, but contained also a little soda.

Experiments made with this clay proved it to be admirably adapted to the manufacture of firebricks. Indeed, the experimental bricks made with it resisted a high temperature better than the imported Stourbridge or Newcastle bricks.

Chalcopyrite

From the Moonta Mine. Massive specimens of the mineral, with iridescent tarnish "Peacock copper ore," and the untarnished form, have been examined, but, as the results prove, both specimens have the same composition, viz., that represented by the formula Cu_2S, FeS_2, FeS.

No. I. is the analysis of the untarnished form, and No. II. that of the "Peacock ore." No. III. shows the theoretical composition of copper pyrites, deduced from the formula given above.

The samples for analysis were broken up into small pieces, and portions containing any particles of gangue rejected.

	I.	II.	III.
Copper	34·21	34·04	34·57
Iron	30·65	31·14	30·53
Sulphur	35·16	34·34	34·90
Insoluble silicious residue	0·50	0·63	—
	100·52	100·15	100·00

Bornite.

The composition of this mineral from different localities varies somewhat—in some cases the proportion of copper to iron is as high as 12 to 1, while in others it is as low as 3 to 1. The specimen examined was from the Moonta Mine. It was broken up small and carefully picked over, in order to exclude any small portions of gangue, but, in consequence of the intimate admixture of quartz (the gangue in this instance), the separation was not so perfect as could have been desired.

The result of the analysis, given under I. and II., shows the composition of the specimen after deducting the insoluble residue, and No. III. is the percentage composition calculated from the formula 9 Cu_2 S + 2 (FeS_2, FeS), and from these it will be seen that the above formula represents the composition of the Moonta Mine mineral:—

	I.	II.	III.
Copper ...	59·84	62·00	61·87
Iron ...	11·73	12·15	12·13
Sulphur ...	24·95	25·85	26·00
Quartz ...	4·03	—	—
	100·55	100·00	100·00

Analysis of a Quartz Rock from Broughton Extension.

This rock occurs in pieces of all sizes scattered over the hill-side at the above named place, and the analysis was made with the view of comparing its composition with that of the so-called Dinas clay of the Vale of Neath, Wales, which in appearance it very much resembles.

No. I. is the analysis of the rock in question, and No. II. shows the composition of the Dinas clay as given by Percy:—

	I.	II.
Silica	96·78	96·73
Alumina	1·69	1·39
Ferrous oxide ...	0·92	0·48
Lime	0·23	0·19
Potass and Soda ...	0·45	0·20
Water combined ...	0·59	0·50
	100·66	99.49

It will be seen from the above analysis that in all essential respects this rock corresponds in constitution with that of the Dinas clay.

Analysis of a Boiler Deposit.

In connection with mineralogical chemistry the question of the composition of the mine water of this district is of considerable interest. It is probably within the knowledge of the fellows of this Society that the water which finds its way into the mines on Yorke's Peninsula is salt, and even at the lowest depths this character of the water still holds good. I have not had occasion to make an examination of the water, but, as bearing upon the subject, I subjoin the result of the analysis of a boiler deposit obtained from one of the boilers on the Wallaroo mine, which was fed with the water pumped from the mine. As I received it the deposit was in the form of a fine powder, of a light pinkish colour, having a greasy feel between the fingers.

Lime	19·19
Magnesia	13·70
Sulphuric acid	45·39
Ferric oxide	8·30
Silica	1·98
Water and trace of carbonic acid ...	5.36
Alumina	1·07
Chlorine	2·61
Cupric oxide	·69
Alkalies calculated as soda	·99
	99·28

I have now to record a few minerals which have lately come under my notice, and which I believe have not hitherto been recognised as occurring in South Australia.

Apatite.

This mineral occurs at the Wallaroo Mine, where it was mistaken for fluorite, and I have also met with it amongst the copper ore from the Kurilla Mine. A specimen obtained from the Wallaroo Mine about one inch diameter was of the characteristic sea-green colour, and exhibited the planes of the hexagonal prism; the greater portion of the pyramidal planes were, however, destroyed. Specimens from the Kurilla Mine were in the form of isolated crystals embedded in yellow copper ore; the crystals were of a greenish-grey colour, exhibiting the planes of the hexagonal prism and pyramid, together with the terminal plane of the former. These crystals were about a quarter of an inch long. The chemical, blowpipe, and physical characters were those characteristic of the mineral apatite.

Rutile, oxide of Titanium.

This mineral occurs in fair-sized crystals at the following localities:—Lyndoch, Collingrove, Tanunda Creek, and Mount Crawford. The specimens examined from Mount Crawford, Lyndoch, and Collingrove were in the form of well-defined crystals. The mineral obtained from Tanunda Creek is in the form of small more or less rounded fragments in a quartz sand, and was obtained from the side of the creek. I am indebted to Messrs. Warren, Marshall, and Tepper for specimens of the above-mentioned mineral.

Ullmannite.

A double sulphide of antimony and nickel. Specimens of this mineral have been received from the interior of the colony.

For obvious reasons I am not at present allowed to name the precise locality. The mineral was subjected to a thorough examination both chemical and physical, and there can be no doubt of its identity. Since it contains about 25 per cent. of nickel it will doubtless prove of considerable commercial value.

Celestine, Strontium sulphate.

I have obtained this mineral in the form of small crystalline nodules from a clay deposit near Wallaroo.

Chalcotrichite.

This somewhat unusual form of cuprite has been met with in a specimen from this colony (the exact locality is unknown). The mineral occurs in groups of small acicular crystals with native copper.

Several other minerals are in course of being examined, and when completed the results will be communicated to this Society, but I regret very much that this interesting work is delayed in consequence of my having so little spare time to devote to the subject. That considerable advantage would accrue to the colony generally by the examination of the various minerals which abound there can be no doubt, and I trust that the time is not far distant when this work will be undertaken, not as at present by one or two persons who have only a few spare hours to devote to the work, but by a competent mineralogical chemist who can devote his whole time and energy to the duty.

The Destructive Potato Moth.*

By J. G. O. Tepper, F.L.S., Corr. Memb.

[Read March 1, 1881.]

Some thirty years ago, when practically connected with farming, I observed that during the first years the potato tubers kept well, and the loss through rotting was but trifling. But after that a change took place, and putridity attacked them in an unusual degree, and even many of those that appeared healthy were found, to the astonishment of the persons concerned, when brought to the test, to contain a number of small caterpillars living in tortuous galleries tunnelled out by them. These, which were only marked on the exterior by small rough projections scarcely discernible to sight or touch, eventually became putrid and affected all the adjoining tubers, thus causing in a comparatively short time the destruction of a large proportion. These remarks are intended to show that the pest I refer to was little known at first, and that it was either introduced, or that the culture of the potato plant supplied some previously scarce native insect with such abundance of food as to produce its excessive increase. As far as my continued observation goes, the same insect designated above as the "Destructive Potato Moth," causes now, in its immature form of the caterpillar or grub, the destruction of hundreds of tons of potatoes every year by boring them, and thereby inducing putridity. During late years I have scarcely ever been able to get half a dozen pounds without finding a considerable percentage more or less affected in this way. Unless proper means are adopted to check this growing evil, the chances are that potato cultivation will suffer so much as to become unremunerative, and therefore more and more restricted in area.

As the first step in attempting to combat effectually an existing evil is to learn as much about it as possible by close observation, I was resolved to do as much in this instance as circumstances would permit, and the following remarks will show the results obtained :—

* Specimens submitted to Mr. Meyrick, M.A., of Sydney, were named by him *Lita solanella*, Boisduval—the insect which formed the subject of a paper in Lin. Soc., N.S.W., IV., p. 112, 1879.—Edit.

A small quantity of potatoes (about ¼ cwt.) having been purchased on October 10, 1880, apparently of that year's growth, and healthy looking, it was noticed on close scrutiny that several tubers presented to the touch and sight the minute ominous roughness and blackish spots. In a week or two a large proportion was found to be full of small grubs, and the last few had to be thrown away as utterly unfit for food. On the 27th November four small tubers were taken at random from this refuse—all affected tubers having been carefully removed from the stock as soon as noticed—and enclosed in a box with a glass lid, allowing free circulation of air, yet preventing escape of any but very small insects indeed. They were inspected at least twice daily, and on the morning of December 4 the first caterpillars were noticed to have attained maturity, thus requiring a minimum period of about forty-five to forty-eight days for their development. The caterpillar is then about half an inch in length—rather more than less—and not one-tenth inch diameter in its thickest part, viz., near the middle, whence it tapers both ways. The posterior extremity ends in a point, and the whole body presents eleven segments. The head is dusky, with strong, black mandibles; the remainder is of a dirty greenish-grey above. Most, or all, of the segments are marked with a very faint narrow pink transverse bar; the underside is faint pinkish-grey. Having quitted their galleries, they spun themselves immediately a kind of cocoon formed in the angles of the box. The dirty-grey silk forms a slanting roof over the chrysalis, is very closely and firmly woven, and about half an inch long by one-eighth wide. Each one forms a separate cover, but many may join like the links of a chain endwise. The chrysalis is very small, and scarcely differs, if at all, from that of other *Tineadæ*.

On the 22nd December the first imago presented itself, and next day five more appeared; thus about sixteen to seventeen days are required for this stage. In the meantime fresh cocoons continued to be found almost daily, and since the first appearance of the moths, their production continued with such frequency that at the end of January, 1881, several scores had been obtained. This may be explained by the fact that those left in the box paired and deposited their eggs in the now putrid externally shrivelled and dry lumps, whence fresh larvæ are constantly being hatched; and this, it seems, continues as long as they find the least moisture within. This fact proves that the insect thrives not only in fresh, but also in putrid tubers, and that therefore any refuse heaps of them, left undestroyed, act as a hotbed of propagation.

The moth is very insignificant in size, and a strict nightflyer. Although great numbers must exist, to judge by the ravages committed by the caterpillar, yet I had not observed it previously, and my large collection contained no specimens till the present inquiry was taken up.

Its length of body is about six millimetres, the span of the wings is 15·5 m.m. for the female ; the male is a trifle smaller.

The colour of the whole insect is a brownish-grey, in various shades ; the face of the head is almost white ; the eyes large, dark brown or black ; the maxillæ are very large in proportion, being longer than the head, the middle joint of the three being beset with close hairs like a brush ; the antennæ are very long and slender, equalling nearly in length that of the whole body ; the joints very numerous and small, in the upper part showing a minute spinous projection. The anterior wings are straight, narrow, rounded at the end. The inner margin near the base is smooth for about three-fifths of the length, the last two-fifths furnished with long fringing hairs, longest inferiorly ; the colour in the female is light brownish-grey, mottled with very minute black and white specks, forming very indistinct bars. The colour of the anterior wings of the male is a rather clearer brown, the black mottlings forming a semicircle along the inner margin, and a kind of a very small eyespot at the very end.

The posterior wings of both sexes are perfectly alike, the membranous portion being of about the same width as the former, but about one-fourth less in length ; colour brilliant silvery bluish-white ; this is fringed from the extremity to the base posteriorly with long silky brownish hairs, exceeding in length at the widest part the width of wing considerably, and so arranged as to form a semicircle. The three pairs of legs are all unequal ; the first pair are the shortest, and not armed with spines, or very minute ones only ; the last pair is the longest, exceeding the length of the body considerably, the shank or tibia armed with four strong spines below, and set with long, close, stiff hairs above ; the medial legs are intermediate in size, the spines reduced and the hairs wanting ; the colour of the legs is nearly white, dotted sparingly with brown and black ; the claws very minute. The same colour prevails over all the underside of the abdomen ; the upper is darker than the rest, a tuft of light orange hue at the extremity of that of the female distinguishes the sex easily. Whether the moths take any food I have not been able to ascertain, but it seems so, as they continued alive in the breeding box for two to three weeks before dying. In that case they must partake of the same food as their immature progeny.

That these moths occur in other situations less confined than the entomologist's hatching case was gleaned latterly from the information a farmer gave me when speaking about the subject.

He said he had several bags of potatoes of his own production, and quite healthy when dug, placed in his storeroom, where they were left undisturbed for a considerable time. When he at last came to open a bag for use, lo! quite a swarm of little moths greeted the event, and to his surprise he found the tubers spoiled by the grubs to a great extent.

My opinion is that the eggs are first deposited by the moths upon the stalk near the ground, when the infant grub burrows through the soil till reaching the tubers; or the moth itself burrows, as many are found to do, and deposits the eggs direct upon the tubers. My reason for this is the fact that the longer the tubers are left in the soil, the more infected they will prove to be. They ought therefore to be unearthed as soon as possible after ripeness. Then they should be washed clean (perhaps in saltwater, or, if only for consumption, a weak solution of sulphuric acid would be better), and stored in store-rooms without large cracks in floor and walls or strewn litter of any sort, for in and among these the chrysalis-state is passed. If such a one is wanting, deal boxes or tin cases would do as well for smaller quantities, instead of bags. While in store they ought to be frequently stirred, and the walls, &c., carefully swept, as by these operations the chrysalis cases would be disturbed and the insects destroyed. Rotten and affected tubers ought to be separated from the rest at once and destroyed (burying does *not* do), either by *boiling* them for the pigs, burning, or throwing them into water. By simply throwing them on the rubbish heap, the evil is not checked, but, on the contrary, aggravated, as my experiments show, and is only forming a moth-hatching establishment, from whence millions of moths arise and spread over the adjoining regions; for increase of numbers in insect life of this sort means augmented security for propagation and multiplication.

If an enterprising chemist could devise a cheap and efficient solution, in which the newly-dug potatoes might be immersed and washed, that would effectively destroy the adherent ova and infant caterpillars buried only skin-deep, without impairing the quality of the tubers or their germinating powers, a benefit would be conferred upon the community, the value of which could hardly be over-estimated.

Sketch of a Geological and Physical History of Hundred Cunningham

and Neighbouring Regions.

[Abridged.]

By J. G. Otto Tepper, F.L.S., Corr. Mem.

[Read May 3, 1881.]

The Palæozoic rocks forming the bulk of the South Australian mountain ranges, and consisting principally of divers hornblende and mica schists, clayslates, quartzites, and marbles, have been—and still are to a great extent—a puzzle to geologists as to their correct position among geological formations. This much, indeed, has been ascertained of late—1. That they form one great system of alternating (or interchanging) layers of immense thickness; and 2. That this system is certainly of Pre-Silurian age, true Silurian rocks—as determined by the critical examination of Professor Tate, F.G.S.—having been found by me overlying them near Ardrossan, Y.P.

Having resided for many years among these Pre-Silurian rocks, and examined quarries, wells, mines, &c., where and whenever opportunities offered, the impression has grown strongly upon my mind (especially since studying Dawson's "Dawn of Life," and other works,) that they will ultimately be proved to be Huronian or Laurentian, the description of the non-fossiliferous Canadian rocks seemingly agreeing very well with the general characteristics of ours. Mr. Scoular, in a very interesting paper on the "Geology of Munno Para" (Trans. Royal Soc., S.A., 1879-80, vol. III.), has treated their general aspects so well, that it only need be mentioned here that they generally exhibit very high angles of dip, denoting enormous *foliation* by lateral pressure, as noted also in the Canadian rocks. My own observations have been principally made in the neighbourhood of the Barossa Ranges about Lyndoch, Tanunda, Angaston, &c., but embrace also more distant localities. Almost everywhere their anticlines have been extensively removed by erosion, while, in most instances, the synclines are buried deeply below later deposits. One of the latter, however, is visible in the bank of the creek at

Daveyston, nearly opposite the hotel, where a small quarry of clayslate has been opened for building material. Though ever on the *qui vive* for fossils, or indications of such, yet my search has never been successful in bringing any undoubtable ones to light, except what appear to be impressions of fucoids preserved in ferruginous oxide, in some quartzites.

In the paper on the "Rocks and Cliffs about Ardrossan" (Trans. Roy. Soc., vol. II., 1878-9), I treated the hornblende and mica schists, quartzites, and marbles, under the term Primary Rocks. Familiarised as I am with the varying appearances of similar rocks, subsequent examinations have confirmed the opinion that the first three really are identical with similar rocks on the mainland, and belong to the same formation, together with a gneiss in the Yorke Valley Hills, and a coarse conglomerate and arenaceous shale on their easterly spurs. But the last, viz., the Ardrossan marbles, are scarcely so, but seem to be the lowest part of the Silurian formation, on account of their conforming mode of stratification and deposition. Though they have not yielded any fossils, yet the fossiliferous "Parara limestones, &c.," appear, either intercalated between them, or are but a less metamorphosed part of the "marbles," in which the fossils have not been wholly destroyed by crystalline arrangement. What formerly was taken as the plane of deposition, seems now to me, according to observations in Rogues' Gully, to be the plane of cleavage, though I may be mistaken in this respect.

All the members of the Silurian group appear to be deposited in the same uniform plane, forming almost parallel layers of various and varying dimensions, and undulating in gentle curves. The general dip is at a very low angle from about W.S.W. to E.N.E. but increases inland. The Pre-Silurians, on the contrary, exhibit uniformly a strike almost due N.—S., with a very high angle of dip, viz., from 59° to 80°. They, with granitic dykes, seem to form the core of the hill ranges everywhere throughout the Hundred and the adjoining region. Above them the older Tertiaries occupy the summits of the coast hills, or fringe the inclines of those in the interior, while the newer Tertiaries, with the most recent soils, either occupy the highest plateaux, or fill the lowest depressions.

The granites of Cunningham are probably co-eval with the close of the Pre-Silurian period, the injections of which caused the upheaval of the strata in such a way that their anticlines were extensively exposed to denusive agencies.

At Winulta, somewhat beyond the northern boundary of Cunningham, there occurs an exceedingly coarse conglomerate, mixed with some sharp-angled fragments, adjoining the granite, which here (for the locality) attains the greatest development.

This is succeeded by a coarse, evenly-grained quartzite, and this by fine-grained arenaceous shales. Two and a half miles N.W. from Ardrossan, on the Kalkabury-road, granite dykes, extending over about two miles, break through, and are accompanied by chloritic, hornblendic, and micaceous schists and shales, frequently highly indurated. Near the place where the road from Ardrossan to Maitland crosses the Yorke Valley Hills, it is not yet exposed in bulk, but only appears in occasional dykes of the "graphic" variety between a highly crystalline fine-grained gneiss. Similar in occurrence and aspect are all the other granitic areas.

During the Silurian period some portions of the present land were submerged to very considerable depths, while others, as far as the evidence of the rocks goes, only attained slight depths. The former fact is proved by the fine-grained nature of the respective strata. These limestones—capped and fringed with a thin layer of very hard felspathic conglomerate and sandstone—form the series of rocks which were first determined by Prof. Tate as undoubtedly Silurian from the fossils the middle layers yielded, viz., the dark and variegated Parara limestones mentioned in my former paper. The principal fossils obtained are Strophomena sp., one specimen only; fairly numerous heads of a Trilobite, apparently eyeless, and varying in dimension from one-eighth to one and a half inch in width. Both these were obtained in the upper layers of a dark grey tint, and are accompanied by numerous impressions of minute molluscs and concretions of ferruginous oxide in the topmost portion. In a detached knoll of flesh-coloured and grey variegated limestone, evidently on a lower level, occurs (almost exclusively) a large tabulate coral in great plenty. From this knoll the numerous pebbles on the beach, exhibiting sections of the fossil, seem to be derived. Specimens of all these have been submitted to Prof. Tate, who will perhaps favour the Society with a note on the fossils. The "Ardrossan Marbles," considered as the lowest member, appear first in a small dale in Section 75, near the road to Maitland, forming the base of the hills as far as Horse Gully, where they are either replaced by the fossiliferous limestones or disappear beneath them, as they cannot be seen anywhere in this deeply eroded gorge. These limestones form well-defined escarpments on both sides, extending some distance inland in nearly horizontal layers, fringed on the west by the marbles, exhibiting the appearance of massive travertines on the surface where weathered (a blow with the hammer, though, reveals their real nature), sometimes enclosing rather sharp-angled fragments of granite or quartzite where, to all appearance, abutting upon them. Their highly crystalline state may therefore be owing to metamorphosis induced by the contact. Crossing the south boundary into Muloowurtie, we find them forming both sides of Rogues' Gully to a height of about 200 feet, thence extending southward they are finally determined by a wide granitic dyke between Trooka Creek and Pine Point. About Muloowurtie Point they are found at and below sea level, underlying the older Tertiaries. The boundaries assigned to the Silurian on the map are, of course, only proximate, the rock being seldom exposed to any extent.

Detached smaller areas in the form of hills occur in the northern portion of Cunningham (Sections 172, 182, 181, 173, 160, 161, 150, and 151) at a greater distance from the sea, and somewhat differing in aspect (but not in the form of deposit) from the marbles. It is more saccharoid in structure, contains small irregular hollows, and is crossed by short disjointed cracks frequently lined by a dark film; possibly the hollows mentioned may be the only remaining indications of organic inclosures, at first contorted by metamorphic changes and finally removed through chemical agencies. Specimens of an exceedingly similar rock (if not identical) were sent to me from Kilkerran, where they were obtained in a well about ninety feet deep. If they be Silurian, this would indicate that the whole width of the Peninsula partook of the depression.

The marbles, as well as the last-mentioned limestone, are accompanied occasionally by concretions of magnesite. The felspathic rock forming the uppermost stratum of the Silurian series assumes—according to situation—either the structure of a conglomerate or a gritty sandstone, but most frequently the former. The most northern locality observed directly by me is in a quarry in Section 77, near Ardrossan, whence it extends southward, overlying the marbles, and traceable at several places around the Silurian area landward. The same rock appears also on the western incline of the Yorke Valley Hills, where its stratification can be studied in a quarry situate in Section 214, Hundred of Maitland. Near Ardrossan the dip is easterly; at Yorke Valley westerly, with about the same low angle and gentle foliation as the limestones. Though now very hard and tough, they were obviously deposited in a shallow, turbulent sea as a gravel or sand, exhibiting in many parts, like the modern sands of a beach, unmistakable false bedding, denoting that the land experienced a rapid elevation during their deposition, as no gradation from the fine-grained limestones to the conglomerates has been noticed. In some localities, or in some layers only (generally the uppermost) the constituent grains are fine and evenly bedded; in others they are more or less coarse, sometimes even verging upon true breccias in angularity, denoting that the material had been derived from no great distance, in fact, from the pre-existing quartzites and granites of the neighbourhood, Most likely we behold in them only a small remnant of once extensive deposits, the less coherent portion having been entirely swept away while emerging from the sea, to begin the long period of its subaerial existence, and when again submerged at the inauguration of the Tertiary period; for under these conditions denuding agents would act most vigorously.

To the absence of later Palæozoic and all Mesozoic rock in the Peninsula and the whole southern portion of the province is also owing the absence of *coal*, denoting that either the condition for the formation of "black diamonds" never existed, or that the latter were afterwards entirely removed. The former seems to me to be the more probable reason of the two. The sporadic announcements by the papers of "discoveries" of coal therefore only produce a dubious smile of the practical geologist. Our Palæozoic rocks may yield *graphite*, and the Tertiaries *lignite*; but before the existence of characteristic rocks is proved, the search for "real" coal will be nothing but waste of energy and money.

During this long era the land assumed, through erosion, much of its present aspect; gorges and gullies were cut into the rocky deposits and widened into valleys, as we see them at present. Thus, for example, Horse Gully was cut out through about 250 feet of the very dense Parara limestone, and the Ardrossan sandstone almost entirely removed.

At last the change came. Elevation ceased, stability turned into depression. The advancing waves swept gradually all the accumulated debris off the rocks into the gulfs, and then attacked them till they sank below their influence. Thus, it seems to me, the escarpments of the hills south of Ardrossan mark the shore line of cliffs of this time. The solid layers of sandstone were undermined till gravity overcame the cohesion and huge fragments fell down to lower levels, where we see them now strewn in irregular heaps and at incongruous levels. The debris was carried out to sea and re-arranged along the retreating coast as gravel, sand, and mudbanks. Thus we find rolled grains of all the rocks of the region, even pebbles of the Silurian limestone, included in the various deposits, viz., clays, marls, and grits.

The lowest local deposit, the yellow Muloowurtie clays, with its predominating bivalves, *Ostrea*, *Waldheimia*, &c., implies a comparatively deep sea; the grits a shallower one, *i.e.*, nearer to the land, which is also borne out by the great prevalence of its characteristic fossil, *Turritella Aldingæ*, Tate. The grits consist of thin layers of an opaline silica, alternating with arenaceous clays and marls. The lime of the fossils has been entirely removed and replaced by pure silica in the form of bluish or white semitransparent hyaline. North and west from Parara these grits are elevated about 250 to 260 feet above those two miles south-east of that place, where they emerge with a low angle from beneath the beach sands. The most distant outlier of the grits occupies the summit of the highest hill on the coast range in Section 22, the elevation of which is 266 feet.

Supposing an area of basin-like form to be uniformly depressed, the first deposits would fill the lowest levels and the following extend gradually over more extended areas, levelling all inequalities in the course of time. If afterwards such a basin became elevated again, the central portions would be first removed, occupying somewhat lower levels. At last only the fringes of such deposits would be left in protected localities. And this is precisely the case here, as of the Silurian series we only meet the *conglomeratic sandstone* inland, where the least depression occurred ; so with the Tertiary we meet only the *grits* inland fringing the low tracts near the summits of the surrounding hills in detached parts. The only place where distinct fossils were discovered by me is about the south-west corner of Section 41, where they were preserved in mottled ferruginous coarse sandstone, associated with nodules of iron oxide. The latter, though, have been noticed at numerous points, apparently on a uniform level, over arenaceous shales, quartzites, gneiss, and even granite. This seems to prove that the Eocene sea extended thus far with sufficient depth to form layers, yet of so inconsiderable dimensions that most were swept away subsequently, only leaving the hardest and most ponderous portions as a momento of its sway. A similar sandstone has been met with at a few points containing the nodules, but no fossils.

Land appears to have been in existence within easy distance during the deposition of the grits, covered with some forest vegetation, though the fossil remains as yet recovered are very limited. A single specimen of a leaf, resembling those of some *Cinnamomum* species in venation, has been found impressed upon a fragment of this rock. Its form is broadly lanceolate, length one and a half inches, width five-eighths of an inch. Specimens of silicified wood are much more numerous.

After finding some few fragments along the beach and others among the gravels forming the upper portion of the cliffs, I succeeded in finding a spot where they strewed the ground in plenty, viz., on the road crossing Horse Gully between Sections 22 and 30. There they are embedded in the clays covering the Silurian limestones, are of medium size with sharp angles, and most likely belong to one or more trunks that floated out to sea, were buried in the mud, fossilized at the spot, and exposed through the removal of the covering clays by the action of the ordinary agents of denudation.

The period subsequent to the one described above—the Upper Eocene—is still somewhat enveloped in obscurity owing to the absence or non-discovery of undoubtable characteristic fossils appertaining to the respective deposits. It appears to me that a considerable interval must have elapsed between the deposition of the grits, as the last of the Eocene, and the "Ardrossan (or mottled) clays" and gravels, the succeeding deposits of the following, more recent era, because, even assuming a very rapid petrification of the loose debris into real stone under the influence of silicated hot waters, yet some considerable time must elapse before successive layers are transformed so completely as we find the "Turritella grits." Yet we find even in the lowest accessible layers of these more recent deposits fragments of the former, with their unmistakeable fossils, differing in nothing from those obtained *in situ.* Very probably, therefore, these grits were overlaid to some extent by looser materials, assisting through pressure in transforming them into stone. The whole was then elevated above the sea-level, from about the southern boundary of Cunningham, and northward through the whole hundred and further, so as to enable the waves to gnaw away a large portion of those (then recent) deposits, and rearrange them near shore in shallow disturbed waters, in the manner exhibited by the modern sea-cliffs about Ardrossan. The largest proportion of the gravels accompanying them being made up of fragments of all kinds of locally-occurring rocks in all stages of wear, from sharp-angled ones to the globose pebble, it seems certain—1. That they were not brought any great distance; and 2. That, false bedding being observable at odd spots in all elevations, they were deposited in a shallow turbulent sea near shore. This elevatory movement may have been coeval with the activity of the south-eastern volcanoes, or more likely have preceded this, ere the pent-up gases found an outlet through them. This would fix the event about the close of the Pliocene period, to which conclusion also the occurrence of small patches of the desert sandstone (or ferruginous comglomerate) points, the greater part of the latter having been removed by denudation locally during subsequent periods. However, this elevatory movement cannot have been long geologically speaking, else the comparatively inconsiderable Eocene deposits would have been much more reduced, considering their very incoherent structure, and was again succeeded by submergence to such extent that not even the smallest hill-top escaped; for everywhere, even upon the (locally) most elevated summit we find indications thereof in the small water-rolled pebbles enclosed in the "Bay of Biscay" soil, which I have elsewhere endeavoured to prove to have originated in primeval mudflats and shore marshes.

In Europe, and indeed through the whole extent of the old world, one glacial period (or several such in succession) has been proved to have been prevalent subsequent to the Tertiary era, during which the diluvial unstratified clays, &c., were deposited. If, therefore, while the whole of the Peninsula was submerged, analogous conditions are assumed, several phenomena, peculiar to this section of time, admit an easy explanation. 1. The very obscure stratification of the lower and major part of the mottled "Ardrossan clays" forming the present abrupt sea cliffs, and much resembling in structure those forming the banks of the Torrens near the Exhibition Buildings, which competent authorities compare with the boulder clay of England, and the loess of Germany in aspect and structure. 2. The rounded knobs and polished surfaces of the Ardrossan sandstone, where protruding from the soil, which are as smooth as glass frequently, and of such hardness and solidity that a steel hammer produces hardly any impression upon them, and rebounds as from an anvil. 3. The reason would appear why the various ingredients of them appear so sharp-angled and so little rolled, this being a natural consequence of carriage by ice. However, these are as yet conjectures, awaiting to be proved or rejected by future investigations, when the surface will be more exposed by the destruction of the obstructive, dense scrubby vegetation, and pierced by cuttings and wells. As far as ascertained facts go, so much seems sure that the whole Peninsula has been under water subsequent to the Tertiary period, though very likely only to an inconsiderable depth in respect of its highest points, the accumulated thickness of the respective deposits (exceeding 90 feet) being referable to very gradual subsidence, long continued.

In respect of the wide spread of ferruginous conglomerate or Upland Miocene (Prof. Tate), but here very rare, my impression is that it is intermediate in age between the Turritella grits and the Ardrossan clays, and I entirely concur with the opinion of Prof. Tate, who assigns it to the Upper Miocene. Only one small patch of it has been seen by me in this locality identical in appearance with the same as occurring north of Gawler, viz., at Yorke Valley, where it is associated with analogous soil and vegetation as at the former locality. A similar small layer, with *Turritella Aldingæ* casts, in the upper part of the cliffs at Muloowurtie is clearly assignable to a preceding period.

When our present hills and higher grounds again and finally emerged from the sea, the low lands between them (which I have called the Cunningham Plains) must have formed in succession a deep land-locked bay, a lake, and a salt marsh before it assumed its present aspect, gradually brought about by the detritus from the surrounding hills being washed into it and filling it up by degrees. Yorke Valley will, at the same time, have been a long narrow arm of the sea, probably the estuary of a gently-flowing tidal river communicating with Spencer's Gulf near about Port Victoria (several other, but much smaller, similar low areas exist along the southern branch of Horse Gully). That matters really were as represented appears to be proved by the physical aspect and the nature of the deposits. In Yorke Valley, for example, there exists some low ground, about four miles N.E. of Maitland, which is still covered by water, though only very shallow, through the wetter portion of the year, but even in summer a few feet of sinking reach the level of permanent water, though of brackish taste, clearly indicating that there had existed a lake of some dimension before filled up by the mud brought by the rains from the neighbouring hills. The deposits are of but recent origin, and reach a thickness of more than 170 feet at a well near Mr. Rogers' Yorke Valley station, about one and a half miles S.E. of Maitland, *i.e.*, somewhat below sea level, and the strata pierced by it consisted wholly, as far as my information goes, of clays and gravels similar to those met with in the Ardrossan cliffs.

The lake that presumably occupied the site of the present Cunningham Plain was finally drained by the erosion of its outlet through Horse Gully, which certainly seems to have been formed much anterior to this period, but re-closed during the subsequent submersion, and again washed out by the outflowing of water. At present not a drop of the water supplied by an average of about twenty inches rainfall per annum finds its way to the sea above ground, the fall of the land being so slight and the soil (arenaceous and marly clay, succeeded by sub-globular calcareous concretions, &c.,) so porous that the supply of the heaviest showers is almost immediately absorbed. Again, at the narrow outlets very little below the general level the underground drainage appears to be prevented by the rocks rising to very near the surface, and the wells and springs along the seashore exhibit such very weak inflow, entirely inadequate to requirement in proportion to the area drained, that the question naturally arises, what becomes of the supply of rain-water? The only well sunk in this area is in Section 83, is said to be ninety feet deep, piercing only clays, gravels, and sands, while the elevation of the surface is only estimated at about thirty to fifty feet above sea level, thus also placing the brackish water found at that depth below the sea, proving that there can be no connection with the latter. What is it, then, that prevents the formation of a marsh? Most likely the present dense vegetation, consisting of such small-leaved plants as Mallees, Melaleucas, Acacias, &c., does that by evaporating the greater part of the water supply through its innumerable leaves, and in its present state just sufficient to sustain the balance between supply and demand. Should this be cleared off incautiously curious results may startle the occupiers in course of time.

The present surface soil is simply the result of the decomposition of the local pre-existing rocks distributed by wind and rain. The sharply angular form of constituent particles clearly proves this. They are even frequently embedded in the travertine, forming in aggregated, most disjointed, subglobular layers in the subsoil, showing thereby that the latter also has been formd *in loco*. Where the clay is very fine in grain the lime, instead of being globularly disposed, surrounds dead roots, &c., assuming frequently very fantastic forms, sometimes mistaken for corals by amateurs. This form of the travertine is not of frequent occurrence about Ardrossan.

The above sketch of the geological history would hardly be complete if no illusion were made to the present. According to nearly three years' attentive observation it seems to me that the balance of evidence is inclining in favour of a slight subsidence prevailing just now. The facts are that during this interval the sea has gradually and steadily been encroaching upon the sand dunes fringing the steep cliffs or raised beaches to a great extent from the southern boundary of Muloowurtie to the northern limit of Cunningham, a distance of some 25 to 28 miles, and has swept away vast masses of sand, in some cases 20 to 30 yards width of formerly permanent beach, as for example near Ardrossan. This had the immediate effect of the waves at high tides washing parts of the cliffs, which for many years had been protected therefrom, thus causing falls of undermined portions to occur more frequently than before. I am certainly aware that other causes may affect coasts facing the east similarly, but the previous accumulation of the sands and other debris preclude them from offering a sufficient explanation of the observed phenomena.

On the Geographical Relations of the Pulmoniferous Mollusca of Victoria.

By Professor Ralph Tate, A.L.S., F.G.S., &c.

[Read September 6, 1881.]

As the result of two lengthy holidays spent in Victoria, for the especial purpose of studying its natural history, I hold the opinion that that country is extremely poor in species of land and fresh-water snails. This paucity of species is the more surprising and disappointing, as from the varied surface features of the country, its perennial streams, lakes of fresh water, humid glens, and other favourable habitats of the molluscan denizens of land and water, one would have expected to find a rich fauna.

But despite the very close searching which I have made about Hamilton, Clunes, Ballarat, Fernshaw, and around Port Philip Bay, I have encountered very few species, and, for the most part individuals are not at all numerous.

Correspondence with other observers who have collected in Gippsland and the Cape Otway Ranges has elicited the same experiences.

The list of the fluviatile pulmoniferous snails comprises *Limnæa*, two species; *Aplexa*, five species; and *Ancylus*, one species; making a total of eight, or less than ten per cent. of the described species inhabiting Australia. Only one of the eight—*Ancylus australicus*—is extra-limital, occurring near Adelaide and about Melbourne. (For list of species see Appendix II., p. 76).

The terrestrial pulmonates, which all belong to the family Helicidæ, are represented by a comparatively limited number of species.

Dr. Cox, who has embodied in his "Monograph of the Land Shells of Australia" the labours of previous authors, mentions only four species of *Helix* and one species of *Vitrina*.

Mr. Brazier, Proc. Zool. Soc., 1871, describes, as new, one species of *Helix* and one species of *Bulimus*.

The Rev. J. E Tenison Woods, Proc. Lin. Soc. N.S.W., 1878, describes a new *Helix*, and adds a previously unrecorded species.

Mr. Petterd, in Journ. of Conchology and in his "Tasmanian

Land Shells," adds 9 species of *Helix* and 1 sp. of *Vitrina;* and *in litteris* a *Succinea* and *Helix* n. sp.

My own collections furnish four species of *Helix* not previously known to occur.

To summarise, Victoria is now known to be inhabited by 23 indigenous species of land snails, distributed as follows:—*Helix*, 18 species; *Helicarion*, 1; *Vitrina*, 2; *Bulimus*, 1; and *Succinea*, 1.

The generic grouping of the land snails of Victoria is identically that of those of Tasmania. The genera represented are all in common, one of which, *Helicarion*, is not found in any other parts of Australia. Victoria as well as Tasmania is marked by the absence of the genus *Pupa*, so well represented in the neighbouring colonies of South Australia and New South Wales, and by the absence of the operculated genus *Pupina*, which links the molluscan fauna of New South Wales with that of sub-tropical Queensland.

Nanina, represented by a widely distributed species, is common to extra-tropical South Australia and tropical Queensland, but is not known in the south-east of Australia.

The geographical distribution of the genera of terrestrial pulmonates inhabiting South and South-Eastern Australia is shown in the following table:—

GENERA.	SOUTH AUSTRALIA.	VICTORIA.	TASMANIA.	NEW SOUTH WALES.
Helix	41	18	66	67
Vitrina	..	2	1	7
Helicarion	..	1	2	..
Nanina	1	..	..	..
Bulimus	5	1	2	2
Pupa	2	..	..	3
Stenogyra	..	..	..	1
Succinea	2	1	2	3
Pupina	..	..	..	2
Total species	51	23	73	85

I have excluded from my survey the consideration of the slugs, as the information we are in possession of is very meagre, possibly because so little attention has been given to them. However, Tasmania has the peculiar genus *Cystopelta* (*C. Petterdi*, mihi), a *Limax* (*L. Legrandi*, mihi), and a *Milax* (*M. Tasmanicus*, mihi). South Australia affords one species of *Milax* (*M. nigritus*, mihi); and New South Wales a *Milax* (*M. olivaceus*, Gould), and a peculiar genus of bitentaculate slug *Triboniophorus* (*T. Græffii*), Humbert.

Touching the specific alliances of the Victorian terrestrial mollusca, we are at once arrested by the fact that only about one-half of the total number of species are endemic, and of these two, at least, are so closely related to Tasmanian species that had they been found living in the same geographical region they would have been regarded as not more than varietal forms. Of the extra-limital species, seven occur in Tasmania, and there is a slight community with South Australia and with New South Wales. The geographical range of the Victorian species is set forth in Appendix I.

That there should be some specific points of contact between the molluscan fauna of Victoria and Tasmania is not surprising; but that there should be so large a proportion in common is most startling. Thanks to Mr. Petterd, I have had the means of comparing Tasmanian and Victorian examples of all the species in common, and after a most rigid examination I am forced to acknowledge the specific identity of seven. Mr. Petterd considers also *Helix ruga* and *H. Allporti* to have place in the same category; but as the Victorian examples show differential characters, I have regarded them as distinct species. It is true that the differences are so very trivial that but for the fact of the shells exhibiting them are found so isolated from their congeners, one would not be justified in separating them. If the other extreme view be adopted, then there are nine species, out of a total of 23, in common between Victoria and Tasmania.

Referring again to the table giving the number of species inhabiting Victoria and its neighbouring colonies, we may well ask, why this paucity of species? It certainly cannot be attributed to climatic conditions, as South Australia, with its drier climate, possesses about 50 species, many of which inhabit regions subjected to continued droughts and scorching heats; whilst Tasmania, which is paralleled with the alpine regions of Victoria, counts 73, and has, moreover, a rich and varied group of aquatic pulmonate snails. I would fain seek a cause in recent geological changes. It is popularly held, but I think erroneously, that Australia is an ancient continent. But the present configuration of the surface of Victoria is largely due to forces which have exerted their influence over vast areas, and at comparatively recent times. A glance at a geological map of the colony will satisfy you that the larger portion of it, on the south of the main watershed, is covered with igneous rock; and a personal examination would result in the opinion that much of the remainder had been similarly mantled over, from which it has been stripped in later years. Now, the period, at which this vast sheet of basalt and porphyritic traps* was ejected, was at about the incoming of existing species. Such a deluge of igneous mass must have destroyed terrestrial forms of life over the greater part of the southern region of Victoria. A small portion of south-east South Australia and part of Tasmania were involved in this catastrophe. From this it may be inferred, that the outlying regions unaffected by the volcanic disturbances retained their faunas and floras in all their pristine characters, whilst, on the other hand Victoria was reduced to the condition of a tenantless tract, which was re-peopled by migration from surrounding areas. A remnant of its more ancient flora and fauna was doubtlessly preserved in the Grampians and other similar mountain masses, which would seem to have been, in part at least, beyond the reach of the volcanic eruptions.

Into this organically new region immigration would take place; forms of limited means of dispersal would probably undergo morphological change *in transitu;* others with greater inherent powers of locomotion, or those which were transported, *nolens volens*, with rapidity, may have continued unaltered. Thus it may be conjectured that the endemic forms are either remnants of an older fauna, or are modified from extra-limital immigrants. Of the first, *Helicarion atramentaria* may be cited, and of the latter, *Helix exoptata.* Whilst *Helix brevipila* may be mentioned as an example of an immigrant form which has resisted modification.

Touching the introduction of continental forms no special difficulty exists, but in respect to that of the species common to Tasmania and the continent the case is different. Such community of species implies a land connection, or at least a closer proximity than what actually occurs at the present day. A community of species is traceable as far back in geologic time as the period of the formation of the Pleistocene sandrock which fringes the southern coast line of Australia and the islands in Bass Straits. The Pleistocene sandstone of Badger, Barren, and other islands have yielded to the researches of Mr. R. M. Johnston (Trans. Roy. Soc. Tasmania for 1878, p. 41, *et seq.*) the following living continental forms:—*Helix pictilis*, *Succinea australis*, *Aplexa tenuistriata*, and *Pomatiopsis striatula;* the first of which occurs in similar deposits at Cape Northumberland. I have elsewhere (Trans. Roy. Soc. S. Aust., vol. ii., p. lxviii.) pointed out that the Pleistocene sandstone was accumulated when the land stood relatively higher than it does now, and may thus have constituted a land connection between Tasmania and the continent, by way of which an interchange of

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*I consider the so-called porphyrites of Macedon, Dandenong, and other high peaks to belong to the same geological series as the well-known basalts.

those plants and animals, whose migrations are not aided by external agents of dispersal, may have been effected.

Appendix I.

List of Victorian Terrestrial Pulmoniferous Snails.

Species.	Victorian Localities.	Extra-limital Range
	(An asterisk indicates the locality of the type example.)	
Helix.		
Melbournensis, *Cox*	*Melbourne ; Fernshaw *(Ptrd.)*	
Victoriæ, *Cox*	*Western Pt.; C. Otway *(Ptrd.)*	
brevipila, *Pfr.*	Victoria *(Cox)*; Melb. *(Ptrd.)*	N.S.W., S.Aust.
Hobarti, *Cox*	Dandenong ; Melbrne. *(Ptrd.)*	Tasm., S.Aust.
Mortii, *Cox*	Burrumbeet *(Tate)*	N.S.W., Tasm., S.A.
juloidea, *Forbes*	Melb. *(Woods)*; Geelong ; Muddy Creek *(Tate)*	Qnsld., N.S.W., S.A.
sub-depressa, *Brazier*	*Snowy R. ; Dandenong (*Petterd* as H. Dandenongensis) ; Fernshaw *(Tate)*	
McCoyi, *Petterd*	*Dandenong *(Petterd)*; Fernshaw *(Tate)*	Allporti, Tasm., var McCoyi, *Petterd*
Fernshawensis, *Ptd.* (1)	*Fernshaw	
mucoides, *Woods*	*Melbourne	
Stanleyensis, *Ptrd.* (2)	*Fernshaw	Tasm.
Otwayensis, *Petterd*	*Cape Otway	Tasm.
mansueta, *Pfr.* (?)	Fernshaw *(Tate)*	Qnsld., N.S.W.
Tamarensis, *Petterd*	Burrumbeet *(Tate)*	Tasm.
exoptata, *Tate*	Dandenong, Sale, and C. Otway *(Ptrd.)* as *H. ruga* ; Fernshaw *(Tate)*	
sp. to be named	Burrumbeet *(Tate)*	
sp. to be named	Burrumbeet *(Tate)*	
Garthii, *Petterd*, M.S.	*Fernshaw	
Helicarion,		
atramentaria, *Shutt.*	Mt. Arnold and Bendigo *(Cox)* ; Fernshaw *(Tate)*	
Vitrina.		
nigra, *Quoy & Gaimard*	*Western Port	
Verreauxi, *Pfeiffer*	Fernshaw, Sale, Gippsland, Cape Otway *(Petterd)*	Tasm.
Bulimus.		
Kershawi, *Brazier*	*Snowy River	
Succinea.		
australis, *Quoy & Grd.*	Western Port *(Quoy)* Melbourne *(Petterd)*	S. Aust. Tasm.

(1). Possibly an immature, *H. McCoyi*.
(2). *Syn.—Petterdiana*, Taylor, non Brazier.

APPENDIX II.

LIST OF VICTORIAN FRESHWATER PULMONIFEROUS SNAILS:—

Limnæa Melbournensis, *Pfeiffer*. Melbourne (types); Lake Wendouree, Ballarat (*Tate*).

Limnæa viridula, *Tate*. Murndal, Hamilton (*Tate*).

Aplexa Yarraensis, *T. Woods*. Upper Yarra (type).

Aplexa arachnoidea, *T. Woods*. Mordialloc (type).

Aplexa crebreciliata, *T. Woods;* incul. pilosa, *T. Woods*. Caulfield, Melbourne (types).

Aplexa Kershawi, *T. Woods*. Upper Yarra (type), Clunes Reservoir (*Tate*).

Aplexa turrita, *Tate*. L. Wendouree, Ballarat (*Tate*).

Ancylus australicus, *Tate*. Melbourne (*Tate*).

Descriptions of South Australian Staphylinidæ.

Translated from the French and Latin of M. Fauvel by Sydney E. Holder, Assoc. Roy. Soc.

[Read October 4, 1881.]

Introduction.

The following paper is a description of all the species of Staphylinidæ as yet known to occur in this colony, translated from the work of M. Fauvel, "Les Staphylinides de l'Australie et de la Polynesie," published in two volumes at Geneva in 1877-8.

The total number of species recorded is thirty-two. Of these twenty-six appear with South Australian localities in M. Fauvel's monograph; but a collection of ten South Australian species forwarded to that author by Mr. Tepper,* contained six not previously enumerated.

The species are as follows:—

Trogophlœus simplex, *Mots.*, Adelaide.
Oxytelus subæneus, *Fauvel*, Port Augusta.
semirufus, *Fvl.*, Port Augusta.
impennis, *Fvl.*, Adelaide.
sparsus, *Fvl.*, Adelaide.
Xantholinus phænicopterus, *Er.*, Nuriootpa. (Univ. Mus., *Tepper.*)
erythropterus, *Er.*, Adelaide.
chloropterus, *Er.*, Adelaide, Port Augusta.
chalcopterus, *Er.*, Nuriootpa. (Univ. Mus., *Tepper.*)
socius, *Fvl.*, Adelaide, Nuriootpa. (Univ. Mus., *Tepper.*)
Emus erythrocephalus, *Fabr.*, Ardrossan. (Univ. Mus., *Tepper*).

* The collection of South Australian insects formed by Mr. Tepper has been acquired by the University of Adelaide.

Philonthus sordidus, *Grav.*, Adelaide. (Univ. Mus., *Tepper.*)
hepaticus, *Er.*, Adelaide.
sanguinicollis, *Fvl.*, Nuriootpa. (Univ. Mus., *Tepper.*)
nigritulus, *Grav.*, Adelaide.
Quedius fulgidus, *Fabr.*, Nuriootpa. (Univ. Mus., *Tepper.*)
thoracicus, *Fvl.*, Adelaide.
ruficollis, *Grav.*, Nuriootpa. (Univ. Mus., *Tepper.*)
Heterothops luctuosa, *Fvl.*, Adelaide.
picipennis, *Fvl.*, Adelaide.
Conurus triangulum, *Fvl.*, Adelaide.
Brachida suturalis, *Fvl.*, Adelaide.
Bolitochara discicollis, *Fvl.*, Adelaide.
Homalota sordida, *Marsh*, Adelaide.
coriaria, *Kraatz*, Port Augusta.
politula, *Fvl.*, Adelaide.
Calodera australis, *Fvl.*, Adelaide.
cribrella, *Fvl.*, Adelaide, Port Augusta.
Fauvelia oxytelina, *Fvl.*, Adelaide.
Phlœocharis antipodum, *Fvl.*, Adelaide.
Pæderus cruenticollis, *Germ.*, Adelaide, Nuriootpa. (Col. Univ. Mus., *Tepper.*)
Lithocaris debilicornis, *Woll.*, Adelaide.

With regard to one of the above genera, viz., *Fauvelia*; this appears in the work as *Correa*, but for the sake of precision it has been thought advisable to alter it.

In this connection may I be permitted to quote from the last anniversary address delivered by Professor Tate on October 5, 1880—"One of the new genera instituted by M. Fauvel, uniquely represented by a South Australian species, is named *Correa*—a denomination already occupied for a well-established group of Rutaceous plants, a familiar example of which is *Correa speciosa*. As under these circumstances a dual employment of the cognomen will prove of inconvenience, I have been bold to suggest that of *Fauvelia* for the genus of beetles."

Of the whole number the following five are exclusively South Australian, the majority of the remaining species being almost cosmopolitan in their distribution. These are *Brachida suturalis*, *Homalota politula*, *Calodera cribrella*, *Fauvelia oxytelina*, *Phlœocharis antipodum*.

A comparison of the South Australian Staphylinidæ with those of the other regions treated in M. Fauvel's work shows that we have representatives of six tribes out of the nine there described; but when we come to genera the same relations do not hold, we only having 32 species distributed among 16 genera, while in the other case there are 351 species, representing 78 genera.

DESCRIPTION OF SPECIES.

1. Tribe Oxytelini.

KEY TO GENERA.

Section Oxyteli.

a. Legs without spines, celiated or pubescent; tarsus having three joints. *Trogophlœus.*

b. Legs spiny, or at least the anterior ones; tarsus three-jointed; the front legs with only one row of spines; antennæ very little, or not at all, curving; the body depressed. *Oxytelus.*

Trogophlœus simplex, Mots., Bull. Mosc., 1857, IV., 505; Fauvel, II., 26.

Corslet very transverse, with a transverse impression at the base, and two very obsolete little holes on the disc, sometimes absent; size very small.

Subelongate, slightly depressed, either black or else blackish or pitch-brown, rather nitid, with minute grey pubescence, either the first joint of the antennæ only or the whole of the base as well as the feet more or less red; antennæ short, slender, the 9-10 joints surpassing the preceding ones in length and breadth; the eyes large, extending to the bottom of the head; the head on each side in a longitudinal line opaque and alutaceous, as also the thorax; the latter very short, transversely oval, the sides very much rounded—especially posteriorly, anteriorly a little less rounded, the base having an obsolete, somewhat broad and sinuous impression, the back very rarely being obsoletely bifoveolate; the elytra large, quadrate, frequently very finely punctured, the abdomen almost more finely so. *Length*—1¾ mill.

Localities—Adelaide, East Indies, and Ceylon.

KEY TO SPECIES OF OXYTELUS.

A. Elytra very short, strongly transverse. Body brown or pitch-bronze; elytra extremely short, of a dull testaceous tint. *impennis.*

B. Elytra longer than they are broad, parallel or slightly oblique.

- *a.* Elytra very little oblique; body bronzy; breast not spotted. *subæneus.*
- *b.* Elytra square, or a little longer than they are broad; eyes ordinary size or small, not extending to base of head.
  - I. Head and breast reddish; abdomen pitchy red; elytra a dark slate. *semirufus.*
  - II. Breast reddish, elytra testaceous and without spots. *sparsus.*

O. impennis, Fauvel, I., p. 30, 1877.

Male, pitch bronze, shining, thorax paler colour, elytra and feet a dirty testaceous pitch; very easily distinguishable from all other species by having short elytra, and eyes much smaller than usual; the antennæ slightly thickened, 6-8 joints small, strongly transverse, 9-11 not so short and broader; the head large, transverse, dilated behind the eyes, above them finely punctate, on each side close to the eyes a narrow impression; forehead concave, produced anteriorly, truncated, rising in front of the clypeum, smooth; the top sloping downwards, not corrugated; thorax one-third as broad again as it is long, subtrapezoid, slightly narrower than the head, about the base rather markedly narrow, the anterior extremities rectangular, the posterior being rounded; on the dorsal region are three furrows, these, especially the outer ones, being subobsolete; the disc is finely and rather densely punctate, a little more rugose than the sides, which are marginate, and slightly impressed; the elytra are of same breadth as the head, one-third broader than they are long, deeply but sparsely punctate and rugose; abdomen very smooth; in the male the bottom of the sixth segment in front of the apex has a transverse impression; the seventh has the apex deeply divided into two lobes, the middle of the lobe being somewhat triangularly extended. The female is smaller with smaller head, narrower than the breast, which is longer. *Length*—$3\frac{1}{3}$ mill.

Localities.—Adelaide, Victoria.

O. subæneus, Fauvel, I., p. 31.

Male, in size and shape something like *complanatus*, but more rounded and in other respects totally distinct; bronze black, moderately shining, with a dark brown antenniform tuberculum on the forehead; the thorax and elytra also dark brown, the feet being paler; antennæ slightly thickened, the 4-6 joints moniliform, the 7-10 rather transverse; head convex, a little transverse, suborbiculate, with somewhat fine punctures pretty thickly scattered over it, the forehead smooth, lightly indented on either side, a little raised in front of the clypeum, anteriorly prolonged and subtruncated; thorax same breadth as head, but flatter, a third as broad again as it is long, rather sinuous about the base and very narrow with deep punctation equally meagre and rugose, the anterior extremities salient, subacute, the posterior ones obtuse, the back obsoletely trisulcate, the sides margined with deeper impressions; the elytra a little broader than the head, slightly oblique, very thickly and deeply rugose-punctate, rather depressed between the shoulders; abdomen less shiny, alutaceous, sparsely and very finely punctate; the middle of the sixth segment emarginate below the apex, having behind this section a sinuous impression, with a yellow margin; the seventh is yellow at the apex, on either side deeply sinuate, the middle of the bend broad, the apex strongly prolonged triangularly; female differs chiefly from male in having a much smaller head, which is also orbiculate, the thorax being narrower and a little longer. *Length*—$2\frac{3}{4}$-$3\frac{1}{3}$ mill.

Localities.—Western Australia, Port Augusta.

O. semirufus, Fauvel, I., p. 34.

Almost the size and form of *complanatus*, but altogether distinct; slightly depressed and nitid; head and thorax red; abdomen a pitchy red; elytra a lead-black; the first four joints of the antennæ and the feet a testaceous red, the 3-5 joints moniliform, 6-10 broader, strongly transverse and thickened, the 11th rather large and conical; head transverse, thickly and pretty finely furrowed, each side behind the eyes—which are rather large—is bordered by a deep impression, the forehead broadly depressed, in front of the clypeum slightly convex, almost smooth, raised in that part above the antennæ, rounded anteriorly; the top parts are more broadly furrowed; the thorax is a quarter as broad again as the head, equally long with it, somewhat transverse, anteriorly a little and posteriorly strongly narrowed, very rugosely and rather regularly punctate, the back is trisulcate, the external furrows being the broader, on each side pretty near the margined borders is a deep impression, the anterior extremities truncated, the posterior ones obtuse; elytra a good deal broader than the thorax, a little longer and flatter, with dense and somewhat deep strigose punctation, with two keels as it were under the shoulders; the abdomen not so shiny as the rest of the body, almost alutaceous, with a few very fine punctures. The elytra are often of a smoky red. Male not known.

Length.—3 mill.

Localities.—Melbourne, New South Wales, Port Augusta.

O. sparsus, Fauvel, I., p. 35.

Much smaller than the preceding species, and differently coloured; a yellowish testaceous, nitid, head reddish brown, thorax shining, abdomen blackish pitch, the top of the 6th segment and the 7th of paler tint; the antennæ gradually become rather thickened, from the 6-8 joints strongly transverse, the 9-10 broader and not so short, the 11th conical and rather large; the head slightly transverse, suborbicular, slightly convex, marked with some rather deep punctures, the forehead somewhat deeply impressed, anteriorly lengthened and rounded, above the antennæ very much raised, convex in front of the clypeum, smooth, with short grooves near the rather large eyes, posteriorly there is a conical impressed pit; the thorax is a little broader than the head, not longer, a little transverse, about the base oblique and very narrow, sparsely but deeply punctate, on the back one deep furrow, each side slightly impressed anteriorly; the elytra are somewhat broader than the thorax, a very little longer, with a few very deep punctures; the abdomen rather smooth. No difference is detected in the general appearance of the sexes.

Length.—2 mill.

Localities.—Java, Victoria, Adelaide, New South Wales.

Observation.—Two specimens forwarded to M. Fauvel from Sydney and Victoria by Mr. Sharp are black, with dark brownish black elytra, the clypeum a dull red, the first four joints of the antennæ reddish brown, and the feet yellow. He considers these to have the normal colour of the species. Mr. Sharp also sent him a dozen specimens of a bright colour from Adelaide like those described.

2. Tribe Staphylinini.

KEY TO GENERA.

Section I.—Xantholini.

The antennæ strongly curving; the second joint of the maxillary palps conical, scarcely narrower than the third at the base. *Xantholinus.*

Section II.—Staphylini.

a. Under lip emarginate; mesosternum transverse, much rounded at the top. *Emus.*

b. Under lip entire; thighs not spiny, the posterior tarsi are equal in the first and fifth joints, the second, third, and fourth are oblong; the maxillary palps much elongated, at the second joint slender acicular. The metasternum sinuously rounded anteriorly, not salient; the lateral hairs of the clypeum inserted on the marginal border. *Philonthus.*

Section III.—Quedii.

a. The second joint of the palps linear or oblong; the prothoracic scars obsolete. *Quedius.*

b. The second joint of the palps small, subovate; the prothoracic scars visible. *Heterothops.*

KEY TO SPECIES OF XANTHOLINUS.

Antennæ black or brown, on the last joint only sometimes testaceous altogether or in part.

a. Elytra of a beautiful purplish-violet tint, brilliant, feet black, legs having violet spines. *phœnicopterus.*

b. Elytra, feet, and anus red. *erythropterus.*

c. Elytra green or blue.

1. Feet black ; elytra green, dullish shagreen. *chloropterus.*
2. Feet red ; elytra green, brilliant, not shagreen. *chalcopterus.*

d. Elytra and feet black or pitch-brown ; brilliant ; size small ; clypeum punctate in rows. *socius.*

X. phænicopterus, Er., Gen. Staph., 314 ; Fauvel, I., 74.

Exactly the size of *X. analis*, jet black, brilliant ; antennæ black, a little longer than the head ; the palpæ dark brown ; head same width as thorax, a little longer than broad, slightly narrowed anteriorly, the sides straight, posterior extremities rounded with punctures, one on each side and two near together towards the middle of the forehead, these being placed obliquely near the upper margin of the eye, also a few more irregularly placed transversely, with the exception of the ordinary anterior grooves it is altogether very smooth; thorax is a little narrower than the elytra, slightly longer than broad, towards the base somewhat narrowed, the sides slightly curving in the middle, the apex on each side obliquely truncated, anterior extremities obtuse, rather convex, between the anterior angle on each side is a large and deep puncture, also a few punctures on each side on the anterior margin; scutellum punctate ; elytra very little longer than the thorax, marked with three pretty regular rows of punctures, the first sutural, the second in the middle of the back, and the third marginal, these rows being red, brilliant, with purple lustre ; abdomen parallel, punctured finely and rather sparsely, black, resplendent ; feet short, black, the tibiæ having violet spines ; tarsi dark brown ; wings dark bottle-green. In January.

Length.—10-12 mill.

Localities.—Melbourne, Sydney, Cape York. Nuriootpa, Mr. Tepper's collection.

X. erythropterus, Er., Gen. Staph., 320 ; Fauvel, I., 72.

Not longer, but a little broader and more depressed than *X. glabratus*, black, shining ; antennæ a little longer than the head, the 4-10 joints cylindrical, slightly transverse, equal, dusky brown, the first a pitchy red, the apex of the last ferruginous ; palpæ and labrum pitch-red ; head broader than thorax, subquadrate, the base truncated, posterior angles rounded, sides straight, anteriorly rather narrowed, slightly depressed above, a few punctures impressed on each side, a very short and obsolete lateral furrow on each side in front of the eyes, terminating towards the middle in a broader and rather deep pit; thorax not quite so broad as elytra, slightly narrowed towards the base, a little longer than broad, the anterior extremities raised, slightly depressed, with 4-5 dorsal rows of punctures, three or four placed towards the front, and one by itself near the middle, a lateral row of five or six punctures, these being finer; scutellum punctate; elytra a little longer than thorax, red, sparsely but finely punctate, lateral margin smooth; abdomen also sparsely and finely punctured, with a scattered pile, the top of the fifth segment and the whole of the sixth testaceous red; feet pitchy red.

Length.—13½ mill.

Localities.—New South Wales, Queensland, Rockhampton, Adelaide.

Obs.—M. Fauvel has determined by a comparison of specimens that this species is identical with the *cervinipennis* of Mr. MacLeay; *vide* Trans. Ent. Soc., N.S.W., 1871, II., 138.

X. chloropterus, Er., Gen. Staph., 311; Fauvel, I., 75.

Almost the same size as *X. chalybeus*, more slender, black, opaque, elytra slightly nitid, abdomen sub-bronzy; in appearance preferable to *glabratus;* antennæ very little longer than head, the 4-10 joints equally thickened, rather sensibly shorter, the apex of the eleventh ferruginous; palpæ pitchy red at the top; head same length as thorax, base of latter as long as the top, front part narrow, oblong-triangular, base and sides very little convex, posterior extremities rather so, being strongly rounded, with one somewhat large puncture towards the middle, and one more impressed near the upper margin of the eye, moreover it is smooth except the ordinary furrows; thorax and apex of elytra are same length, towards the base the thorax is rather narrow, a little longer than broad in front, the sides straight, the apex obliquely truncated on either side, anterior angles sub-rotund, rather convex, having one long punctate impression on the top, in other respects very smooth, slightly alutaceous; middle of scutellum punctate, elytra very little longer than thorax, somewhat alutaceous, with three rows of punctures, the first in the form of a suture, the second dorsal, the third marginal, the top of the margin is reflexed and the apex here and there punctate, the abdomen elongate, parallel, the punctures moderately fine, with a little black pile; wings dark brown. In October.

Length—17-23 mill.

Localities.—New South Wales, Victoria, Tasmania, Port Augusta, Adelaide.

X. chalcopterus, Er., Gen. Staph, 312; Fauvel, I., p. 76.

Same appearance as *fulgidus*, but much larger, black, shines brightly, antennæ and palpæ dark brown, feet and front of hips reddish yellow; the elytra either cyanide or bronzy green; abdomen slightly brassy; antennæ little longer than the head, the top of eleventh joint ferruginous; head a little broader than thorax, longer than broad, base and posterior extremities rounded, sides nearly straight, not narrowed anteriorly, somewhat depressed, the punctures are the most fine and obsolete of all the species; there is a rather small puncture towards the centre of the forehead and two close together near the upper margin of the eye, also a number of them irregularly placed transversely, there are two intermediate grooves running anteriorly nearly parallel; thorax a little longer than broad, narrowed towards the base, sides slightly curved behind the centre, the base narrower than elytra, rather convex, one puncture at the anterior extremity; scutellum somewhat punctate; elytra a little longer than thorax, very finely punctate in three rows, the first sutural, the second in middle of back, the third marginal, all being pretty regular; abdomen has a few scattered punctures, a fine pile; wings dark brown.

Length—10-12 mill.

Localities.—Brisbane, Rockhampton, Swan River. Nuriootpa, Mr. Tepper's collection.

X. socius, **Fauvel, I., p. 79.**

In size and general appearance like the smaller specimens of *X. punctulatus*, black, subnitid, slightly alutaceous, elytra not so, and more shining; the mouth, antennæ, with the exception of the first joint, the feet, and the margins of the segments dark brown; antennæ very little longer than the head, rather thickened, the 5-10 joints shortly transverse, the 11th conical; head subquadrate, quarter as long again as broad, the front rather narrowed, the posterior extremities subobtuse, on each side here and there deep punctures, two short furrows in front, somewhat curved, anteriorly a large punctate impression between the furrow and the eye, a small groove contiguous with it; thorax same breadth as front of head, one-third longer than broad, the posterior rather markedly narrowed, sinuous in the middle, all the extremities rounded, there are seven straight dorsal lines and eight lateral ones curving and punctate; scutellum bipunctate; elytra a little broader than thorax, but not longer, the back having three fine lines and the suture irregularly punctate; the margin very finely inflexed in lines, abdomen subcupreous, rather thickly and very finely punctate.

Length.—5½-6½ mill.

Localities.—Victoria, Rockhampton, Adelaide.

Emus erythrocephalus, Fabr., Syst. Ent. 265; Er., Gen., 351 et syn.; Fauvel, I., 81.

Elytra bluish; head bright red, with a large black discoidal patch.

Exactly the size of *maxillosus*, black, thorax shining, posterior extremities rounded, elytra a blackish purple, head red, a rounded frontal puncture and mouth both black.

Length.—14-17 mill.

Localities.—Victoria, Swan River, New Caledonia, Tonga. Ardrossan, Mr. Tepper's collection.

Obs.—This species is well known, specimens in every collection.

KEY TO SPECIES OF PHILONTHUS.

A. Clypeum showing a line of three punctures on each side of the disc, no lateral impression.

- *a.* Clypeum black; elytra deeply and sparsely punctate, brown or black, slightly bronzy. *sordidus.*
- *b.* Clypeum reddish; elytra densely and finely punctate, rosy, brighter at the suture and summit. *hepaticus.*

B. Clypeum showing a series of five points on each side of the disc.

- *a.* Clypeum red; apex and sides of elytra bordered with a testaceous tint. *sanguinicollis.*
- *b.* Clypeum black or pitch brown; head much longer than broad; size very small. *nigritulus.*

P. sordidus, Grav., Micr., 196; Fauv., Fn. Gall.-Rhén., III., 448 et syn.

Very closely allied to *Ph. cephalotes*, but only two-thirds the size and blacker, nitid, with more scanty pubescence; the head especially in the male narrower, never broader than the thorax, four equidistant interocular punctures; the antennæ more slender and shorter; the elytra have larger and fewer punctures, not in ridges, with more scanty pubescence; the abdominal segments not margined with red; in male the head is more quadrate; the incision of the seventh segment is less deep, with rounded apex.

Length.—5-5½ mill.

Localities.—Asia, Furope, America, Adelaide.

P. hepaticus, Er., Gen., 451.; Gemming & Harold, Cat. Col., 589 et syn.; Fauv. Notic. Ent., 1866.

Very like the form of *albipedis*, but a little smaller, black, nitid, the thorax and margins of the abdominal segments dusk brown or reddish brown, elytra dark brown, apex and suture pale, the first two joints of the antennæ and the feet testaceous ; antennæ pretty short, joints sensibly though slightly shorter ; head subovate, some punctures on each side above the eyes, also four punctures placed transversely between the eyes ; thorax oblong, not longer than broad, the posterior angles as well as the base rounded, anterior angles slightly so, three rather distinct rows of punctures on the back, the sides marked by four punctures beside the marginal ones ; elytra a little longer than thorax, often somewhat finely punctate, those of the abdomen even more dense and minute ; often rather thick pubescence on the thorax and abdomen.

Length.—5½ mills.

Localities.—America, Adelaide.

P. sanguinicollis, Fauvel, I., p. 97.

Beautifully coloured, very short, black, very long and dense smoky pubescence on the abdomen, the thorax a bright red, elytra having narrow yellow borders on the sides and apex, feet testaceous, the tibiæ sometimes of rather dark-brown colour, the margins of the segments very often slightly reddish, the base of the antennæ a dirty testaceous, the 8-10 joints subquadrate ; head somewhat convex, subquadrate with rounded angles, interocular punctures near together on each side of the eye, postocular rarely met with ; thorax convex, a quarter as long again as broad, narrowing very much from the base dorsally, the base a third broader than the head ; the anterior angles obtuse, the posterior slightly rounded, five rows of fine punctures on the back, two other punctures turned away from the middle, and two more again running obliquely near the anterior extremity ; scutellum densely covered with very fine punctures, those of the elytra being somewhat dense and fine, while those of the abdomen are frequently much more minute ; elytra a good deal broader than thorax, and very little longer ; in male the top of seventh segment has a triangular incision, which has a slight marginal impression.

Length.—4½ mill.

Localities.—Victoria, River Paroo. Nuriootpa, Mr. Tepper's collection.

P. nigritulus, Grav., Micr., 41 ; Fauv., Fn. Gall.-Rhén III., 469 et syn.

Black, nitid ; mouth, base of antennæ, elytra and margins of abdominal segments more or less of reddish tinge ; feet testaceous ; tibiæ dark-brown testaceous ; elytra very slightly bronze-tinted ; penultimate joints of antennæ transverse ; head longer than broad, oblong and parallel, forehead slightly hollowed and furrowed, with subdiscoidal punctures on each side running obliquely; thorax narrow, parallel, the extremities obtuse, five rows of punctures on the back; elytra broader than thorax, very little longer, pretty deeply and rather densely punctate, while the abdominal punctures are much finer and closer; these latter organs have small sparse pubescence; in male the seventh segment has an obtuse incision below the apex, behind this a pretty deep triangular impression, smooth.

Length.—3-4½ mill.

Localities.—Asia, Europe, Africa, America, Victoria, Adelaide.

Obs.—Without doubt a cosmopolitan species, as *longicornis* and many others of the genus.

KEY TO SPECIES OF QUEDIUS.

The head transverse or orbicular.

A. Size large; elytra red; antennæ and feet blackish pitch; margins of all abdominal segments red. *fulgidus.*

B. Size medium or small; elytra not red, of one colour; clypeum red.

a. Abdomen all black, head small. *thoracicus.*

b. Abdomen black, anus reddish, head very large. *ruficollis.*

Q. fulgidus, Fabr.; Fauvel, I., p. 100.

Black, nitid; the elytra, margins of the segments, anus and tarsi red, antennæ brown except the base, somewhat robust, the 11th joint obliquely truncated; head large, suborbiculate, disc very obsolete, punctate densely and rather deeply behind the eyes; three large punctures situated in a curve between the eyes and neck; thorax transverse, a broad impression on each side, base rounded and sinuous, anteriorly somewhat narrow and inflexed; anterior extremities right angles, the posterior rounded; two punctures on each side close together on the front of the disc, three or four others on the sides arranged in a curve; elytra a little longer than thorax, rather deeply and densely punctate, the abdomen even more finely and thickly, with iron-gold pubescence, the last segment almost red, the sixth marked underneath with five bristly punctures; in male the head is much larger, broader, the top strongly depressed marginally; the sixth segment curved underneath, the middle impressed and pilose for about 5 m.; the seventh obtuse and finely emarginate, smooth, slightly depressed behind the incision. The palpæ, antennæ, and feet are sometimes red.

Length.—8-10 mill.

Localities.—Java, Asia, Europe, N. America, Melbourne, Tasmania. Nuriootpa, Mr. Tepper's collection.

Obs.—This species may have been imported here, although M. Fauvel writes that it is probably cosmopolitan.

Q. thoracicus, Fauvel, I., p. 103.

A third smaller than *ruficollis*, body impressed on each side, slightly convex, antennæ slender, dark brown about the top, the last two joints yellow; head minute, transversely orbiculate, base strongly constricted, breadth of the thorax greater than its length in *ruficollis*, less narrowed anteriorly, posterior angles obtuse, scutellum and elytra rather finely and closely punctate, slightly rugose, the punctures of the latter are the larger; best distinguished by the slender abdomen, which is acute, black all over, finely and rather densely punctate; in the male the seventh segments are somewhat alike.

Length.—5½ mill.

Localities—Sydney, Rockhampton, Adelaide, Swan River.

Q. ruficollis, Gravenhorst; Fauvel, I., p. 102.

Convex, black, with a little rather long and black pubescence, brilliant; thorax, front of the hips, top of sixth segment and whole of the seventh red; apex of antennæ and the tarsi reddish; the former slightly thickened, the joints slightly decreasing, the penultimate subquadrate; head large, shortly orbiculate, marked by three punctures on each side (two on the very margin of the eye), two others on each side of the base, others minute behind the eyes; thorax somewhat broader than head, strongly transverse, subsemicircular, anterior angles subobtuse, posterior strongly rounded, the third part of the disc in front marked by two punctures close together; scutellum has a reddish tinge, elytra somewhat densely and finely tinged with green; in male the top of the seventh segment is slighly incised subtriangularly.

Length.—7 mill.

Localities.—Sydney, Melbourne, Tasmania. Nuriootpa, Mr. Tepper's collection.

KEY TO SPECIES OF HETEROTHOPS.

a. Elytra black, punctuation rugose and squamose. *luctuosa.*
b. Elytra brown, punctuation not rugose. *picipennis.*

H. luctuosa, Fauvel, I., p. 107.

Somewhat like *H. binotata*, but a little larger, narrower both anteriorly and posteriorly, black, the first joint of the antennæ and the feet a dirty testaceous red, the tibiæ and antennæ pitch brown; black pubescence, abdomen slightly reddish; antennæ more slender and all the joints more elongated than in the other species; head oblong, much narrower and longer, eyes half as large again, marked by three punctures on each side (two on the inner margin of the eye); front of thorax narrower, the two punctures on the disc are nearer together; elytra a little shorter, a little more squamosely punctate, altogether black; abdomen much more sparsely punctate, especially the top.

Length.—6 mill.

Localities.—Melbourne, Adelaide.

H. picipennis, Fauvel, I., p. 108.

One-third smaller than *H. prævia*, much narrower, with more thin and fine dusky pubescence; antennæ a little more slender; head slightly narrower, eyes half the size, two punctures above the forehead and behind the disc; thorax little more than half the breadth, cylindrical, obconic, much broader anteriorly, much narrower posteriorly, head nearly quarter as broad again in front of the base; two punctures very near the middle of the disk; elytra dark brown, slightly tinged with bronze, longer and narrower, more convex, finely and pretty closely punctured, though not corrugated, right at the top pale; abdomen more sparsely punctured, slightly bronzy, the segments have a narrow margin of dark brown; feet dark brown, tarsi reddish.

Length.—$3\frac{2}{3}$ mill.

Localities.—Victoria, Adelaide.

3. Tribe Tachyporini.

Section Tachypori.

KEY TO GENUS.

Abdomen not marginal, body pubescent. *Conurus.*

KEY TO SPECIES.

Size large or medium; corselet rosy or testaceous red; elytra much longer than corselet, more or less smoky. *triangulum.*

C. triangulum, Fauvel, II., p. 101.

Of same size and having something of the appearance of *Tachyporus formosus*, but distinguished from it chiefly by the colour and punctuation; more shortly conical than *C. impennis*, somewhat nitid, convex, with rather sparse dusky pubescence, a pale pitch colour, the palpæ, first three joints of the antennæ and top of eleventh, and tarsi testaceous; thorax, elytra, suture, and third part of the apex curving from the scutellum, the 2, 5-7 segments and feet more or less red; the second segment with golden pubescence; less punctuation on the thorax, almost perceptibly rough, that of the elytra and abdomen is pretty dense and deeper; the 6-7 segments are paler; antennæ short, thickened, the 7-8 joints quadrate, 9-10 slightly transverse; thorax nearly semicircular, transverse, the anterior strongly curved and narrow, the posterior extremities abruptly truncated, it may be obtuse; the elytra about the apex are rather narrow, the thorax a little wider, slightly longer; the abdomen conical and shorter.

Length—3-4 mill.

Localities.—Victoria, King George's Sound, Adelaide.

Obs.—The relative punctuation easily distinguishes this species from all others of the same localities.

4. Tribe Aleocharini.

KEY TO GENERA.

Sect. I.—*Gyrophænæ.*

Labial palpæ of three joints. Mesosternal plate narrowed to the middle. *Brachida.*

Sect. II.—*Aleocharæ.*

Antennæ having eleven joints.

a. Anterior and intermediate tarsi of four joints, the posterior ones having five. Anterior and middle legs pubescent; labial palps of three joints; lower lip bifid; mesosternal plate keeled. *Bolitochara.*

b. Anterior tarsi of four joints, middle and posterior of five. Head not carried on a very slender neck. First joint of posterior tarsi a little elongated, not so long as the two following put together. The middle hips approaching one another. *Homalota.*

c. All the tarsi having five joints.

1. Head projecting, free from the corselet and attached at the base; first joint of posterior tarsi at least as long as the two following taken together. *Calodera.*
2. Head sunk in the corselet, or very slightly attached to the base; labial palps of four joints, maxillary of five. First joint of posterior tarsi nearly equal to the second. *Fauvelia.*

KEY TO SPECIES OF BRACHIDA.

Antennæ testaceous. *suturalis.*

B. suturalis, Fauvel, II., p. 107.

Short, stout, rather broad, somewhat nitid, rather densely covered with a fine yellow pubescence, abdomen having a scattered pile, the insect being a testaceous red all over. head and belt of 5-6 segments dusky, the antennæ short, slender, slightly thickened towards the apex, the first joint being thicker, 2-3 narrower, equal and elongated, the fourth short, transverse, 5-10 broader and very short; head somewhat densely and very finely punctate, thorax a little more thickly and deeply so, elytra pretty deeply but not more densely, slightly squamose; head large, transverse, subconvex, eyes large; thorax twice as wide as it is long at the base, rising to the dorsal region with a slight curve and becoming strongly narrowed, the base on each side curving, convex, equal, anterior extremities rounded, posterior obtuse; elytra a little longer than thorax, a very little broader, rather convex, curving near the extremities at the middle of the apex and on each side; abdomen broad, short, subparallel, a little narrower than elytra, the 2-3 segments rather frequently finely punctate, while the 4-6 have punctures scattered and deeper, the 6th has a wide yellow apex; in male the elytra are slightly tufted about the scutellum, medial suture crenose with 4 or 5 in form of a chain; the sixth segment is furnished with a medial denticulum running longitudinally and a little elevated. Female not found.

Length.—2⅓ mill.

Locality.—Adelaide.

Obs.—"It is doubtful whether this is identical with the *Homalota pallidipennis* of Mr. MacLeay. I cannot in every particular recognise it from the supposed description given in less than a line of that author."

Bolitochara.

B. discicollis, Fauvel, II., p. 131.

Same appearance and size as *B. varia;* red, nitid, with a little pubescence, the whole of the antennæ except the base reddish brown, the elytra, the whole of the 4-5 segments and the base of the sixth more or less widely, dark brownish black, the shoulders very often reddish; the antennæ somewhat thick, the fourth a little longer than wide, 5-10 sensibly shorter and transverse, the eleventh large, obtuse; head irregularly and on each side rather deeply punctate, thorax and elytra pretty densely and deeply so, the elytra being slightly squamose, the 2-5 abdominal segments almost only at the base, the sixth all over rather densely and much more finely punctate; thorax strongly transverse, one-third as broad again as the head; the whole of the disc is depressed, the sides in front of the middle are narrowed, the anterior parts strongly rounded; posteriorly the sides are rather narrow, the posterior angles being slightly obtuse; elytra nearly one-third broader than thorax, one-fourth longer, rather transverse; abdomen parallel, the base of the 2-4 segments exceedingly transverse, the fifth being slightly impressed.

Length.—3⅓ mill.

Localities.—Swan River, Adelaide.

KEY TO SPECIES OF HOMALOTA.

a. Abdomen obviously narrowed towards the top. Same appearance as the acuminate *Oxypoda*; elytra almost entire, anus and feet a testaceous red. *sordida.*

b. 1—Abdomen parallel. Corselet strongly transverse; head sunk into it; the fourth joint of antennæ transverse; body broad, short, not bronzy. *coriaria.*

2—Abdomen parallel. Corselet not at all or very little transverse; head sunk into it. The fourth joint of antennæ a little transverse; head, corselet, and elytra more or less brilliant, not shagreen; size medium or rather small. Corselet almost glossy or obsoletely dotted. *politula.*

H. sordida, Marsh, Ent. Brit., 514; Fauvel, II., p. 112.

Same appearance and colour as *Oxypoda lividipennis*; much smaller, fusiform, rather convex, black, rather opaque; mouth, antennæ, margin of the segments, anus and feet red; the tarsi and elytra testaceous, the latter dusky about scutellum; with very dense brown pubescence; the anterior parts of the body very frequently punctate very densely, the abdomen less opaque, thickly, finely, and equally punctated; antennæ very stout, elongated, the fourth joint slightly transverse, fifth to tenth subquadrate, the eleventh longer than the two preceding ones; the thorax convex, obsoletely furrowed, somewhat transverse, anteriorly pretty narrow, the posterior extremities very obtuse, the base a little curving, elytra a little broader and longer; in male the seventh segment subemarginate at the top, underneath conical, very much elongated; female underneath slightly elongated, deeply emarginate.

Length.—3-3$\frac{1}{3}$ mill.

Localities—Japan, Persia, Europe, America, Adelaide.

Obs.—This species appears to be cosmopolitan.

H. coriaria, Kraatz., Nat., 282; Fauvel, Fn. Gall., Rhén., III., 715, pl. VII., fig. 11, et loc. cit., I., p. 115.

In shape broad, short, convex as in *H. succicola* and *trinotata*; the body, and especially the head and thorax, nitid; these latter being very densely punctate obsoletely, the elytra often very finely, the second to fifth abdominal segments finely but sparsely punctate, the sixth nearly smooth; black; base of antennæ, elytra, and feet dirty testaceous; the former dark brown on the upper extremities; the antennæ stout, short, fourth and fifth joints, and especially sixth to tenth strongly transverse; head and thorax broad, the latter very short, in the male widely hollowed, in the female foveolate and slightly grooved, the sides anteriorly rather narrow; posterior extremities rounded; elytra wide, one quarter as broad again as the thorax, and one-third longer; in the male the seventh segment slightly incised above, curving outside the incision, on each side dentate.

Length.—2 mill.

Localities. — America, Europe, New South Wales, Port Augusta.

Obs.—This insect appears to be cosmopolitan.

H. politula, Fauvel, II., p. 113.

In appearance and colour very much like *Calodera australis*, but belongs to another genus. The antennæ not clubbed, a little thickened about the apex, longer, the fourth joint subquadrate, those following it slightly broader, somewhat transverse, the eleventh paler; the punctuation of the head and thorax (both of which are brilliant) is obsolete, that of the elytra very frequently in fours, very fine, that on the segments is the finest, 2-5 pretty dense, sixth more scattered; head smaller, narrower, and oblong, with smaller eyes; thorax more obscure, much longer, narrower, slightly transverse, a little narrower anteriorly than posteriorly, the sides somewhat rounded, the posterior extremities almost wholly rounded, the basal pits obsolete; elytra narrower, with pretty thick yellow pubescence.

Length.—$2\frac{1}{2}$, $2\frac{1}{3}$ mill.

Locality.—Adelaide.

Obs.—"This species appears to be the most common of those which I have seen from Australia."

KEY TO SPECIES OF CALODERA.

a. Body rosy; head, external angles of the elytra and an abdominal band black. *australis.*

b. Body black. *cribrella.*

C. australis, Fauvel, I., p. 119.

Same shape as *Ischnoglossa prolixa*, but smaller; subnitid, the abdomen being the brightest, a scattered yellow pubescence, convex, red, the first joint of antennæ, anus and feet testaceous; head, antennæ, elytra (more or less about the dorsal region), the whole of the 4-5 abdominal segments and the sixth about the apex either pitch brown or pitch black; antennæ stout, the 5-10 joints strongly transverse, eleventh conical and of good size; head oblong, with a small transverse impression between the eyes, rather densely and finely punctate, thorax more densely so, the elytra with a little deeper punctures and somewhat rough, those of the abdomen scattered but fine; thorax a little broader than head, rather transverse, the sides very much rounded dorsally, the base slightly narrowed, a pretty wide basal pit and an obsolete longitudinal line; elytra one-fourth as broad again as thorax, and a little longer; abdomen parallel, the base of the segments very slightly impressed; in the male the apex of the seventh segment is truncated above, densely and finely crenulate, on each side slightly denticulate, a small triangular prominence below.

Length.—2½ mill.

Locality.—Adelaide.

C. cribrella, Fauvel, I., p. 119.

A little smaller than *C. australis*, black all over, with more scattered and grey pubescence, antennæ dark brown, feet a dirty red, tarsi of lighter tint; antennæ more slender, the head having no impression, more sparsely and equally punctate, thorax deeply so, elytra thickly and finely, while the abdominal punctures are often slightly rough; thorax much narrower, subcordate, more convex, a little longer than broad, base foveolate, posterior extremities nearly right angles; elytra one-third broader than thorax, slightly longer; top of abdomen a little narrower, subnitid, the base of the 2-4 segments strongly impressed transversely.

Length.—2⅓ mill.

Localities.—Port Augusta, Adelaide.

Fauvelia, *Tate* (*Correa*, Fauvel).

Genus allied to *Aleochara*. Body parallel. Head much larger, more prominent. Mandibles stout, protruding. Eyes minute. Maxillary palps with a very distinct minute joint (fifth) added. Anterior and intermediate tibiæ very spinose. Tarsi short, five-jointed, the first joint of the posterior pair about two inches in length, the fifth equal in length to the three preceding put together.

This new generic group, from its five-jointed maxillary palps, should be placed near *Aleochara*, having much of the same appearance as the parallel species (*nitida*, &c.), although it rather recalls some species of *Oxytelus*. However, the totally different form of the posterior tarsi is sufficient distinction—the first joint of these being like *Aleochara*, half as long again as the following joint.

F. oxytelina, Fauvel, II., p. 128.

About the size of *Aleochara nitida*, but much longer and narrower, in appearance like *Oxytelus insecatus*, parallel, brilliant, with scanty short dark-brown pubescence, black, the palpæ, three first joints of antennæ, the elytra (except perhaps the very bottom and the sides, which are dark-brown), and the feet are bright red; antennæ slightly thickened, rather short, the fourth joint a little transverse, the following ones rather strongly so, the eleventh ovate; head and thorax striking, in the male broader than the elytra in both directions, the former very large, suborbiculate and convex, the latter transverse almost semicircular, anteriorly abruptly truncated, the anterior angles acute, sides parallel, base and posterior extremities rounded; head moreover punctured on each side scantily, but rather deeply; behind the eyes rather roughened by them; on the thorax they are scanty, only just visible, in female longer, anteriorly rather narrow; elytra small, slightly convex, a very little shorter than thorax, transverse, sparsely but somewhat deeply punctate, those of the abdomen (except the base of the segments) are minute,rather dense and slightly rough, on the sixth segment they are more scanty; in the male the seventh segment above the middle of the apex is finely margined, with numerous bristles, which are short and very slender, as if the part were ciliated.

Length.—4-4½ mill.

Locality.—Adelaide.

5. Tribe Phlœocharini.

Section Phlœochari.

Phlœocharis antipodum, Fauvel, II., p. 19.

Nearly double the size of *P. subtilissima*, much more depressed, slightly alutaceous, subnitid, densely covered with shorter pubescence, less opaque, head and thorax not at all opaque; reddish, back of the head and base of elytra dusky tint; mouth, antennæ, and feet a reddish testaceous; antennæ stouter, apex less thickened, the fourth and fifth joints quadrate, sixth to tenth slightly transverse; head pretty closely and finely punctured, those of the thorax often being deeper; the elytra, which are slightly scaly, having them closely, and a very little finer, on the abdomen (which is not alutaceous), they are very often somewhat deep, and in the form of a network; thorax much shorter, nearly twice as wide as it is long, anteriorly and posteriorly alike a good deal narrowed, about the posterior extremities slightly impressed, the disc a little depressed, obsoletely grooved; elytra parallel, abruptly truncated at the apex, same width as thorax, but nearly one-third longer; abdomen a little more broadly margined, the apex not so narrow.

Length.—2⅓-2⅔ mill.

Locality—Adelaide.

6. Tribe Pæderini.

Key to Genera.

Section Pæderi.

Posterior tarsi two-lobed in the fourth joint, or furnished with a membranous appendage; anterior tarsi expanded. *Pæderus.*

Posterior tarsi with the fourth joint simple, not furnished with a membranous appendage. *Lithocharis.*

Pæderus.

P. cruenticollis, Germ.; Fauvel, I., 55. **P. cingulatus**, Macleay, Trans. Ent. Soc., N.S.W., 1871, II., 146.

Corselet red; elytra blue, passing to green or to black; antennæ stout, rising; abdomen black. or at the fourth and fifth segments more or less reddish, sparsely punctate. Winged, black, nitid, with very long grey pubescence thinly distributed, elytra a purple tint, or greenish, or else blackish purple, thorax red in front of the hips, the fourth and fifth abdominal segments very often dark brown or red, the middle dusky, the first three joints of the antennæ reddish, beyond more or less pitch brown; these latter are stout, strongly clubbed about the apex and pilose, fifth and tenth joints sensibly broader; head oblong, eyes large, a pretty deep impression on each side running longitudinally to the base of the antennæ, head finely but sparsely punctate; middle of the disc and forehead smooth; mandibles black; thorax ovate, convex, same width as head, on each side finely but sparsely punctate; scutellum black and punctate; elytra a good deal broader than thorax, a little longer, thickly and deeply rugose, together with the abdomen pretty deeply but rather thinly punctate.

Length—6½-7 mill.

Localities. — Rockhampton, Melbourne, Tasmania, King George's Sound, Adelaide (type examples).

Lithocharis.

L. debilicornis, Woll.—Fauvel, II., 51.

Size very small, testaceous red all over. The smallest of the genus; in shape like *brunnea;* a little shining, having a sparse pubescence, the mouth, antennæ, elytra, and feet yellow; antennæ very short, moniliform; head and thorax very finely alutaceous, with rather deep dense punctures, those of the elytra being denser, while on the abdomen they are obsolete; head quadrate, having a space running lengthwise without any punctures; thorax subquadrate; the elytra one-third longer than the thorax.

Length—2½ mill.

Localities.—Siam, Japan, Persia, Egypt, Algeria, France, Adelaide.

Obs.—This insect is probably cosmopolitan.

Diagnoses of New Species of South Australian Plants.

Translated from Baron von Mueller's Fragmenta Phytographiæ Australiæ, vol. XI., No. xciii.

By Stirling Smeaton, B.A., Assoc. Roy. Soc.

[Read October 4th, 1881.]

Lasiopetalum Tepperi, F. v. M., op. cit., p. 109 (Ord. Sterculiaceæ.)

Tall; the leaves shortly petiolate, oblong-lanceolate and slightly curved, perfectly smooth on the upper surface, and on the lower velvety with a very fine light-coloured wool; *densely-flowered cymes*; *floral bracts narrow-lanceolate, almost petaloid and equal in length to the calyx;* the limb of the calyx deeply five-partite and downy within; the anthers linear-oblong, narrowing upwards; style smooth; ovary velvety.

Yorke Valley, Hundred of Maitland; *Tepper.*

A shrub four to five feet high. The leaves, on a single branch examined by me, about one and half inches long and about four lines broad, with the edge slightly recurved. The largest peduncles often half to two-thirds of an inch long. The pedicels generally a line long, here and there lengthened to three lines. The lower bracts, oblong-linear and very short; three floral bracts, almost three lines long, inside and outside covered with velvety spots. The calyx less hairy within than outside and almost red; the limb semi-lanceolate, rather sharp, and about three lines long. Petals rounded, brown or fox-coloured, incurved, ending with a short point, and about a line long. Anthers varying from blackish-purple to brown, shining, a little recurved, two pores at the blunted lighter-coloured point; a little more than a line long, and adnate; the filaments extended below the anthers to about one line in length. Style bristly, about half a line long. Fruit not known.

This plant is easily distinguished from all its allies by the large bracts under the calyx, except from *Lasiopetalum discolor*, from which it is removed by the much narrower leaves with their shorter petioles; the flowers more decidedly pedicellated and never with dense heads; the sharper bracts not overtopping the calyx so much; and the segments of the calyx not smooth within; it differs from *L. Baueri* by the broader leaves ; many-flowered cymes ; larger flowers ; bracts not much shorter than the calyx, but almost like the corolla ; the segments of the calyx narrower on account of their length ; anthers more slender ; it differs from *L. Behrii* by the sharper leaves not so remarkably roughened above, and the flowers of the cymes much more numerous ; the bracts under the calyx much larger and not so stiff, the outside of the calyx rather more purple than ashy, the segments of the calyx narrower and downy inside. It flowers principally in September and October.

It may perhaps be a hybrid plant sprung from *L. discolor* and *L. Baueri*, with which plants it occurs in a single locality, as the distinguished discoverer in communicating to me now confirms. From the large order of Sterculiaceæ of the whole world hitherto no hybrid plants are noted, except from the genus Mahernia. (See W. O. Focke, Die Flanzen-Mischlinge, p. 78 ; 1881.)

Commersonia Kempeana, F. v. M., op. cit., p. 113 (Ord. Sterculiaceæ.)

Velvety in spots ; leaves rhomboid or lanceolate-ovate, irregularly toothed, slightly crenulated, and underneath, towards the base, very prominently veined ; cymes very short or with thickly-set flowers hardly pedunculated ; *small calyx* obtuse before opening and almost angular, and split almost to the middle into deltoid teeth ; *the cup of the rather shorter petals with an oblong-spathulate claw three times longer than the incurved appendages ;* the staminodia semilanceolate and the petals smooth, the latter exceeding the former by a third part ; *anthers in two sets ;* style smooth ; seed vessel woolly.

In the neighbourhood of the Finke River ; *Kempe.*

Leaves rather flat, and mostly three-quarters to one and a quarter inches long, shortly or greatly petiolate, quite sharp, here and there some of them furnished with rather larger teeth, the upper surface a light green, very much lighter beneath. Calyx about two lines long, very slightly downy inside. The cells of the anthers globose to oval, red, and slightly at an angle. Styles cohering imperfectly into one. Fruit as yet unknown.

It is specially separable from *C. loxophylla* by the much narrower leaves, scarcely unequal-sided, petals broader upwards and almost equal to the length of the cup, and perhaps not so yellow. From *C. cuneata* again it is separable by the less crumpled and narrower leaves, but sharper, and with shorter crenulations, as well as the rather sharper lobes of the calyx ; probably distinguishable from both known ones by the fruit.

Pterostylis vittata, Lindley; F. v. M., op. cit., p. 126 (Ord. Orchideæ)

Robust, *with the numerous leaves of the stem narrow lanceolate*, having a broad base surrounding the stem, the edge slightly recurved; no radical leaves, the floral leaves similar to the others; flowers in a leafy raceme, nine in number, or fewer, here and there only two, rarely with only one; *the lower lip of the calyx orbicular-ovate, and hanging down*, of a deep red, and *split into two sharp, short lobes; the upper lip* below the middle line much swollen longitudinally, with broad striations, which are slightly red, and the interspaces lighter-coloured, ribbed, and shortly tufted, at an acute angle with the lower lip, and equal in length to it; *the labellum oval-shaped*, with a straight edge, apex slightly blunted, and also a little bent in and ciliated, from *the slightly two-lobed base of which* (*the labellum*) *is produced a semi-lanceolate linear tooth, which is a little ciliated and adnate below.* The labellum towards its centre swells on both sides, and has a dark-red colour; *the column is produced on both sides at the base into a semi-oval membrane; above, it is dilated on both sides into an appendage tending upwards, which is almost square, with a blunt point, toothed at the base, subulate and semi-lanceolate, and furnished with somewhat long hairs.*

Spread over West Australia and the neighbourhood of Swan River, as far as to the regions about King George's Sound; in the valleys near Mount Lofty (*Mueller*), near Port Phillip (*Walter*), on Wilson's Promontory (*Mueller*).

[It is not uncommon and gregarious under the shade of trees at high elevations on the Mount Lofty Range, also at Uley, Munno Para East, and at MacLaren Vale, Hundred of Willunga; Ardrossan *(Univ. Herb.)*]

The species can only be confounded with *P. longifolia*, but it is often more robust, with broader leaves, the bracts as if changed into leaves, the flowers therefore more axillary than racemose, the calyx of a deep colour, or slightly red-tinted and more strongly striated, the lower lip broader and almost gibbous, the surface of the labellum smooth, with the basal tooth sharp and plain and not roughened, the labellum also furnished with a swollen curved point, and less elongated; the column distinctly winged below, and furnished above with appendages elongated downwards.

In the taller examples (*i.e.*, those about two feet high) the lower part of the stem to the length of a span bears scales instead of leaves. Capsules ovate-ellipsoid, one-half to three-fourths of an inch long. Labellum easily excited by a light touch, as in its allies. Column, and the part below the apex, warty. *P. vittata* is earlier in its time of flowering than *P. longifolia*, generally about May to July the flowers appear;

but *P. longifolia* begins to flower at Port Phillip in August and continues in flower in October.

Stipa Tuckeri, F. v. M.; op. cit., p. 128 (Ord. Gramineæ.)

Dwarf; leaves rather flat with sheathing petioles, and nodes covered with a very soft hair; *the branches and branchlets of the spreading panicles rather long and with fine spreading hairs*, the lower verticillate, the upper fasciculate, the highest here and there double; *the exterior bracts short*, gradually narrowing to a very fine point and overtopping to some length the lower floral glume which is rather scaly; the awn, which is beardless, exceeds the glumes many times.

In the less fertile regions near the Rivers Lachlan and Darling, where it avoids the sand; *Gerard Tucker* (but passing over the South Australian borders—*F. v. M.*) This grass resembles closely *S. elegantissima*, from which it especially differs in the short stem, appearance of the leaves, the branches and branchlets of the panicles much shorter and bearded, the glumes twice or thrice shorter, the awn rather thinner, but not much shorter; taller, however, in appearance on account of the shortness of its glumes.

Supplement to a Census of the Indigenous Flowering Plants and Ferns

OF EXTRA-TROPICAL SOUTH AUSTRALIA.

By Professor Ralph Tate, Assoc. Lin. Soc., F.G.S., &c.

[Read October 4th, 1881.]

I.—ADDITIONAL SPECIES.

Violarieæ.

Hybanthus Tatei, F. v. Mueller; *M.S.*
Sa. Wilpena Pound. *R. Tate.*

Sterculiaceæ.

Hannafordia Bissillii, F. v. M., Frag. x., 95.
C. Finke River. *Kempe* (F. v. M., Frag. Phyt. xi., 115).
Commersonia Kempeana, F. v. M., Frag. Phyt. xi., 113.
C. In the vicinity of the Finke River. *Kempe.*
Lasiopetalum Tepperi, F. v. M., Frag. Phyt. xi., 109.
Sd. Yorke Valley, Maitland. *Tepper.*

Amarantaceæ.

Achyranthes aspera, Linn.; v., 246.
C. Finke River. *Kempe* (com. by F. v. M.).

Ficoideæ.

Zaleija decandra, Burman; iii., 329.
C. Lake Torrens. (com. by F. v. M.)

Myrtaceæ.

Eucalyptus Stuartiana, F. v. M.; iii., 243.
E. Mount Gambier. *J. E. Brown.*

Cucurbitaceæ.

Melothria Muelleri, Bentham; iii., 320.
M. "Not uncommon on sandy ground between the Great Bend and the junction of the Darling." *F. v. M.*

Rhamnaceæ.

Ventilago viminalis, Hooker; i., 411.
C. Finke River. *Kempe* (com. by F. v. M.).

Compositæ.

Quinetia Urvillei, Cass.; iii., 595.
Sc. Miocene sands, Golden Grove. *R. Tate.*
Calotis Kempei, F. v. M.; *vide post.*
C. Finke River. *Kempe.*

Gentianeæ.

Sebæa albidiflora, F. v. M.; iv., 371.
M. Lake Bonney. *E. Wehl* (com. by F. v. M.).

Liliaceæ.

Corynotheca lateriflora, F. v. M.; vii., 49.
C. MacDonnell Ranges. *Kempe.*
M. Murray River. (com. by F. v. M.)
Thysanotus exiliforus, F. v. M.; *vide post.*
C. MacDonnell Ranges. *E. Giles* and *H. Kempe.*

Orchideæ.

Pterostylis pyramidalis, Lindl., vi., 357.
Sc. Norton's Summit (*teste* J. Fitzgerald).
Caladenia cærulea, R. Brown; vi., 388.
Sc. Clarendon. *O. Tepper.*

Naiadeæ.

Naias major, All.; vii., 101.
C. Finke River. *Kempe.*
Sb. Pidinga. *J. Tietkins* and *Mrs. Richards* (com. F. v. M).

Cyperaceæ.

Carex breviculmis, R. Brown; vii., 445.
Sc. Golden Grove; *R. Tate;* and Clarendon; *O. Tepper.*

Gramineæ.

Panicum helopus, Trin.; vii., 476.
Panicum spinescens, R. Brown; vii., 499; and
Eriochloa annulata, Kunth; vii., 463.
M. West of the Darling River, passing over the S. Aust. boundary. *Bonney* (com. by F. v. M.).
Setaria macrostachya, H. B. et C.; vii., 493.
C. River Finke. *Kempe* (com. by F. v. M.).
Aristida leptopoda, Bentham; vii., 562.
M. West of the Darling River, passing over the S. Aust. boundary. *Bonney* (com. by F. v. M.).
Stipa Tuckeri, F. v. M.; Frag. xi., 128.
M. "Mallee Scrub, River Murray." *F. v. M.*
Sporobolus Lindleyi, Bentham; vii., 623.
C. Lake Torrens. *Lattorf* (com. by F. v. M.).
Eragrostis Brownii, Nees; vii., 646.
E. "From near the Glenelg River." *F. v. M.*

Danthonia bipartita, F. v. M. ; vii., 592.
M. "Several places in the interior of S. Aust." *F. v. M.*

Danthonia carphoides, F. v. M. ; vii., 592.
M. "Seen by me at the Murray River." *F. v. M.*

MARSILEACEÆ.

Pilularia globulifera, Linn. ; vii., 684.
Sa. Wilpena Pound. *R. Tate.*

II.—EXCLUDED SPECIES.

Scutellaria mollis, *Glossodia minor*, and *Adiantum hispidulum* have been erroneously included in the "Census." The claims of the following to rank as indigenous species are very doubtful :—*Polycarpon tetraphyllum*, *Chenopodium glaucum*, *Alchemilla arvensis*, *Lythrum Hyssopifolia*, *Adenostemma viscosum*, and *Picris hieracioides*.

III.—ADDITIONS TO THE GEOGRAPHICAL REGIONS.

Abbreviations :—*O.T.*, Mr. Otto Tepper ; *A.R.*, Mrs. A. Richards ; *R.T.*, Prof. R. Tate ; *Frag.*, Fragmenta Phytographiæ, by Baron F. von Mueller.

Myosurus minimus. *M.* Margins of lagoons, R. Murray (*R.T.*)
Ranunculus lappaceus. *Sa.* Hallett ; Wirrabara ; Wilpena (*R.T.*)
Ranunculus aquatilis. *Sa.* Wilpena Pound (*R.T.*)
Ranunculus rivularis. *Sa.* Ippinitchie Creek, Wirrabara (*R.T.*)
Ranunculus parviflorus. *M.* Pasture slopes of R. Murray Cliffs, opp. Morgan ; *Sa.* Hallett Hill ; Wirrabara ; Mt. Brown ; Wilpena (*R.T.*)
Hibbertia densiflora. *Sb.* Port Lincoln (Frag. xi., 92)
Cassytha glabella. *Sc.* Clarendon (*O.T.*)
Erysimum brevipes. *Sb.* Pidinga (*A.R.*)
Stenopetalum lineare. *Sa.* Wilpena Pound (*R.T.*)
Capsella pilosula. *Sb.* Fowler's Bay (*A.R.*)
Lepidium papillosum. *Sb.* Pidinga and Eurio (*A.R.*)
Lepidium ruderale. *Sa.c.d.* By omission
Hybanthus floribundus. *Sb.* Desert sandhills, 60 miles north of Fowler's Bay (*A.R.*)
Drosera auriculata. *Sa.* Wirrabara ; Wilpena (*R.T.*)
Drosera Menziesi. *Sb.* Hills near Franklin Harbour (*R.T.*)
Bursaria spinosa. *Sa.* Tickera and north to Wilpena (*R.T.*)
Comesperma scoparium. *Sb.* 60 miles north of Fowler's Bay (*A.R.*)
Comesperma calymega. *Sd.* Ardrossan (*O.T.*)
Thomasia petalocalyx. *Sd.* Maitland (*O.T.*)
Lasiopetalum discolor. *C.* Gawler Ranges (Frag. xi., 110)
Lasiopetalum Baueri. *C.* Gawler Ranges (Frag. xi., 110)
Malvastrum spicatum. *Sb.* Pidinga (*A.R.*)
Sida corrugata. *Sc.* near Wasleys (*R.T.*)

Sida intricata. *Sa.* Gladstone (*Francis*).
Sida petrophila. *Sb.* Pidinga (*A.R.*)
Euphorbia Drummondii. *Sb.* Franklin Harbour (*R.T.*)
Euphorbia eremophila. *Sb.* Pidinga (*A.R.*)
Phyllanthus thymoides. *Sc.* Clarendon (*O.T.*)
Parietaria debilis. *Sa.* Wirrabara; Mt. Brown; Wilpena (*R.T.*)
Dodonæa viscosa. *Sb.* Franklin Harbour (*R.T.*)
Hypericum Japonicum. *Sa.* Wirrabara (*R.T.*)
Elatine Americana. *Sa.* Wilpena Pound (*R.T.*)
Geranium dissectum. *Sa.* Hallett Hill, Wirrabara; Mt. Brown; Wilpena (*R.T.*)
Erodium cygnorum. *M.* Blanchetown to Morgan (*R.T.*)
Pelargonium cygnorum, *var.* erodioides. *Sa.* Wilpena (*R.T.*) *Sc.* Clarendon (*O.T.*)
Oxalis corniculata. *M.* Common on the Murray Plain (*R.T.*)
Eriostemon difformis. *Sb.* 60 miles north from Point Bell (*A.R.*)
Frankenia pauciflora. *Sa.* Tickera (*R.T.*)
Saponaria tubulosa. *M.* Sandy Places Murray Plain; *Sa.* Mt. Brown; Wilpena Pound (*R.T.*)
Stellaria multiflora. *M.* Sandy ground, Blanchetown, and Morgan; *Sa.* Rocky knoll, between Mount Bryan and Hallett Railway Stations (*R.T.*)
Sagina apetala. *M.* Morgan; *Sa.* Hallett Hill; Mt. Brown; Wilpena Pound (*R.T.*)
Spergularia rubra. *Sa.* Wallaroo; Wirrabara; Mt. Brown (*R.T.*)
Spergularia marina. *Sa.* Point Riley (*R.T.*)
Scleranthus pungens. *Sc.* Rocks by Little Para River, Section 1560, Hundred of Yatala (*R.T.*)
Claytonia pusilla. *Sd.* Muloowurtie (*O.T.*)
Chenopodium carinatum. *Sa.* Point Riley; Hallett; Mt. Brown (*R.T.*); *Sb.* Eurio (*A.R.*); Franklin Harbour (*R.T.*)
Atriplex holocarpum. *Sb.* Pidinga (*A.R.*); *Sa.* Kanyaka to Ediowie (*R.T.*)
Chenolea diacantha. *Sa.* Hallett (*R.T.*)
Chenolea enchylænoides. *Sa.* Wirrabara; Mt. Brown (*R.T.*)
Kochia oppositifolia. *C.* Bunda Cliffs, Gt. Bight (*R.T.*)
Kochia villosa, *var.* aphylla. *Sc.* Drift plain at Port Wakefield (*R.T.*)
Suæda maritima. *Sa.* Wallaroo Bay; *Sc.* Port Adelaide Creek (*R.T.*)
Tetragonia expansa. *Sb.* Pidinga (*A.R.*)
Polygonum prostratum. *Sa.* Wirrabara (*R.T.*)
Polygonum minus. *Sa.* Wilpena (*R.T.*)

Viminaria denudata. *Sa.* Wirrabara (*R.T.*)
Eutaxia empetrifolia. *Sa.* Mt. Brown (*R.T.*)
Goodia medicaginea. *Sd.* Kilkerran (*O.T.*)
Lotus australis, *var.* Behrianus. *Sb.* Eurio (*A.R.*)
Swainsona phacoides. *Sc.* Railway reserve northward from near Gawler (*R.T.*)
Glycine Latrobeana. *Sc.* Clarendon (*O.T.*)
Glycine clandestina. *M.* Murray Scrub about Blanchetown (*R.T.*)
Glycine tabacina. *Sb.* Pidinga (*A.R.*)
Cassia artemisioides. *Sb.* Pidinga (*A.R.*)
Acacia tetragonophylla. *Sb.* Pidinga (*A.R.*)
Acacia verticillata. *Sc.* Mt. Lofty Range (*R.T.*); Clarendon (*O.T.*)
Acacia acinacea. *Sd.* Muloowurtie (*O.T.*); *Sc.* Clarendon (*O.T.*)
Acacia pycnantha. *Sa.* Gladstone; Wirrabara; Mt. Brown (*R.T.*)
Acacia rupicola. *Sa* Wirrabara (*R.T.*)
Acæna ovina. *Sa.* Wirrabara (*R.T.*)
Tillæa macrantha. *Sb.* Between Venus and Streaky Bays (Frag. xi., 117)
Loudonia Behrii. *Sd.* Muloowurtie and Maitland (*O.T.*)
Haloragis teucrioides. *Sd.* Yorke Valley (*O.T.*); Mt. Lofty (*R.T.*); *Sc.* Clarendon (*O.T.*)
Haloragis tetragyna. *Sa.* Wirrabara (*R.T.*)
Epilobium tetragonum. *Sa.* Wirrabara; Wilpena (*R.T.*)
Leptospermum lævigatum. *Sd.* Muloowurtie (*O.T.*)
Melaleuca parviflora. *Sa.* Port Pirie district (*Francis*)
Melaleuca uncinata. *Sa.* Port Pirie district (*Francis*)
Eucalyptus leucoxylon. *M.* Tatiara; *Sa.* Mannanarie and Wirrabara (*J. E. Brown*)
Eucalyptus Behriana. *Sa.* Wirrabara (*J. E. Brown*)
Eucalyptus goniocalyx. *Sa.* Wirrabara; *Sc.* Mt. Pleasant (*J. E. Brown*)
Eucalyptus oleosa. *Sa.* Wirrabara (*J. E. Brown*)
Eucalyptus rostrata. *Sa.* Flinders Range (*J. E. Brown*)
Cryptandra amara. *Sb.* Eurio (*A.R.*)
Pimelea phylicoides. *Sb.* Sixty miles north from Point Bell. (*A.R.*)
Pimelea ligustrina. *Sc.* Clarendon (*O.T.*)
Grevillea ilicifolia. *Sc.* Scrub between Roseworthy and Wasleys (*R.T.*)
Hakea leucoptera. *Sd.* Ardrossan (*O.T.*)
Hakea multilineata. *Sb.* Sixty miles north from Point Bell (*A.R.*)
Banksia marginata. *Sa.* Wirrabara Forest (*R.T.*)

Santalum acuminatum. *Sa.* Tickera (*R.T.*) *Sc.* Clarendon. (*R.T.*)
Santalum persicarium. *Sa.* Tickera (*R.T.*)
Leptomeria aphylla. *C.* Bunda Plateau; *Sa.* Tickera (*R.T.*)
Hydrocotyle vulgaris. *Sa.* Wilpena Pound (*R.T.*)
Hydrocotyle callicarpa. *Sa.* Wilpena Pound (*R.T.*)
Hydrocotyle trachycarpa. *Sa.* Wilpena Pound (*R.T.*)
Xanthosia pusilla. *Sd.* Muloowurtie (*O.T.*)
Aster ramulosus. *M.* Blanchetown (*R.T.*)
Aster floribundus. *C.* Bunda Plateau (*R.T.*)
Aster pimeleoides, *var.* minor. *Sb.* 60 miles north of Point Bell (*A.R.*)
Aster calcareus. *C.* Head of Bight and Ooldea (*A.R.*)
Aster teretifolius. *M.* Murray Scrub at Blanchetown (*A.R.*)
Aster conocephalus. *Sa.* Tickera (*R.T.*)
Calotis cuneifolia. *Sc.* Magill (*Francis*).
Calotis cymbacantha. *Sb.* Eurio, and 40 miles N. from Point Bell (*A.R.*)
Calotis scabiosifolia. *Sc.* Government Farm (*Francis.*)
Calotis hispidula. *M.* Murray Plain and Flats (*R.T.*). *Sb.* Pidinga (*A.R.*)
Lagenophora Huegelii. *Sa.* Mount Brown; Wirrabara (*R.T.*) *Sb.* Hills near Franklin Harbour (*R.T.*)
Brachycome goniocarpa. *Sb.* Fowler's Bay (*A.R.*)
Brachycome pachyptera. *Sa.* Wirrabara; Mount Brown; Wilpena (*R.T.*)
Brachycome exilis. *Sa.* Mt. Brown (*R.T.*)
Brachycome calocarpa. *Sc.* Kapunda (*R.T.*)
Siegesbeckia orientalis. *Sa.* Mount Brown (*R.T.*)
Cotula coronopifolia. *Sa.* Jamestown; Wirrabara; Wilpena Pound (*R.T.*)
Cotula australis. *Sa.* Wirrabara Forest (*R.T.*)
Centipeda Cunninghami. *Sa.* Wirrabara (*R.T.*)
Elachanthus pusillus. *M.* On limestone soil, Morgan (*R.T.*)
Angianthus tomentosus. *Sa.* Wallaroo and northward (*R.T.*)
Angianthus brachypappus. *Sa.* Kanyaka; Wonoka; Ediowie (*R.T.*)
Angianthus pusillus. *Sb.* Pidinga (*A.R.*)
Angianthus strictus. *M.* Limestone soil, Blanchetown (*R.T.*) *Sb.* Bookerby near Fowler's Bay (*A.R.*)
Gnephosis skirrophora. *M.* Scrub east of Wellington (*R.T.*)
Calocephalus Brownii. *Sc.* Stony beach, Aldinga Bay (*R.T.*)
Calocephalus citreus. *Sa.* Wirrabara; Mount Brown (*R.T.*)
Cephalipterum Drummondi. *Sb.* Pidinga (*A.R.*)
Gnaphalodes uliginosum. *Sb.* Eurio (*A.R.*)
Cassinia spectabilis. *Sd.* Yorke Valley (*O.T.*)
Toxanthus perpusillus. *Sb.* Bookerby, Fowler's Bay (*A.R.*)

Podotheca angustifolia. *Sa.* Tickera (*R.T.*)
Leptorhynchus squamatus. *Sa.* Merna-Merna (*R.T.*)
Podolepis Siemssenia. *M.* Sandy scrub Blanchetown to Morgan; *Sb.* Stony hills about Franklin Harbour (*R.T.*); Pidinga, (*A.R.*)
Helichrysum scorpioides. *M.* Scrub east of Wellington (*R.T.*)
Helipterum floribundum. *Sb.* Pidinga (*A.R.*)
var. Stuartinum. *C.* Ooldea; *Sb.* Pidinga (*A.R.*); *Sa.* Wallaroo (*R.T.*)
Helipterum hyalospermum. *M.* Open stony ground Murray Plain (*R.T.*); *Sb.* Sandhills 60 miles north of Point Bell and Fowler's Bay (*A.R.*)
Helipterum corymbiflorum. *M.* Morgan.
Helipterum moschatum. *M.* Sandy ground, Wellington to Morgan (*R.T.*)
Helipterum pterochætum. *Sb.* Fowler's Bay (Frag. x. 109)
Helipterum exiguum. *M.* Blanchetown (*R.T.*)
Helipterum dimorpholepis. *Sc.* Inkermann, Munno Para E.; hill pastures about Blumberg; Islington (*R.T.*); Clarendon (*O.T.*)
Gnaphalium Japonicum. *Sa.* Wirrabara; Mount Brown (*R.T.*)
Erechthites picridioides. *M.* East of Wellington; *Sa.* Tickera (*R.T.*)
Erechthites hispidula. *M.* East of Wellington (*R.T.*)
Senecio Gregorii. *M.* Sandy ground, Blanchetown, Morgan (*R.T.*); *Sb.* Pidinga (*A.R.*)
Senecio lautus. *Sa.* Port Pirie (*Francis*)
Senecio Cunninghami. *Sb.* Fowler's Bay (*A.R.*)
Senecio odoratus. *Sa.* Wirrabara Forest (*R.T.*)
Cymbonotus Lawsonianus. *Sa.* Hallett (*R.T.*)
Lobelia anceps. *Sa.* Ippinitchie Creek, Wirrabara (*R.T.*)
Velleya paradoxa. *Sa.* Terowie; Wirrabara; Mount Brown (*R.T.*)
Goodenia albiflora. *Sa.* Wirrabara (*R.T.*)
Goodenia varia. *Sd.* Ardrossan (*O.T.*)
Goodenia glauca. *Sc.* Top of cliffs, Aldinga Bay (*R.T.*); *Sd.* Adrossan (*O.T.*)
Scævola linearis. *Sd.* Maitland (*O.T.*)
Sebæa ovata. *Sa.* Wirrabara Forest (*R.T.*)
Limnanthemum exaltatum. *Sa.* Ippinitchie Creek, Wirrabara; Wilpena Pound (*R.T.*)
Mitrasacme paradoxa. *Sc.* Highbury scrub, near Adelaide; about Blumberg (*R.T.*); Clarendon (*O.T.*); *Sd.* Ardrossan (*O.T.*)
Samolus repens. *Sa.* Ippinitchie Creek, Wirrabara (*R.T.*)
Jasminum lineare. *M.* and *Sa.* By omission.

Solanum simile. *Sc.* Scrub near Owen, Hundred of Dalkey (*R.T.*)
Solanum lacunarium. *Sa.* Woolundunga (*R.T.*)
Datura Leichardti. *Sa.* Parachilna (*R.T.*)
Anthocercis angustifolia. *Sa.* Wilpena Pound (*R.T.*)
Veronica distans. *Sc.* Goolwa (*Francis*)
Orobanche cernua. *Sc.* Sandhills, Holdfast Bay (*R.T.*)
Dichondra repens. *Sa.* Wirrabara; Mt. Brown; Wilpena (*R.T.*)
Halgania lavandulacea. *Sb.* 40 miles north of Point Bell (*R.T.*)
Echinospermum concavum. *Sa.* Hallett Hill; Mt. Brown; Wilpena (*R.T.*)
Cynoglossum suaveolens. *Sa.* Wirrabara (*R.T.*)
Cynoglossum australe. *Sa.* Clarendon (*O.T.*)
Mentha satureioides. *Sa.* Wirrabara; Wilpena (*R.T.*)
Prostanthera spinosa. *Sa.* Wilpena Pound (*R.T.*)
Westringia rigida. *Sa.* Tickera (*R.T.*)
Teucrium racemosum. *Sa.* Wirrabara; Mt. Brown; Wonoka; Wilpena (*R.T.*)
Myoporum viscosum. *Sc.* Torrens Gorge; Munno Para hills (*R.T.*); Clarendon (*O.T.*)
Myoporum deserti. *Sb.* Franklin Harbour (*R.T.*); Eurio (*A.R.*)
Eremophila viridiflora. *Sb.* 40 miles north from Point Bell (*A.R.*)
Eremophila alternifolia. *Sb.* Fowler's Bay; Eurio; Pidinga (*A.R.*)
Eremophila longifolia. *Sa.* Mount Brown (*R.T.*)
Eremophila latifolia. *Sb.* Pidinga (*A.R.*)
Styphelia Sonderi. *Sb.* Hills near Franklin Harbour (*R.T.*) Coffin's Bay (Frag. xi., 122)
Styphelia Richei. *Sd.* Black Point (*O.T.*)
Casuarina distyla. *Sa.* Wilpena Pound (*R.T.*)
Halophila ovata. *Sa.* Franklin Harbour (*R.T.*)
Thelymitra carnea. *Sd.* Yorke Valley (*O.T.*)
Microtis porrifolia. *Sa.* Wirrabara Forest (*R.T.*)
Pterostylis nana. *Sc.* Magill (*Francis*); Government Farm (*R.T.*); Clarendon (*O.T.*)
Pterostylis rufa. *Sb.* Eurio (*A.R.*)
Lyperanthus nigricans. *Sd.* Maitland (*O.T.*)
Caladenia Menziesi. *Sc.* Mitcham (*Francis*, *Fitzgerald*); Clarendon (*O.T.*)
Hypoxis pusilla. *Sa.* Hallett Hill; *Sb.* Hills about Franklin Harbour (*R.T.*)
Wurmbsea dioica. *M.* Murray Plain; *Sa.* Hallett; Wirrabara to Wilpena. *Sb.* Franklin Harbour (*R.T.*); Fowler's Bay (*A.R.*)

Bulbine semibarbata. *M.* Sandy soil, Morgan and Blanchetown; *Sa.* Point Riley; Mt. Brown to Wilpena (*R.T.*)
Bulbine vulbosa. *Sa.* Wirrabara (*R.T.*)
Thysanotus exasperatus. *Sb.* Eurio (*A.R.*)
Thysanotus Baueri. *Sd.* Sandhills, Muloowurtie (*O.T.*)
Dichopogon strictus. *Sa.* Bundaleer; Wirrabara; Mount Brown (*R.T.*)
Bartlingia sessiliflora. *M.* Scrub east of Wellington (*R.T.*)
Triglochin striata. *Sa.* Ippinitchie Creek, Wirrabara (*R.T.*)
Triglochin centrocarpa. *M.* Wet sandy ground, op. Morgan (*R.T.*)
Potamogeton natans. *Sa.* Wirrabara; Wilpena (*R.T.*)
Typha angustifolia *Sa.* Wilpena Pound (*R.T.*)
Xerotes effusa. *Sb.* Franklin Harbour (*R.T.*)
Xerotes juncea. *Sc.* Uley Scrub, Munno Para E. (*R.T*)
Xanthorrhæa semiplana. *Sa* .Bundaleer; Wirrabara; Wilpena (*R.T.*)
Luzula campestris. *Sa.* Wirrabara (*R.T.*)
Juncus bufonius. *Sa.* Wirrabara; Wilpena (*R.T.*)
Juncus prismatocarpus. *Sa.* Wirrabara; Wilpena (*R.T.*)
Juncus cæspititius. *Sa.* Wirrabara (*R.T.*)
Centrolepis aristata. *M.* Blanchetown (*R.T.*)
Centrolepis strigosa. *Sa.* Wilpena Pound (*R.T.*)
Cyperus vaginatus. *Sa.* Wirrabara; Wilpena (*R.T.*)
Heleocharis sphacelata. *Sa.* Wirrabara; Wilpena (*R.T.*)
Heleocharis acuta. *Sa.* Wirrabara; Wilpena (*R.T.*)
Heleocharis multicaulis. *Sa.* Wirrabara; Wilpena (*R.T.*)
Scirpus cartilagineus. *Sa.* Wirrabara; Wilpena (*R.T.*)
Scirpus nodosus. *Sa.* Wirrabara; Wilpena (*R.T.*)
Scirpus lacustris. *Sa.* Wirrabara; Wilpena (*R.T.*)
Schœnus Tepperi *Sb.* Hills near Franklin Harbour; *Sc.* Government Farm, and above third fall, Waterfall Gully, Mount Lofty (*R.T.*)
Schœnus Brownii. *Sd.* Maitland (*O.T.*); *Sa.* Wirrabara (*R.T.*)
Lepidosperma viscidum. *Sd.* Ardrossan (*O.T.*); *Sa.* Wilpena Pound (*R.T.*)
Cladium articulatum. *Sa.* Wilpena Pound (*R.T.*)
Cladium psittacorum. *Sc.* Moist gullies, Mount Lofty (*R.T.*)
Carex paniculata. *Sc.* Scott's Creek (*O.T.*) and R. Onkaparinga near Clarendon (*R.T.*)
Carex tereticaulis. *Sa.* Wirrabara; Wilpena (*R.T.*)
Carex vulgaris. *Sa.* Wirrabara; Wilpena (*R.T.*)
Carex Gunniana. *Sa.* Wilpena Pound (*R.T.*)
Lappago racemosa. *Sb.* Fowler's Bay (*A.R.*)
Neurachne alopecuroides. *Sa.* Wirrabara (*R.T.*)
Anthistiria ciliata. *Sa.* Bundaleer to Wilpena (*R.T.*)
Dichelachne crinita. *Sa.* Wirrabara; Wilpina (*R.T.*)

Agrostis Solandri. *M.* Margin of lagoons, R. Murray (*R.T.*)
Amphibromus Neesii. *Sd.* Yorke Valley, Maitland (*O.T.*)
Poa cæspitosa. *Sb.* Fowler's Bay (*A.R.*) ; *Sc.* Holdfast Bay (*R.T.*)
Poa nodosa. *Sb.* Fowler's Bay (*A.R.*).
Poa syrtica. *M.* *Sd.* Sanddunes, Muloowurtie (*O.T.*)
Triodia irritans. *Sb.* Franklin Harbour (*R.T.*)
Danthonia penicillata. *Sa.* Bundaleer to Wilpena (*R.T.*)
Lepturus incurvatus. *Sb.* Fowler's Bay (*A.R.*) ; *Sa.* Ippinitchie Creek, Wirrabara (*R.T.*)
Ophioglossum vulgatum. *Sb.* Eurio (*A.R.*) ; Yadmana, Franklin Harbour (*R.T.*) ; *M.* Sand knolls opp. Morgan (*R.T.*)
Cheilanthes tenuifolia. *Sa.* Tickera, Flinders Range ; *Sb.* Hills about Franklin Harbour (*R.T.*)
Pteris aquilina. *Sa.* Wirrabara (*R.T.*)
Asplenium flabellifolium. *Sa.* Wirrabara (*R.T.*)
Grammitis rutæfolia. *Sa.* Mt. Brown ; Wilpena. *Sb.* Hills about Franklin Harbour (*R.T.*)
Grammitis leptophylla. *Sa.* Wirrabara (*R.T.*)

Descriptions of Two New Species of Plants.

By Baron F. von Mueller, K.C.M.G., F.R.S., &c., Hon. Member.

[Read October 4, 1881.]

Calotis Kempei, *spec. nov.* *(Section Anacantharia.)*

Upright, short glandular-downy; lower stem-leaves narrow-lanceolar, sessile, remotely and sharply serrated; upper leaves gradually smaller and toothless; scales of the involucre ovate-lanceolar, pointed; ray-flowers yellow; achenes semiellipsoid-cuneate, tubercular-rough, slightly glandular-downy; pappus membranous, broadly annular, undivided, rolled inward at the margin, quite destitute of prickles.

In the vicinity of the River Finke, MacDonnell Ranges. *(Rev. H. Kempe.)*

In habit similar to the broad-leaved forms of *C. erinacea*; in fruit more like *C. cuneifolia* and *C. dentex*, but differing from these, and indeed from all others, in the form of the pappus—so abnormal that the plant might generically be separated from the other species under the above sectional name.

Thysanotus exiliflorus.

Dwarf, smooth; branches of the panicle dichotomous; bracts very short, semilanceolar, acuminated; pedicels mostly two, rarely three together, or solitary, shorter than the flower, jointed below the middle; flowers exceedingly small; the inner sepals merely narrowly purple, and very minutely fringed; all sepals blunt; stamens six; anthers all of nearly equal length, oblong-linear, reaching up to two-thirds of the sepals.

On MacDonnell Ranges, *E. Giles;* near the Finke River. *Rev. H. Kempe.*

The few specimens of this miniature "fringe lily" seen, a span high, accompanied by separate tubers of large size when compared to the stem of the plant; these tubers smooth, pale, ellipsoid-cylindrical, $1\frac{1}{2}$ to 2 inches long, gradually attenuated at each extremity, held by long descending fibres. Leaves, none with the stem; perhaps soon drying up. Sepals only two to three lines long, the inner along the median line broadly greenish; filaments very short; anthers oblong-linear, blunt, about one line long; ovary spherical, three-celled, with two ovules in each cell; fruit not yet obtained.

This Thysanotus differs from all others in the singular smallness of its flowers; in systematic characteristics it approaches as well *T. isantherus* as *T. asperatus*.

THE ANNIVERSARY ADDRESS.

By PROFESSOR RALPH TATE, Assoc. Lin. Soc., F.G.S.; Corr. Memb. Acad. Sc. Philadelphia; Roy. Soc., Tasmania; Lin Soc., N.S.W., &c., &c.

GEOLOGY IN ITS RELATION TO MINING AND SUBTERRANEAN WATER SUPPLY IN SOUTH AUSTRALIA.

Because of the activity and spirit which now pervades our mining community, and of the more extended search for underground supplies of water in arid regions which is now being prosecuted, I have thought that the present occasion may not be an inopportune one to discuss the nature and character of these several enterprises from the geologist's point of view. In a general way the information that is gleaned from each underground exploration commences and finishes in itself; whereas I would regard it as furnishing its quota to a store of experience from which we may deduce some guiding laws to replace the haphazard methods of search so prevalent in this colony. The exceedingly short time that has been given me to prepare this address has not permitted me to obtain as much specific information as is desirable; nevertheless, after reviewing the observations already collected, I believe that the deductions to be submitted are brought within a measurable distance of completeness.

GEOLOGICAL SURVEYS.

Geological science is of much practical use by itself, and its practical use is greatly enhanced by the aid afforded by chemistry and physics. Although geological knowledge is comparatively inexact, yet it becomes more exact as our knowledge advances. So-called "practical" men entertain a contempt for what they consider the "theoretical" opinions of geologists. The former trust to mere empirical guidance; whilst the geologist, who is trained to acquire comprehensiveness, power of observation, and the invaluable habit of taking all the facts into consideration to the exclusion of none, applies known systematised facts for discovering the unknown. As an art geology has done great service to mankind, and were it needful I could adduce numerous examples of the waste of money in connection with mining enterprises, in wilful ignorance of geological results, or in spite of the warnings of geologists. Of the practical good that has come of the enlightened application of theoretical knowledge of geology, I may refer to the many successful artesian wells, which but for the aid of the geologist would never have been sunk. Therefore, let the practical man believe in and respect the slowly and carefully-reached conclusions of geologists, certainly to take them into consideration, so far as to comprehend them and to govern himself by them in his own collection and collation of facts relating to his own pecuniary interest.

Here I must crave your indulgence to refer once more to the great importance of commencing a geological survey of the province. In January, 1877, this Society brought this question under the notice of the Government; later on a resolution in favour of such a survey was carried in the Assembly with the express approval of the Ministry then in office, but no steps were taken to give effect to those resolutions. Now, after a lapse of nearly five years, we look back with regret at the many opportunities which have occurred in which the services of a geologist would have been of inestimable benefit to the country. Perhaps at no time in the industrial history of this colony could we have realised the value of a systematic survey more than at the present.

Though undoubtedly the chief object of a survey is to construct a geological map, yet the basis of a map may vary according to the special requirements. It may be a purely scientific one, whereon the stratigraphical features are depicted —that is to say, the map may be coloured to represent areas occupied by strata of different epochs; or it may be coloured to represent lithological features, in which case it is industrially valuable because it indicates the different rocks and soils, irrespective of their geological age. It is an advantage that the geologist should precede the discoverer of minerals, for though he is not necessarily a prospector, yet he indicates the regions where prospectors will be more likely to find what they are in search of. Where the geologist precedes the miner or cultivator of the soil he gains information which will enable the agriculturist the better to select his land, or the miner to search for mineral treasures.

The chief object of a geological survey is to represent on a map the rock features of a surface, from which any intelligent man would deduce the absence or presence of any useful minerals, the nature of soils, the sources of subterranean drainage, and also the nature of waters. It indicates the best routes for roads, the proper sites for dams. The attention of the geological surveyor is given, among other matters generally beneficial to the progress of a great community, to the materials for the construction of roads, houses, bridges—such as building stones, limestones for the manufacture of quick-lime, sand, clays for bricks and earthen pipes, as well as for potters' use; also to the various soils and subsoils, and their adaptability to the growth of different kinds of crops and forest trees.

It may be argued against a geological survey that we have had several already; but these have been more noticeable for negative results than for any positive information. A survey to be thorough would involve a work of several years, while those which have been made only occupied a few months in the aggregate.

In 1856 a search for gold under the direction of Mr. Babbage resulted in nothing more than a further geographical exploration of the colony.

In 1859, Mr. Selwyn, then director of the geological survey of Victoria, was invited by the South Australian Government to visit the colony for the purpose of examining into and reporting on the geological evidence of the probable extent and character of its gold-bearing rocks, also upon any indications of workable coalfields, and the applicability of the artesian principle for securing a permanent supply of water in the northern districts, and generally upon the geological structure of the province. The explorations of this accomplished geologist extended in time from May 3 to June 24, and covered a very large tract of country. He was able to furnish little more than a mere catalogue of rocks, and a sketch map of the geology of the country extending from Cape Jervis to the latitude of Beltana, which nevertheless will furnish a foundation for future detailed surveys.

In 1864, Mr. E. H. Hargraves examined the country for the purpose of the discovery of a workable goldfield, but his report is devoid of scientific value, if we except those portions which have been borrowed from Mr. Selwyn's, whose track he pretty closely followed.

In 1866, the Rev. J. E. Tenison Woods reported on the geology and the mineralogy of the south-eastern district of South Australia. This report is in part an epitome of his work entitled "Geological Observations in South Australia, 1861," and describes the geological and physical features of an extremely interesting district. From the fact that no older rocks than Tertiary are known to occur in the district it can have no interest to the metalliferous miner. Mr. Woods has, however, shown the existence of various rock materials of considerable industrial value, and how by an attentive study of the geological features the drainage of the district may be accomplished at a very moderate cost. The sketch map of the geological features is the most detailed of the kind that had been presented to the South Australian public, but, as might be expected, the boundaries of the formations are only approximately sketched in, and are not from actual survey.

In 1872, Mr. Ulrich examined and reported on the mineral resources of the country north of Port Augusta. As he was required to do nothing more than to examine as many mines and mineral discoveries as the time at his disposal permitted, and to give their descriptions, it is pleasing to find his report is more than a mining engineer's account of the mines examined, as it contains records of geological observations which will be useful to those who may have to re-examine the country.

Significant evidence of the importance of a geological survey is afforded by the fact that nearly every civilised country has been geologically surveyed or is in process of survey. Even Japan has a survey and a large geological department, consisting of several Americans and a number of specially trained Japanese. Among the Australasian colonies, South and West Australia are the only ones that have not undergone some kind of systematic examination. The staff of a Geological Survey Department would be incomplete without the services of a chemist as public analyst, whose independent position would guarantee his conscientiousness. Too often a chemist is forced to untrue results, or by a concatenation of circumstances becomes careless in his professional habits, and learns the dishonest method of making up his results commonly called "cooking" by the profession. A great useless expenditure in mineral prospecting, which is a loss to the State, might be saved by the appointment of an analyst. Indeed the benefits to be derived from an analytical supervision in this and other directions are too obvious to need recounting at my hands.

PROSPECTING AND MINING FOR GOLD.

The geological distribution of gold in South Australia is restricted to the Pre-Silurian rocks, certain gravels of the Miocene period, and to drifts of later age. In the first, it occurs disseminated in veins of quartz; in the second and third cases as alluvial gold. The auriferous veins are confined for the most part to the middle portions of the Pre-Silurian strata. The commonly occurring rock which encloses the auriferous veins is a mica slate, as in the Blumberg, Williamstown, and Waukaringa areas; but on the east slope of the Mount Lofty Range gold-bearing quartz veins are included in talcose slates, and in the Echunga district in gneiss. No gold has been found in the numerous granite veins intruded among the metamorphic rocks just referred to, nor do I know of any discovery of it in the metamorphic granites (micaceous or hornblendic) which they superiorily succeed.

The mica slates are rich in interlaminations of quartz, which have invariably given rise to local contortions, the amount of disturbance being somewhat proportionate to the magnitude of the intrusions, which sometimes is considerable. These quartz masses are usually lenticular in shape, and some have been found to be auriferous, and, in consequence, have been mistaken for true reefs or leaders. These interlaminations of auriferous quartz may be more frequent and more widely distributed than has been ascertained, and the gold drifts may in some measure at least be due to their denudation.

The exploitations for gold are so few that I cannot venture to group the auriferous reefs according to the character of the matrices, the direction of their lines of outcrops, or to the general bearing they have to the prevailing strike of the containing rocks.

Distribution of Gold in the Veins.—A summary statement of my South Australian experiences is that the auriferous portion of the vein is of limited extent horizontally, and that the precious metal is not well diffused throughout the quartz, but is for the most part gathered in patches, or what the miner calls "pockets," so that a barren quartz occupies large sections of the vein. This circumstance introduces an element of great uncertainty in ascertaining the payable character of the vein, and has largely operated in the past to discourage extensive explorations.

The Waukaringa lode is the most defined at the surface of all the auriferous reefs in South Australia with which I am acquainted. It is traceable for many miles, but its auriferous nature, as it appeared to me on the occasion of an inspection five and a half years ago, was fullest developed in the Alma claim, from which on either side it deteriorated rapidly concurrent with the change of the matrix from a quartzose hæmatite to pyrolusite. Nevertheless, I sincerely trust that the many explorations that have been carried on during the last few months on distant parts of the reef have proved that my observations if correct are only applicable to the superficial parts of the lode, and that they have revealed a more encouraging feature than that which was seen by me. Here I may be allowed to state that I have no pecuniary interest in any mine or mineral property in South Australia, and that any statements of mine in reference thereto are but expressions of honest conviction.

With regard to the chances of our reefs carrying payable gold in depth, I may refer, by way of introducing the question, to the opinion of that celebrated—perhaps the best—authority on the occurrence of gold in the Palæozoic rocks, the late Sir Roderick Murchison, who propounded in his "Siluria," 1859, when writing of the Victorian gold-fields, the hypothesis that the gold in quartz reefs would gradually decrease in quantity downward and ultimately run out, or at least cease to be payable to work at a limited depth. His reasons for the prognostication were based upon mining experiences in other gold countries than Australia. But the exploitations of the Victorian reefs have proved that some at least are payable even at depths which certainly do not deserve to be called limited. In later years the results of deep mining in Victoria have still more fairly established the downward extent of the gold, and several reefs are at present being profitable worked at depths of a thousand feet and upwards; the recent discovery of an auriferous lode at Stawell is likely to carry the depth down to 1,700 feet. Sir R. Murchison, in his last edition of "Siluria," 1867, acknowledged that the results of quartz-mining in Victoria put former general experience at fault, and inferred that quartz reefs of similar character and geological relations might offer similar chances of success in depth. Nevertheless, "though rich yields from great depths are by no means rare, we do not, on the whole, find such rich quartz in the deeper levels of our mines as was obtained from the surface outcrops."—R. A. F. Murray, F.G.S., Geol. Surv. of Victoria, in *Australasian*, Sept. 24, 1881.

Is this new experience applicable in judging of the chances of similar quartz reefs occurring here? My own observations have led me to hold the opinion that the reefs do not resemble each other, having a similarity neither of character nor of geological relations.

Firstly, as to the geological relations of the auriferous veins in Victoria and in South Australia. Sir R. Murchison writes:—"The most prolific sources seem to have been the quartzose veinstones which traverse the Lower Silurian slaty rocks." Now, Mr. Selwyn has satisfied himself—and it is generally accepted—that the gold quartz veins of Victoria are confined to rocks of Lower Silurian age, chiefly those which are included between the Llandeilo and Upper Llandovery formations. "In every part of the colony," says he, "where such rocks appear on the surface they are intersected almost invariably in a meridional direction by quartz veins, from the thickness of a thread to the dimensions of 10 or 15 feet, and in marvellous abundance. Not one per cent. of these "quartz reefs" has as yet been touched by the miner, and therefore the only evidence we have at present of their containing gold is in the richly auriferous and widely spread Tertiary deposits, which everywhere accompany them, and which have undoubtedly been derived from their pre-existing upper surfaces." Though Mr. Brough Smyth has represented, in the "First Sketch of a Geological Map of Australia," 1875, published under the authority of the Victorian Government, our metalliferous rocks as belonging to the same period of time as the gold-bearing Lower Silurian rocks of Victoria, yet this is only one of the many inaccuracies which render the South Australian portion of that map almost valueless. Elsewhere it has been shown that our metalliferous rocks are overlain unconformably by fossiliferous rocks of Lower Silurian age, and therefore they must belong to a vastly older formation.* From the circumstance of their inferior stratigraphical position to the Lower Silurian we have applied to them the tentative designation "Pre-Silurian."

Secondly, as to dissimilarity of character. In Victoria the auriferous reefs consist mostly of massive white quartz, and are plainly exposed on the surface. The active and sanguine spirit of enterprise which has been exhibited by the mining community of Victoria in the last few years has been well rewarded by the discovery of auriferous reefs and drifts beneath the basaltic cover in the Ballarat, Clunes, and Creswick districts. There reefs abound all through the gold-fields; but, as it is commonly said, ninety-nine in a hundred prove barren; however, the hundredth one carries gold throughout its mass. Here the reefs are more frequently of a mullocky character, and are more or less covered by detrital matter; iron ores largely prevail, and often those of manganese, intermixed with the quartz, whilst the gold is fitfully distributed in the matrix, though most quartz reefs hitherto explored have proved to contain some gold. Thus, from a general comparison between this colony and Victoria as to the facilities of prospecting for, and the chances of the existence of, remunerative gold reefs, I must say that there are serious obstacles, arising from the dissimilarity of character of the veins, and from the widely different ages of the strata. But the occasion for an earnest study of the question, Is the distribution of reef-gold limited in depth? is as yet far distant, seeing that we have not yet satisfied ourselves as to its persistency near to the surface.

Examining our auriferous veins *per se*, their characteristics point to the probability that the gold occurs more abundantly near to the surface, especially so in the case of the veins charged with iron pyrites. Iron pyrites I have experimentally determined to be a solvent for gold, in the same way that iron is for carbon, as in cast-iron. By access of moist air the iron pyrites

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* Mihi, Trans. Roy. Soc. S. Aust. II., p. xiv.; Tepper, id. pp. 76-77; Scoular, id. vol. III., p. 112.

is oxidized and transformed into hydrated oxide of iron, and the gold is set free in a finely divided state; but the particles of gold at the moment of liberation seem to have the property of welding together to form grains or nuggets. Pseudemorphs of brown hæmatite after iron pyrites are common objects in the upper parts of the majority of our auriferous veins, from which may be inferred the existence of iron pyrites at lower depths. In consequence of the process to which I have just referred, the quantity of free gold in a reef will diminish with the increase of depth from the surface. But disintegrating agents are constantly reducing the virgin matrix of the reef to a *gossan* or *mullock*, through which some quantity of the liberated gold works its downward course, beyond the reach of the denuding agents which are reducing the absolute height of the reef, concurrently with the formation of *gossan* in depth. Under these circumstances the quantity of free gold is constantly accumulating in the *gossan*. The knowledge of this fact, as also that of the distribution of gold in horizontal extent, may be profitably applied to the mode of preliminary exploitation of a reef. The common method is to sink a shaft through barren ground to intersect the reef at a certain depth, by which the existence of the vein is proved and its auriferous character determined at that depth; whereas the same sum of money spent in opening on the vein would serve the first object equally well, whilst from the vastly large extent of vein that is brought under examination a more reliable estimate of its auriferous value can be formed, and no dead labour is entailed, that is if the veinstone contain a payable quantity of gold.

I cannot refrain from adding, by way of concluding this section of my address, some remarks which, though beyond the scope of my subject, are yet worthy of consideration as affecting the prosperity of our gold-mining industry. I sincerely hope that we have entered on a new phase of gold mining, so to work our gold mines as to yield profit. Let but one of the many ventures now before the public prove a success—and I am very hopeful in respect to some of those on the Waukaringa lode—I do not doubt but that other mines will be similarly so energetically developed as to prove prosperous. Hitherto the value of our gold reefs has never been fairly tested. The want of success is to be sought rather in methods pursued than on account of the percentage yield of gold A mine to be prosperous must be under skilled management, and the working expenses must be on a liberal scale. One held by a proprietary has a better chance of success than one worked by a Company, for several reasons; but a prominent one is that in the former the good business principle is acted on of making the mine provide for its own development.

Mines have been abandoned through ill-advised disposition of funds—too often niggardly forthcoming; whilst, on the other hand, good mines have been ruined through a desire to grow suddenly rich, by which the future well-being of the mine has been sacrificed for a temporary gain. Spain during its commercial greatness passed wise laws regulating mining, equitable and liberal, based on the principle that minerals are sources of national wealth to benefit not only ourselves, but future generations. According to Spanish law all exploitations are to be carried on in such a way that future extension of mining operations shall not be impeded by those in progress. Fluctuations in the price of labour and other concomitant circumstances largely determine the commercial value of the mine, and under adversity there is a tendency "to pick the eyes out of it," to use a miner's phrase, which must always be detrimental to profitable work in the future. By the Spanish law such an act would entail forfeiture of the mine.

Is it a fact that the public are ignorant of the veriest elementary principles of geology as applied to mining, or is it only that so-called professional miners think so? At any rate, the latter must be true, if the former charge is repudiated, if one may judge from the allegations so frequently made in official reports of mines. To cite a few:—"Just touched quartz rock, a certain indication of petroleum; expect to strike oil in the course of next week." "The reef from surface indications promises to open out to a great width at about 15 or 16 fathoms." "Now down about 50 feet, but they do not expect to strike oil until they reach a depth of 150 feet." "'Ernie,' on coal and petroleum, writing on the Pennsylvanian mines, says that 'if a strata of mica, sulphur, and quartz is gone through, that is a certain indication of oil,' and that is precisely the strata the Company is passing through. We were informed that some American petroleum prospecting experts had visited the mine, and they stated that the indications were the best they had ever seen, and they offered the Company £10,000 for the lease, which was refused." A district in the North was declared by a diamond-seeker, returned from Cape Colony, to forcibly remind him of the appearance of the country about the South African diamond-fields, and perforce it must also be diamantiferous. Equally fallacious reasonings have given us several coal-fields. Many other such misleading statements might be quoted. In alluding to them I have no intention to charge the authors with wilful deception; some have given an opinion to the best of their judgment, whilst with others "the wish has been father to the thought." I have no desire to disparage honest studious thought, but I must point out the necessity of balancing honest thought with a due weight of honest facts. An educated public opinion is what is wanted with regard to this and other kindred matters, and to that end is the object of the present effort; and I may add without much fear of contradiction that those who claim to themselves the office of guiding public opinion are pre-eminently conspicuous by their inability to interpret phenomena, to apply facts in the right direction, and to perceive fallacious deductions. One day we have an article summarising the experiences of scientific men, whilst in the next week the wild notions of a charlatan are set forth and commented upon in a highly pernicious spirit.

For the future prosperity of mining, I would have every would-be investor in mining enterprises sift facts from conjectures—a few of the former interwoven among the latter too often lend a false colouring to the whole. I would not accept anything which cannot be demonstrated or that is not within the range of reasonable probability. If a quartz vein is proved to carry gold at intervals along its outcrop it may fairly be inferred that it is auriferous in the unexplored parts, but we cannot predicate therefrom that the lode will continue to preserve that character to any given depth. Gold is not won by hope; indeed, it is a trite saying, not far from the truth, "that it takes a gold mine to work a gold mine," which is traceable to the fact that as much money is spent in unprofitable mines as the value of gold raised from more favoured ones. Ruinous speculations are more often than otherwise the consequences of estimating the value of a mine on what is not seen, instead of on what is within observation.

One disadvantage which has resulted from the unsatisfactory way in which we have hitherto carried on our gold-mining enterprises is that we have not attracted to us suitable men as mine managers. Indeed, no undertakings have been considered to be of such magnitude as to require the services of a properly-qualified mine engineer. We seem to possess none, or few better than the "pick-and-shovel" captains, who happily no longer occupy prominent positions in well-appointed European mines, as it is found better to pay a high salary to a thoroughly efficient officer than to trust wealth to the hands of men who abuse the trust. A mining engineer requires a very careful training, inasmuch as the art of mining consists in the application of several different sciences, because of the variety of the processes which have to be carried out in the raising of the minerals, and in the extraction of the metal from its ores. As a temporary measure to meet the want of skilful management I would suggest that the several Gold-Mining Companies co-operate to secure the services of a technical adviser or consulting engineer.

Distribution of Alluvial Gold.—The chief source of alluvial gold in South Australia is that of the high-level gravels belonging to the later part of the Miocene epoch, which, from the circumstance of their occurrence at considerable elevations above the upper limits of the marine beds of Miocene age, we have called "Upland Miocene." The best-known examples of these gold drifts are those of Echunga and Barossa. Where are the veins which supplied the gold of these drifts? In respect to the former area, some at least are known, but as regards the latter, either they have been almost wholly removed, or a large supply of gold has been derived from the denudation of the inter-laminations of quartz which so frequently occur in the micaceous schists of this area. If the drift-gold of Barossa has been derived from the waste of known reefs, then must it have been from a northern extension of the Lady Alice or from those reefs immediately to the east of it; but in nowise could the drift deposits known as Barossa proper be derived from the Malcolm's Barossa Reef, the position of which is incompatible with such hypothesis.

In the search for the sources of alluvial gold the geologist comes to the aid of the gold prospector. He determines the nature of the materials composing the drift, traces it to its source, and maps out the hydrographical basin within which the drift has been accumulated. In other words, he determines the direction of the aqueous currents which brought the drift and its gold. Locating in this way the source of the material, the miner can concentrate his search over an area that was formerly, if not now, veined with auriferous lodes, not necessarily of restricted limits, probably otherwise, but nevertheless definable.

The Pliocene loams of our plains and the deeper-seated gravel of the same epoch have not yielded gold; but I am not aware if any systematised prospecting has been conducted in them. If gold had been removed from its rocky fastnesses by pluvial action in Miocene times, why not, then, during the period of accumulation of the Pliocene drifts? Theory answers, "Perhaps more so." But the wide dispersal of the sediments and of the inaccessibility of those portions most likely to contain gold are serious obstacles to the successful exploitation of these deposits for it.

An example of a more modern gold drift is that of Biggs's Flat, on the River Onkaparinga. Whether its gold be gathered from the wreck of Miocene gold drifts or directly from auriferous veins in the immediate neighbourhood it is somewhat difficult to answer, though I incline to the latter opinion. Suffice it to say, however, that the period of accumulation of the drift is comparatively of so recent date that it may be said to be in course of formation.

I am confirmed in the opinion that we have been led to the belief that subterranean stores of petroleum exist in this colony from the fact that spurious substances, met with at the surface at several and distant parts of this colony, have been regarded as having an origin in common with petroleum. In all cases of reported discoveries the petrological associations have been adverse to the petroloid nature of the materials, whilst chemical investigations have dispelled any hope of their value as sources of petroleum which may have been fostered by their external appearances. Among these spurious substances, we may mention the so-called Coorongite, which has neither the chemical nor the physical properties of Elaterite—it is not an inspissated mineral oil, but is the remains of a vegetation which grew where the Coorongite now exists. If, therefore, success should attend the boring operations of the Salt Creek Petroleum Company, the existence of petroleum at a considerable depth and the dissimilar Coorongite at the surface will be merely a remarkable coincidence. Another spurious substance is the peaty infilling of a copper lode at Moonta to a depth of 120 feet. Other substances are soils impregnated with resin of the grass-tree, or with the liquefied dung of wombats, sheep, &c.

The origin of petroleum is not yet a solved problem, but that it is connected with plant remains, marine or terrestrial, or with animal *débris*, scarcely admits of dispute. Some oil shales are undoubtedly carbonaceous muds, the carbonaceous matter being derived from organic *débris* entombed with the original sediment. But the exact process of the natural manufacture of oil, or of its transfer from its original site to those beds in which it is now stored, is utterly unknown. The chemical theory which regards petroleum as condensed gas—the gas having been previously distilled from oil shales—does not satisfy all the phenomena of its occurrence.

Nevertheless, keeping in mind the organic origin of the carbonaceous material of oil shales, it is obviously incompatible that a volatile oil should be present in rocks which have been subjected to high temperatures. We should, therefore, not expect such rocks as mica slate, gneiss, granite, &c., which are highly altered rocks, to yield oil; though it is possible, but most improbable, that such may have acquired some slight bituminous infiltrations derived from the distillation of the oily matters from adjacent bituminous beds. The high antiquity and the highly metamorphic character of the Pre-Silurian rocks preclude all reasonable hope of finding stores of bituminous matter in them. Rocks of this age occupy the Cape Jervis Promontory, and extend eastward, at the surface, to Middleton, and are bounded on the ocean side by a granite dyke of vast proportions. The prevailing dip is eastward, and they in all likelihood pass under the tertiaries which occupy the surface of the country eastward of the lakes; in fact, their presence at no inconsiderable depth has been proved on the estate of Mr. MacFarlane at Wellington Lodge. The existence of petroleum in this region is in the highest degree problematical. The prospectus of the Coorong Oil and Coal Company, October 21, 1875, contains a grave error, which must have proved a snare to the ill-informed on geological matters, though at the same time it is a tacit admission that geological teachings are applicable to the search for coal. The passage reads:—"Borings have been put down to a depth of 75 feet, from which depth fossil shells have been raised, indicating a *carboniferous formation.*" The fossils which were shown to me by one of the promoters prove to be of Miocene age, as might have been anticipated from surface indications.

The exploration for petroleum at Mount Crawford is still more at variance with geological induction, for whilst in the former case we do not know what actually underlies the Tertiary cover, nor the depth and character of the overlying strata, yet we do know that in this one search is conducted in highly metamorphosed rocks, as may be inferred from the words of Ernie previously quoted.

In the Lower Silurian, the formation next in time represented in South Australia, we have evidence of the existence of marine life, and the colour of the black Ardrossan limestones is seen to be due to diffused animal matter, though as regards amount it can only be viewed as a petrological novelty.

The Jurassic rocks which occupy the low tracts west and south of Lake Eyre may possibly be proved to contain carbonaceous or bituminous beds; but our knowledge of them is so meagre that we have no warrant to speculate further upon the probability of finding coal, oil shales, or petroleum in them.

The Miocene rocks, which have been fairly well examined in natural and artificial sections, present for the most part arenaceous and calcareous *débris* of marine origin, and are unpromising as a source of coal or petroleum. The Upland Miocenes, occupying as they do isolated areas of very limited extent and thickness, cannot possibly furnish workable coals, though lignites and carbonaceous muds may not unreasonably be expected to be met with among the thicker deposited strata. The same remarks are applicable to the "Desert Sandstone."

The Pliocene drifts which have levelled up to considerable elevations pre-existing broad and deep valleys to form extensive plains are composed in the upper part chiefly of loams, calcareous clays and clayey sands, and in the deeper and marginal portions of sands and gravels. But the thick deposits of the Port Wakefield and Port Augusta basins show interstratifications of carbonaceous muds with driftwood and very thin lignites, none of which, however, are of the character or magnitude to justify a special exploration. The indication at present known to us which is best worthy of further investigation, and to which I drew attention in the early part of 1878, is that of a bituminous shale discovered in a well sinking at Border Town. It yields paraffin on distillation, and has been proved for a thickness of 40 feet at a depth of 91 feet. The overlying rock is a diatomaceous earth of fresh-water origin, and the whole may prove to be the filling-in of a lake depression during Pliocene time.

PROSPECTING FOR COAL.

The method of investigation pursued by the skilled geological surveyor in a search for coal is identically that for petroleum, though more definite results will be obtained in the first case than in the latter, because of the less diversified conditions under which it has been formed. World-wide experience has taught the scientific miner that coal originated as a terrestrial vegetation, and that the period of its growth does not extend very far back in geologic time. Our chief supplies are drawn from the Carboniferous rocks of Primary age, and no coal is known in rocks of older date. Some good coals are derived from Secondary formations, and inferior coals and lignite from Tertiary strata. The stratigraphical occurrences of coal in Australia are Carboniferous, as in Tasmania; Carboniferous-Permian, as in New South Wales; Carbonaceous (? Jurassic), at Cape Paterson, Victoria; and Miocene at Lal-Lal, near Geelong, Victoria.

This province south of the latitude of Lake Eyre is occupied by Pre-Silurian, Silurian, and Tertiary rocks, the last covering fully three-fourths of the whole area.

Among our Palæozoic rocks we can have no expectation of finding coal, as they were deposited as marine sediments untold ages before the epoch of the earliest coal vegetation.

As to the probability of finding coal in the bulk of the strata classified as Miocene, there can be but one opinion, inasmuch as throughout the great extent of country occupied by the system, the beds are of marine origin, and therefore the occurrence of coal among them is not to be looked for—the necessary physiographic conditions having been wanting over the entire area. (This is roughly defined in my "Outlines of South Australian Geology," Trans. Roy. Soc., III., p. li.) The exceptions to the marine character of our Miocene are those beds classified as Upland Miocene (op. cit. p. lviii.). In these remains of land plants have been found, and no marine fossils are known to occur, and from the nature of the sediment there cannot be much doubt that they are of lacustrine or fluviatile origin. It does not necessarily follow that coal-beds have been accumulated among them, though there is a bare chance that a deposit similar to that at Lal-Lal may be discovered in some of the unexplored deeper basins. However, the superficial area of these rocks is for the most part too limited to admit of a coal deposit sufficiently extensive to meet the requirements of a commercial enterprise—to say nothing of the uncertainty in respect to quality.

The much greater thickness of and the much greater superficial area occupied by the Pliocene strata as compared with the Upland Miocene offer us prospects for the discovery of coal not so cheerless, but nevertheless somewhat delusive, in spite of the indications previously alluded to under petroleum.

Various reputed discoveries and indications of coal have been announced in the last few years, and some within the past few months. A short review of the circumstances of some of them may not be without value, as serving to illustrate the fallacious deductions drawn from observed facts, and the immense amount of ignorance that exists as to the nature and mode of occurrence of coal. First, with regard to the alleged discoveries. These, with one or two exceptions, are of true coal, but not *in situ*, as may be proved by a geological examination of the surrounding country, even where it may not be possible to get at the true facts as to how it had come there—whether by accident or design. Of this class belong the discoveries at Beefacres (near Adelaide), Yankalilla (probably), Hog Bay, Kangaroo Island, Middleton, and Hindmarsh Island. An occurrence of carbonaceous material *in situ* is the "coal" of Coffin's Bay, but it is nothing more than partially decomposed seaweed compressed by a weight of blown sand. The "discovery" in the Forest Reserve at Woolundunga, the nature of which the members of the Forest Board are not agreed upon, is, in my opinion, a true coal, and because of the mode of its occurrence and the conditions of samples, I would say *good Newcastle coal.*

To that class of indications, by which ignorant or mistaken men, misnamed practical, have been too often enabled to find dupes for their ruinous speculations belong among my South Australian experiences decomposed slate, mica, black alluvium, oxide of manganese, and tufaceous limonite; whilst in addition there is a wide-spread belief that the iron-charged water of a spring, the colour of a rock, or the association of certain strata are infallible signs of the existence of coal, and that the occurrence of quartz and mica is a certain indication of petroleum.

In the absence of any detailed knowledge concerning the Jurassic rocks around the south and west shores of Lake Eyre it would be unwise to speculate on the probabilities of finding coal in them or beneath them. It is possible that they have interstratifications of carbonaceous strata similar to those of the Cape Paterson series in Victoria, and it is even possible (though not probable, because of their known proximity to the Pre-Silurian strata of the Peake Range and south and east of Lake Eyre) that Carboniferous rocks may underlie them.

I have thus narrowed down the limits within which search for coal may be prosecuted with some possibility of a satisfactory result, though there the outlook is of a very qualified kind. With a geological map before you any one versed in the application of the geological principles to the discovery of coal will be able to arrive at safe conclusions as to the interpretation to be put upon any alleged discovery or indication. Thus given the site of the occurrence of a true coal at Hog Bay, a reference to the geological map will convince you that an error of observation has been committed, as it is incompatible that a coal seam should be interstratified among micaceous schists. In this way it is easy for the geological surveyor to dispel misconceptions which may be entertained in respect to the presence of coal, and in a less degree of petroleum in certain localities, and that without actual inspection.

SEARCH FOR SUBTERRANEAN WATER-SUPPLY.

The great importance to this colony of the feasibility of obtaining water in regions destitute of permanent surface water may be judged from the fact that nearly three-fifths of the whole extent of the province, apart from the Northern Territory, is thus unfavourably circumstanced. But unfortunately successive Governments have neglected to bestow upon the subject of water-supply to the development of the colony the attention it deserves. It is pre-eminently a geological one, inasmuch as the water-supply of any district is most intimately connected with its geological features. To ensure trustworthy information being obtained, it is essential to have the services of officials possessed of the requisite knowledge for the purpose of geological and hydrographical examinations, of conducting experiments, and of collecting and systematising records of all trials for water—whether successful or unsuccessful. The bearing of such a record on future efforts is so obvious that it would be superfluous in me to do more than allude to it; suffice it to say that the Squatting Association of New South

Wales and the Department of Mines of the Government of that colony have taken up the matter. This Society has for the last two years circulated "forms" to be filled up by the recipients with data supplied by the sinking of wells and other subterranean explorations in this country.* Some responses have been received and permanently recorded in its Transactions. The credit which belongs to this Society through its Hon. Secretary, of initiating such a scheme in the interests of the colony at large seems to have induced the Chamber of Manufactures to enter into competition with us. The duplication of effort in this direction must beget incompleteness, if not inefficiency, and the sooner the one or the other withdraws the better for the attainment of the object each has in view. I know well that this Society is fully prepared to transfer its aid to any constituted authority empowered to carry on the record, or to any corporate body which is better able to prosecute the work, and so to deal with the collected information as to make it practically available.

I have said that little consideration has hitherto been given to the question of providing permanent supplies of water; but it must be acknowledged that of late the Government and a few pastoral lessees have experimented after a more determined manner than had characterised their previous efforts.

Our great natural water resources are of two kinds—one is derived from the rainfall which has not passed through Nature's filters, and which is obtainable from creeks and other surface drainers, and from lakes and reservoirs; the other is derived from springs and underground reservoirs.

Where the soil is impervious the rainfall is thrown off by surface drainage, giving rise to a waterless area. But the same water may elsewhere be impounded in lakes, swamps, or rock basins. Surface-collected water is usually soft, but it acquires some amount of mineral ingredients in its passage over the surface, the quantity and quality being dependent on the length and duration of the flow and the chemical properties of the surface. Water thus impounded diminishes in quantity through evaporation, and the ratio of the quantity of saline matter is proportionately increased; newly constructed dams and saturated salt lakes are the first and last stages between which all impounded waters in arid countries are graduating. At Adelaide the mean annual amount of evaporation for nine years has been ascertained by Mr. C. Todd to be about sixty inches, or about three times that of the mean annual rainfall at the same place, so that, assuming no loss by percolation, to

* This mode of inquiry was suggested by Mr. T. E. Rawlinson, C.E., in a paper read before this Society, September 17, 1878, and published in the Trans. for 1878.

have a surplus of stored water we require a catchment area of more than three times the surface area of the reservoir. Let the reservoir occupy one-third of the collecting ground, then it will be necessary to have the excavation five feet in depth if it be required to hold one year's rainfall, falling in one shower, but that quantity would be evaporated in the course of the year. In the central parts of this country the rainfall is not unfrequently of that paroxysmal kind which I have assumed for the sake of argument in the foregoing illustration; consequently provision must be made for the adequate storage of the annual rainfall as a whole. But the ratio of the amount of evaporation to that of the rainfall is much greater in the northern parts of this colony than at Adelaide—say 10 to 1—so that a sheet of water 10 feet in depth, if it received no accession during the year, would just be evaporated in that time. The saline matter of that original body of water remains—again the area is filled, again it is evaporated, leaving behind its salt; thus, the salt is ever on the increase, though it is re-dissolved, all or in part, at each successive influx of water. Let it now be assumed that the surface area of the impounded water is reduced to one-half by doubling its depth over half the original area, we shall then secure a surplus supply of one-half of the impounded waters, by the utilization of which to the last drop the next impoundment of water will not gain in saline strength. Therefore, where practicable; clean out the saltpans to remove the saline accumulations of years, and considerably deepen at the lower levels, is my advice to the pastoral leaseholder.

The local distribution of water derived from the rainfall of each natural watershed district depends on two conditions. These are the surface undulations and the permeability or impermeability of the rocks and soils. Springs and underground reservoirs, which constitute a second kind of natural water resources, are maintained by the rain as it is absorbed at the surfaces of pervious rocks, but the direction of the underground flow to its issue at the surface in the form of springs or to its storage is in no way related to the main lines of surface drainage, but is determined by the inclination of the strata.

The Chief Water-bearing Strata, in which the Supply is of Local Origin.—The Pliocene drifts furnish large supplies of water, but of very uncertain character. The source of supply in them is either the soakage of rain over their surface or from the hills which bound the plain of drift. These drifts consist of permeable and impervious beds which do not show a concentric dip as would cause water to rise as artesian springs. The strata dip away from the hills which they flank, and approach more and more to horizontality as the distance from the ranges increases. The waters tapped at limited depths in such Tertiary plains are derived from soakage from the surface, and vary considerably in the amount of saline matter contained arising from local lithological features. The deeper-seated supply is derived from waters flowing over the surface of the rocks of the hills flanking the plain, meeting in their descent permeable beds of the Tertiary cover, along which they are conducted further and deeper into the plain. In both cases the waters acquire in their passage the objectionable solid ingredients, from which we may conclude that the saline property increases with the increasing depth from the surface and with the increasing distance from the hills. It yet remains to be proved if a supply of better water may not be met with at the base of the Tertiary strata, conducted there from the hilly tracts along the slopes of the subterranean valley, which have been rendered impervious to water by the decomposition of the slaty rocks, and by the grouting over of the less impervious surfaces by the material thus formed. It is highly probable that better water may be obtained there than in the other deeper parts of these drifts, because the basal and marginal beds of the Tertiary basin are for the most part composed of coarse sands and gravel. It is extremely likely that the deeper-seated waters in our Tertiary basins are impounded as in a lake, and are consequently gaining in saline strength. Theoretically such stores by being drawn upon should improve in quality.

Waters when obtainable in the marine Miocenes are highly contaminated with saline matter, if we except those regions where from stratigraphical peculiarities and a large rainfall, the saline ingredients of the water-bearing strata are as it were constantly being flushed out. In other areas, as also in the Pliocene drifts, where a horizontal impervious stratum lies near the surface, the soakage of water becomes stagnated thereon, and by evaporation through the overlying surface there is an increasing tendency towards an accumulation of saline matter. The influence of local lithological peculiarities on the character of the subterranean water is well exemplified where gyspiferous beds are intercalated among the sands and clays. Such conditions, which largely prevail in the central districts of this continent, as also in parts of the Murray Plain, must preclude all hope of finding in them a water fit for use. The cause of the superior quality of the water issuing from the Upland Miocenes has been explained by Mr. Scoular, Trans. Roy. Soc., vol. iii., p. 110.

Our chief water-bearing strata, both as regards quantity and quality of supply, are of Palæozoic age. These are for the most part well elevated, absorb a considerable share of the rainfall, and represent at their outcrop about one-fourth of the surface of the country. They are for the most part inclined at considerable angles, but show little disturbance, and exhibit alternations of absorbent quartzites and impervious slaty beds through vast thicknesses. So that altogether we have in them the most favourable stratigraphical conditions for the existence of springs, which occur wherever the gullies which ravine the sides of our ranges intersect the line of junction of a superior pervious bed and an inferior impervious one. Because of the prevailing easterly dip of the rocks, the larger number of springs are located on the east slopes of the hills. By a knowledge of the elements of hydrostatics, and by correct observations on the sequence and other phenomena of the rocks, it becomes easy to predict with some degree of certainty the depth at which water may be obtained from this source. To obtain water in these rocks it is obvious that the search must be conducted in those strata which rise to the surface to form a collecting ground. Where these older rocks are thrown into synclinal folds, as in the Wilpena Pound, we have one of the important conditions favourable for obtaining water on the artesian principle. A *sine qua non* which must always be borne in mind in dealing with this question as applicable to South Australia is that water must be present in the rocks. If no rain falls on the out-cropping surfaces, or if from their highly impervious character no water can be conducted by them, then an artesian boring must perforce be unsuccessful.

The Chief Water-bearing Strata in which the Supply is Not of Local Origin.—Since 1878, when Mr. Rawlinson propounded his view before this Society that the disappearance of the vast bodies of river water, which collect on the inner watershed of the bordering coast ranges of Australia, is to be accounted for by their absorption into the porous beds of the Tertiaries occupying the interior basin of the continent, I have taken every opportunity to examine into the question raised by him. With respect to "the Barcoo, Cooper's Creek, and other large streams which empty themselves at nowhere in particular in the interior," there seems to be much reason for upholding the generally received opinion that the disappearance of their flood-waters is attributable to evaporation. Most certainly this cannot explain the vast reduction of volume which the River Murray experiences in its onward course to the sea, and the facts which I have collected point most conclusively to the presence of a large body of underground fresh water at or about the level of the river in the whole country extending eastward from the Lower Murray River up to the Victorian frontier. That the water in the wells in this area is not so fresh as that of the river cannot be denied, but it is too pure to be accounted for by soakage from the surface; and there is further no evidence of a subterposed impervious bed, added to which is the fact of the general uniformity of level at which the water is met with. The flow seems to be directed in a somewhat south-easterly direction, and if so, doubtlessly contributes to the largely known volume of water which emerges to the surface in the low-level swamps in the South-east. The underground flow by way of Mount Gambier to MacDonnell Bay must be from an independent source—without doubt derived from percolation of surface waters. The summer water-level of the River Murray at Morgan has been determined by the officers of the Railway engineering staff to be two feet only above low-water mark at Port Adelaide, and that of the highest flood 38 feet; whilst the level of the subterranean water beneath Mount Gambier is about 90 feet above ordinary low-water mark at MacDonnell Bay.

I have already suggested (Trans. Roy. Soc. S. Aust., vol. ii., p. 1.) "the probability of obtaining supplies of water on the artesian principal over some portions at least of the Mesozoic Plains, and possibly over those portions covered by the 'Desert Sandstone,' in the interior part of this continent." I was led to express that opinion from the fact of the mode of occurrence of, and from certain peculiarities exhibited by, the "mound springs," which occur around the west and south shores of Lake Eyre. The water of the springs flows to the surface of an open level plain in an arid climate, and possesses a high temperature and a not inconsiderable amount of saline matter, the chief of which are calcium salts; whilst the geographical distribution of the springs coincides with the outcrop of the Jurassic rocks, at least so far as is known. The constancy and volume of the flow point to sources of supply more copious and regular than that which could be furnished by the rainfall on the Peake Ranges, which bound the Jurassic Plain on the west, or that gathered on the hill country to the southward, or even from both sources; and the high temperature of the water would indicate a more distant origin. If, therefore, we could ascertain the direction of the underground flow, what an inestimable boon will be proved to be within our reach—a means at our command to bridge over the sterile wastes which render unavailable pastoral tracts beyond. As to the whereabouts of the source of these artesian waters, I can point to none other than the tropical rains which fall on the divide separating the Albert and Norman Rivers on the north from the Barcoo on the south. Hence, the direction of flow is roughly from the north-east to the south-west. Let, therefore, a steady advance be made by borings from the known artesian-well region in a north-east line, feeling one's way, as it were, by the stratigraphical sequence which shall first have been ascertained by an experimental boring within the area of the "mound-springs."

Large sums of public money have within the last year been unprofitably spent, at least so far, in the search for subterranean water in the arid country between the Head of the Great Australian Bight and Eucla, which would in all probability have yielded better results if applied to the search for water in the district to the north-east of Lake Eyre. You will not have forgotten that I was employed by the late Government to examine the western country with the view to the feasibility of obtaining water on the artesian principle, and that my report was unfavourable. Soon afterwards the Commissioner of Crown Lands, in reply to a deputation, said that "the Government would not be disheartened by the reports of the geologist who lately visited that part. (Laughter.) In spite of the geological drawbacks he thought water would be found; at any rate the attempt would be made."—*S. A. Register*, 28-4-1880. Such is the respect shown to an opinion thoughtfully and honestly arrived at. I particularly say honestly because if water fit for stock had been obtained as the result of acting on my advice I was to have received a bonus of £500. The next step in the programme was to depute Mr. J. W. Jones to follow in my track, the apparent object, judging from the interjaculations in his report, being to represent things in a different light. He seems to have very closely followed me, as the geological observations set forth in his report are unacknowledged transcripts from my published paper. On the main question at issue, Mr. Jones writes:—"As to the prospect of obtaining water on the artesian principle by boring below the upper water, I think it is difficult to judge with any certainty, and nothing less than boring will satisfactorily solve the doubt."—Par. Papers, vol. iv., No. 191, 1880. Just my sentiments, says the ex-Commissioner. But I am sure that you will agree with me that a simple negation should not cancel a statement logically deduced from indisputable premises. "Let those laugh that win" is a proverb of which I may have occasion to remind the ex-Commissioner and his abettors.

Miscellaneous Contributions

TO THE

Natural History of South Australia.

Edited by Prof. Tate, Director of the Natural Science Correspondence Department.

Botany.

Orobanche cernua, *Loefl.*—This is a Mediterranean species, extending to the East Indies, and is considered by Baron F. von Mueller to have been introduced to Australia, but Mr. Bentham, Fl. Austral., vol. iv., p. 533, remarks that its introduction is not easily accounted for. Now there are circumstances touching its mode of occurrence and distribution that seem to me to justify its claims to rank as indigenous. *O. cernua* is a leafless, somewhat succulent plant, growing parasitically on roots of certain terrestrial herbs and shrubs. It is recorded in the "Flora Australiensis" as occurring near Cudnaka, in this province, and at a few localities in Victoria and West Australia. Since then it has been found by Mr. Tepper at Kilkerran, Yorke's Peninsula, on sandy soil, and has been gathered on the Leisler Hills, in the interior, north from Fowler's Bay, by Mr. Warman. In November, 1880, I collected it in single specimens on the sandhills near Warbuto Point, between Moonta and Wallaroo Bays, and on those of Holdfast Bay. Its distribution cannot be determined in relation to that of its host, which in one instance only has been ascertained, viz., *Senecio lautus*; that composite is one of the most widely diffused of extratropical Australian plants, and affects preferentially the light soils such as prevail in the habitats of *Orobanche cernua*. In the Mediterranean region *O. cernua* is found on several species of *Artemesia*, a genus of Compositæ, not represented in the Australian flora. Its sporadic mode of occurrence and disassociation from alien plants, in some instances at least inhabiting virgin country, are circumstances most antagonistic to the view of its modern introduction. Indeed, the question may be raised, is our plant conspecific with *O. cernua?* The question is partly answered in the negative by Mr. Bentham, who writes, "Sepals in the Australian specimens two, entire, lanceolate with long points, nearly as long as the bracts."—*R. Tate.*

ASTER (?) CONOCEPHALUS, *F. v. M.*—This composite has been collected by me in a hitherto unrecorded district, namely, the Tickera Scrub, a few miles north from Wallaroo. There it grows abundantly, but not gregariously, on the sandier parts of the detritus from the granitoid felstones. Mr. Bentham notes that the species is an anomalous one in the genus, differing "in the anthers being quite free in all the flowers I examined, in its long and narrow but flattened style branches, and in the absence of ray florets." As the result of an examination of many specimens, the stamens are syngenesious, not free.—*R. Tate.*

CLAYTONIA BALONNENSIS, *Lindley.*—"This plant is very much like what we call here pig's face (*Mesembryanthemum australe*), so Mr. Warman told me, and is considered good eating with bread. The blacks also use this plant for food, mixed with baked bark."—*Annie F. Richards.*

SARCOSTEMMA AUSTRALE, *R. Brown.*—"This asclepiad I found in a new locality, very far south of any previously known, viz., on the slopes of the granitoid-felstone cliffs facing the sea, about Tickera, Section 92 in the Hundred of the same name. Here, however, its habit is that of a shrub two to three feet high with erect branches, whereas in the Flora Australiensis it is described as a twiner. At the time of my visit, Nov. 19, it was just blossoming, but ripe fruits were gathered by Mr. Cloud about a month afterwards. Mr. J. Dixon informs me that he had not known stock to touch this plant till the past summer (1880-1), when the cattle on the Eastern Plains lived upon it, without water, for some months of continued drought."—*R. Tate.*

SOLANUM HYSTRIX, *R. Brown.*—"The native name of this plant is 'walga.' The blacks use the fruit for food, but only with the pounded and baked bark of the mallee root called 'congoo' by them. Before using the fruit they take off the shell (the dry prickly calyx) and remove the seeds. This leaves a pulpy skin about the thickness of that of a native peach; the fruit and bark are then made into a cake. When fruits are not obtainable, and they are otherwise hard pressed for food, the natives bleed themselves in the arm and use the blood with the bark. The natives told me, when opening the fruit for the seeds, not to eat the fruit, as it would make my throat sore, nor yet to touch my eyes with my fingers. The fine prickles and juice got into my fingers, and produced a good deal of pain and inflammation for a short time. The plant droops as soon as gathered, and the leaves wither very much in drying; the flowers are at first dark lavender, but after a time become quite white; the seeds are of a black or brown colour. It is common in this district, but only growing in sandy soil; it prevails in burnt scrub lands, if rain follows soon after the fire. I have seen it forty miles north from Point Bell, and nearly sixty miles east from Fowler's Bay; it grows sparingly at Fowler's Bay. The fruit first ripens about the end of February, when the plant dies off; young plants spring again at any time after rain, so that there may be two crops in a year, as it is so here with many plants. Camels eat the plant." *Annie F. Richards.* [Consult Trans., vol. iii., p. 171.]

Solanum simile, *F. v. M.*—"The native name is 'quena.' This shrub grows to a height of from two to four feet, it likes sand, and springs up abundantly on burnt ground, if rain falls shortly after the fire. I saw the ground thickly covered with young plants, all in flower and fruit, a week or two ago (about the middle of February), at a spot about 20 miles up the coast from here. These had appeared after a very heavy thunderstorm, which visited us in November last. The blacks are very fond of the fruit, but do not eat it until it has fallen to the ground; both black and white men agree that to eat many will cause sickness, it is the same with the 'walga.' The fruit causes a hot burning taste in the mouth, but its scent reminds me of that of strawberries. Sheep eat the plant."—*Annie F. Richards.*

The Characteristic Vegetation about Franklin Harbour *observed*, May 29—June 3, *and recorded* by *Prof. R. Tate.*

I. That of the Littoral tract embracing (1) The marine swamps, here flourish mangrove, *Salicornia arbuscula*, to four feet high, and *S. australis.* (2) The sand dunes, the chief shrub is an *Aster*, possibly *A. axillaris*, but it was not seen in flower.

II. That of the Pliocene Drift. This chiefly consists of mallee, with an undergrowth of Asters, Eriostemon, &c. Nearer to the hills, the mallee is not so frequent, and gives place to sandalwood (*Myoporum deserti*) and *Acacia homalophylla*, with undershrubs of *Beyeria opaca*, *Rhagodia parabolica*, *Aster conocephalus*, *A. decurrens*, *Alyxia buxifolia*, *Eremophila Browni*, *Pimelea microcephala*, among which climbs *Cassytha melantha.* Where the brush-wood is not so dense there appear tussocks of *Xerotes effusa*, and *Lepidosperma* sp. *Callitris* occurs with a sandy soil.

III. That of the Ranges. The slopes of the hills, composed of mica slate, are timbered with fine gums and clothed with short herbage; the chief brushwood is *Bursaria spinosa.* The chief herbaceous plants observed were *Hibiscus Wrayæ*, *Drosera Menziesii*, *Lagenophora Huegelii*, *Hypoxis glabella*, *Wurmbsea dioica*, *Ophioglossum vulgatum*, *Cheilanthes tenuifolia* and *C. rutæfolia*. *Casuarina quadrivalvis* has its habitat here as elsewhere on the quartzite outcrops. The surfaces occupied with the sharp detritus of the felstones and granites are covered with a dense scrub of *Melaleuca uncinata*, with here and there the low shrubs *Acacia spinescens*, *Styphelia Sonderi*, and *S, humifusa*, occurring solitarily, and tussocks of *Triodia pungens*.

ZOOLOGY.

Notes on the ZOOLOGY *about* FRANKLIN HARBOUR. *By Prof. R. Tate.*

The genus *Macropus* is unrepresented, though the black-faced kangaroo is so abundant in the Port Lincoln district. Wallabies abound in the low-level scrubs, and the ubiquitous phalanger in the ranges. The osprey was seen at Franklin Harbour, and the wedge-tailed eagle in three individuals at Wangaraleednie. The deaf-adder is common on the loamy tracts, and lizards of two species; a "guana" also occurs. Large scorpions of a dark green colour may be found under almost every large stone in the moist gullies in the ranges.

Of the mollusca, *Helix Flindersi* and *Bulimus Adelaidæ* seem to be restricted to the Pliocene Drift, sheltering themselves at the bases of the stems of umbrageous shrubs; whilst *Nanina rustica* and *Helix patruelis* occurred to me abundantly under large stones in the bottom of gullies in the Pre-Silurian country alone. *Succinea australis* is common to the two regions.

In a small spring on the margin of Wangaraleednie Creek, I found many living examples of a small *Bythinella*, conspecific with a shell which I had collected, in a sub-fossil state, at Penola. The same species was found enclosed in calcareous tuff in Oolabidnie Creek.

In the artificial dams at Yadmana and Wangaraleednie, there lives an *Aplexa*, which I propose to describe as a new species under the name of *rubida*, because of the carmine or ruby colour of the animal; the shape of its shell is intermediate between that of *A. inflata* and *A. subinflata*, the former is known only from Adelaide, and the latter from Mount Margaret, C. Aust.

NYCTOPHILUS GEOFFROYI.—*An addition to the Mammalian Fauna of South Australia.*—This insectivorous bat, which was captured at Smithfield by Mr. Scoular, is readily distinguished from its congeners, by the presence of a largely-developed fold of skin across the forehead from ear to ear. As far as the figures and descriptions in Gould's work on the Mammals of

Australia will serve, the specimen under review would seem to be referrable rather to *N. Geoffroyi* of West Australia than to *N. Gouldii* of New South Wales.

Notes on South Australian Snakes.

1. Specimens of a blind snake have been taken at Ardrossan by Mr. Tepper, and at Golden Grove by Prof. Tate. They belong presumably to *Typhlops bituberculatus*, Peters, Monatsber. Akad. Wiss., Berlin, 1865, which is said by that author to inhabit S. Australia. The species was only known by name to Krefft, and as we cannot refer to any description of it the identification is not certain. The species is quite harmless, and from its habit of burrowing among tussocks of cyperids or in the rotten wood in search of its prey—the white ant—it may have been overlooked, and considered rarer than it really is. Mr. Tepper states that he has met with the species, active at night, at Monarto and New Mecklenburg.

2. *Vermicella annulata.*—This, or an allied species, inhabits the scrub six miles north-east from Kadina, on the authority of Mr. Anthony, from whom specimens have been received. The species is recorded from South Australia by Krefft, but the Kadina snake, from its much smaller size and regularity of alternating bright yellow and black bands, may be a variety or an allied species.

3. *Hoplocephalus spectabilis*, Krefft, "The Snakes of Australia."—This pretty and easily-recognisable species was founded on a specimen taken at Port Lincoln by Mr. Masters; another example was captured by Prof. R. Tate, near Ardrossan in November, 1879.

Notes on South Australian Lizards.

Silubosaurus Stokesi, Gray.—This very fine lizard is described and figured in Stokes' Discoveries in Australia, vol. I., p. 498, plate i., and the locality assigned to it is Western Australia. As there is no published record of its having been found in South Australia, Mr. Rogers' specimens, which were obtained near Port Augusta, must be considered to be the first found in our province, although Prof. Tate has some recollection of having seen the creature on the Bunda Plateau.

Moloch horridus.—Examples of this species, taken at Ooldea, in the desert interior, north from Fowler's Bay, have been forwarded by Mrs. A. Richards. This new locality for it is about equi-distant from Western Australia and Port Augusta, where only it had previously been known to occur.

LAND AND FRESHWATER SHELLS FROM CENTRAL AUSTRALIA.

HELIX PERINFLATA, *Pfeiffer*, hitherto only recorded from the MacDonnell Ranges, "was found near the road crossing of Mann's Creek, 28 miles north of Peake," *J. Chandler*.

HELIX CYRTOPLEURA, *Pfr.*—MacDonnell Ranges (*Kempe*).

HELIX, N. SP.—Allied to *Phillipsiana*, Angas, from which it differs in its more elevated spire, in the plicate sculpturing being less regular and not so sharply defined, and in the surface being coarsely squamosely granulated. MacDonnell Ranges (*Kempe*).

MELANIA BALONNENSIS, *Conrad*.—This is the species inhabiting the Lower Murray River. Mr. Kempe has collected it in the R. Finke, MacDonnell Ranges.

NEW SOUTH AUSTRALIAN MARINE SHELLS, collected at Fowler's Bay by Mrs. A. Richards :—*Erato lachryma*, Gray in Sowerby's Conch. Ill. f. 48 ; Tasmanian examples of the same species have been submitted to me for determination by Mr. Petterd. *Mangelia Merredithæ*, T. Woods, of Tasmania; *Trophon* n. sp., the test of a pale lilac colour. Two species of *Aplysia*, the first record of the existence of the genus in South Australian waters. *R. Tate.*

AMPHIPEPLEA PAPYRACEA, *Tate*.—The species *Limnæa papyracea* was founded on characters presented by the shell only. See Trans. Roy. Soc. S.A., vol. iii., p. 103; but the characters afforded by the snail recently taken alive at the Reedbeds, Adelaide, by Mr. Stirling Smeaton, demand its transference to the genus *Amphipeplea*. The mantle lobes entirely cover the shell ; the foot is so voluminous that it cannot be wholly withdrawn into the wide-mouthed shell ; the egg-masses are circular in outline, about one-fourth of an inch in diameter, depressed, the exterior somewhat coriaceous ; the egg-capsules are about forty in number. The snail has the same habits as the European *A. glutinosa*. Several species of Australian pond-snails have been described as of the genus *Amphipeplea*, but in no case had the animal been observed. The species under review is therefore the first reliable record of the occurrence of the genus in Australia. *A. papyracea* is now known at two widely separated localities in this province—Penola in the South-East, and Reedbeds near Adelaide.—*R. Tate.*

ADDITIONS TO THE COLEOPTEROUS FAUNA OF SOUTH AUSTRALIA, determined by M. Fauvel, Caen, France, from specimens collected by Mr. J. G. O. Tepper :—

BUPRESTIDÆ.

Asthræus Tepperi, *Fauvel*
Bubastes inconstans, *Thoms.*
Melobasis gloriosa, *Lap. et Gory*
obsoleta, *Deyr.*
gloriosissima, *Deyr.*
ænea, *Fauvel*
prasina, *Laferté*
Neocuris (?) funebris, *Fauvel*
hemichlora, *Fauvel*
violascens, *Fvl.*
Stigmodera atricollis, *Saund.*
aurantiaca, *Fvl.*
decemmaculata, *Kirby*
Stigmodera heros, *Gehin*
simulata, *Lap. et Gory*
Stevensi, *Gehin*
Tatei, *Fauvel*
transitoria, *Reich.*
trifasciata, *Murray*
Cisseis duodecimguttata, *Guerin*
lata, *Deyr.*
proxima, *Laferté*
Tatei, *Fauvel*
Tepperi, *Fauvel*
Agrilus australasiæ, *Gray*
Merimna atrata, *Lap. et Gory*

CARABIDÆ.

Carenum elegans, *Macleay*
xeres, *Fauvel*
Julodimorpha Bakewelli, *White*
Paracephalus justacinus, *Hope*
Strigoptera globithorax, *Deyr.*

MORDELLIDÆ.

Mordella Adelaidæ, *Fvl.*
humerata, *Fvl.*
Mordella Moorei, *Perrond*

HYDROPHILIDÆ.

Hydrobius assimilis, *Hope*

GYRINIDÆ.

Gyrinus strigosus, *Fabr.*

DYTISCIDÆ.

Hydroporus bistrigatus, *Clark*
penicillatus, *Clark*
Eunectes australis, *Erichs.*

ELATERIDÆ.

Lacon costicollis, *Candeze*
lacrymosus, *Cand.*
ursulus, *Cand.*
variabilis, *Cand.*
Cardiophorus conspectus, *Cand.*
Monoocrepidius australasiæ, *Boisd.*
attenuatus, *Fvl.*
basicollis, *Fvl.*
macer, *Candeze*

South Australian Nocturni, communicated by Dr. W. H. Gaze.—The collection contains thirty-one species of Nocturni, but many more exist. It comprises:—*Sphinx convolvuli*, which is cosmopolitan, being found also in Europe and New Zealand. Three sphinges probably belonging to the genus *Chœrocampa*. The *Zeuzeriadæ* are represented by some fine, but destructive, insects. *Zeuzera eucalypti* is most destructive to wattles, through the larvæ eating the centre pith out of the trees and killing them. Another species rings round gums, and then eats up the centre, thus destroying them. *Cossus cinereus*, appearing about the end of December, has also a wood-boring larva, though, as the borings were transverse, it injured, though rarely destroyed, trees. A curious relative of this family, having a bright green colour, bordered with ochreous red, tunnels the Melaleucas on the Onkaparinga, but it is rare. A species of *Hepialus* feeds in the roots of eucalypts, and when full grown the larva constructs a cocoon of silk and earth, about five inches long, with a similar tunnel up to the surface of the earth; after the first rains the perfect insect emerges—always at night. The *Doratifera (Limatodes) vulnerans* is remarkable, because the larva has the power of emitting tufts of stinging hairs from a series of wart-like prominences on the back. It has no visible legs, crawling, slug-like, on the leaves of the eucalypti. The cocoon is like a small birds'-egg, and the larva, before emerging, cuts a perfectly circular piece from the top. The *Procridæ* are represented by two species, living in the hills. They are day-fliers. Two species of *Lithosia* are common in the gullies. An *Emydia* is very common about Adelaide. The male insect flies at early dawn, the female at night, though not invariably so. *Deiopeia pulchella*, a beautiful insect, is also cosmopolitan. *Euchelia poas* (?) may commonly be seen flying in the hot sunshine; it broods at the spring and autumn. Of the *Agaristidæ*, *A. glycinæ* is fortunately not common in this colony, for it has forsaken its natural food-plant for the vine, to which it appears to do much damage in Victoria; there are two broods during the year. *A. Casuarinæ*, Scott, also a day-flier, is not common; its larva feeds on the *Loranthus Eucalypti.* Two species of *Spilosma* are both common and much like European insects. A species of *Gastropacha* is common; the larva feeds on the buds of olives, eucalypts, &c., and makes an egg-shaped green cocoon; the larva of another species spins a brownish cocoon between the "gum"-leaves, and may eventually be found of some use, it being closely related to *Anthuria pernii*, the very large silk-worm of China, which is about the same size, with similar markings, but much lighter in colour. Our indigenous species feeds upon the white gum, spins a good-sized cocoon of a light grey silk, with no waste, and it could be utilised.

Professor Tate asked if Dr. Gaze could name the indigenous plant upon which the *Agaristida glycinæ* fed before it changed its food in favour of the vine,

Dr. Gaze replied that he was not aware, but probably it was a species of Glycine, since the species was named after that genus of plants.

The ASSISTANT-SECRETARY mentioned that the tube constructed by the *Hepialis* is often over eighteen inches in length where the eucalypts in the roots of which they bored are growing in deep sandy soil near the banks of creeks. The *Cossus cinereus*, another goat-moth, is very destructive, as might be seen anywhere on the Park Lands, and especially between the Stag Inn and Smith's Brewery, where some of the trees have scarcely an inch of sound wood in their trunks and limbs. The moth comes out of the holes, which are in an upward direction, and consequently the rain-water enters and causes the heart-wood to rot. Within the past few weeks he had observed that four large branches had been broken off through the ravages of these insects.

GEOLOGY.

Notes on the GEOLOGY *about* FRANKLIN HARBOUR, *west side of* SPENCER'S GULF. *By Professor R. Tate.*

The area under observation is about twelve miles from west to east, and about eight miles from north to south, and comprises much of the Hundreds of Playford and Mann, and part of Hawker.

"Pleistocene consolidated sands," with travertine cover, and "Recent sand dunes," occupy the seaboard.

"Recent marine shell-beds" skirt the almost land-locked sheet of water known as Franklin Harbour; they are but slightly elevated above ordinary high tides, and their extent is pretty well defined by the growth of mangrove and samphire.

"Pliocene Drift" extends from the coast to about five miles inland, and consists in the lower levels of sandy loam, but becomes clayey and stony near the hills.

No perennial streams exist in the hills, but the broad and deep watercourses excavated in the Pliocene Drift would suffice for rivers of large magnitude. The deep ravine of the Oolabidnie Creek displays some magnificent sections in the Pre-Silurian rocks, as also the thickness and character of the marginal accumulations of the Drift period.

"Pre-Silurian" metamorphic rocks constitute the ranges or hill region. The prevailing rock is mica slate, with which are associated hornblende schists, quartzose felsites, quartzites, and gneiss. The interstratification of crystalline albite and orthoclase felspars, so well exposed in the Oolabidnie Creek, is noteworthy; white marbles occur on the east flank of Mount Parapet and at Wangaraleednie. Narrow granite dykes abound—the constituent minerals being albite, quartz, and hornblende; the last in prisms, not unfrequently of large dimensions.

The prevailing strike about Wangaraleednie is a few degrees west of south to a few degrees east of north, but changing in the northern part of the area to S. 20° E. and N. 20° W. The beds have an easterly dip at very high angles and show much local contortion. The following minerals were collected from the granite dykes:—Albite, orthoclase, muscovite, hornblende, chlorite, quartz, garnet, galena, and calcite. A compact magnesite occurs in veins in a talcose state in the Oolabidnie Creek.

Geological Sections about Wellington or North-east Shore of Lake Alexandrina, by Professor Ralph Tate.

Section Point Pomond, Lake Alexandrina.

I. North-east Face.

	ft.	in.
Superficial deposits—		
1. Surface soil and red sand	2	6
2. Calcareous rubble, with dense travertine cover	5	0
Miocene—		
3. Dark red clay... ...	3	0
4. Marl, with a denser upper layer	6	0
5. Brown clay	16	0
6. Greenish-yellow sand at level of lake ...		
Estimated total ...	32	6

II. South-west Face.

The section is principally occupied by gypsum in the form of slightly coherent grains, or compacted into a tough rock, showing much false bedding, and at some points fills the whole section below bed No. 2.

A bluff on the east side of the lake is similarly composed of small incoherent particles of gypsum.

The false-bedded arrangement of the gypsum indicates that the original material of the stratum was not tranquilly deposited—possibly in shallow waters of a lagoon or lake—a view corroborated by the fact of the horizontal replacement of clays by it. Whether the gypsum was accumulated as we now see it, or whether it is pseudomorphic after a calcareous sand, I can offer no definite opinion. The condition of the particles of the gypsum-sand rock, though granular, shows in a great measure a tendency to a crystallised form; and on the other hand, the more compact portions, which show a well-developed crystalline structure, have included grains of a white or red marl. An impure band underlying the gypsum bed is a mass of granular gypsum largely permeated by an ochreous paste. An analysis of the gypsum-sand rock gave 8·9 per cent. of free silica and aluminous residue, and a little iron oxide.

SECTION of STRATA traversed in BORE put down by Mr. A. Macfarlane on Section 302, Hundred of Malcolm, distant about four miles from the lake. Surface at the level of high floods.

	Feet.	
1. Black alluvium... ...	3	Intensely salt water.
2. Yellow calciferous sand	53	Water saline and very bitter. A few Middle Murravian fossils.
3. Red clayey sand ...	47	
4. Blue clay, the lower few feet with fragments of iron pyrites and pyritous slaty rock more or less micaceous ...	64	No water.
Total	167	

The bore section may be regarded as a continuation of the foregoing cliff sections; the combined sections giving a total thickness of 190 feet of Miocene strata.

SILURIAN FOSSILS FROM THE PARARA LIMESTONE, near Ardrossan, collected by Mr. Tepper.

(1) Species of *Strophomena*, in shape like *S. spiriferoides*, McCoy, but an inch in breadth, with concentric undulating ridges, and without radial striæ. (2) Head of a trilobite, apparently of the same species as previously found, but of a very much larger size, and showing details not observed in the other examples. The glabella is an inch and a quarter long, and three-quarters wide, with three pairs of oblique furrows; its surface is ornamented with numerous closely-set granules.

NOTES ON THE PHYSICAL AND GEOLOGICAL FEATURES ABOUT LAKE EYRE. Communicated by Mr. G. L. DEBNEY.

The country in the neighbourhood of Lake Eyre and within a radius of fifty or sixty miles on the eastern and northern sides consists of large tracts of sandhill-country skirted with stony plains, which are intersected by stony ridges and table hills. These table lands and ridges appear to have once formed part of an elevated undulating plateau. They are covered with large masses of flint rocks, of reddish hue, now worn into such irregular masses that the stratification is not discernible. The plains are strewn with small waterworn debris of the same rock, and the abrupt sides of the hills with angular broken pieces, which gradually become more waterworn and smaller on descending to the plain.

These table lands and hills are mostly composed of sandstones (white, and white with red streaks), clays, and gypsum beds, while the flint rock is always found on the summits. This rock is *not* to be found on the principal mountain ranges extending from Adelaide to Mount Babbage, on the Denison Range near the Peake, nor the Termination Hill Range south of Lake Eyre.

The broken face of the escarpment of the table hills, overlooking a salt lake 25 miles north-west of Lake Kilapaninna, displays marly clays mixed with gypsum and fossil bones. The fossils, which have been determined by Professor Tate, consist of fish vertebræ, teeth and the bony scales of crocodiles, and phalanges of a gigantic marsupial of the family of the kangaroo, from which it may safely be concluded that the marly clays, sandstone, and gypsiferous beds of the table land country are of lacustrine origin.

The sandhill country skirts the Lake, extending from the shores from ten to fifty miles, the ridges having a uniform direction nearly north and south. The eastern side of the ridges are more abrupt than the western side, and the flats between are generally firm and clayey. The flats rise and dip alternately every few miles, forming small lakes or lagoons, which are filled after heavy rains, but soon dry from evaporation, very little sinking into the soil, which is of a very impervious nature.

I noticed on the Kallacoopah Creek, which runs into the Macumba River, north-west of the lower part of the Warburton River, and near its junction with Lake Eyre, a table land, the west side of which merged into the sand ridges, whilst the other portion was cut up by numerous channels running parallel like sandridges towards the creek; the ridges between these channels, which were about one hundred feet across at the top, were wearing away, and the sides were covered with loose sand, and had every appearance of sandhills forming. I have noticed similar phenomena in other places, and cannot help attributing the formation of the sandridges to the combined influences of wind and water, and not wholly to the effects of the wind.

During about twenty years' experience in the North I have found the prevailing winds to blow from the north, north-west, and south-west.

Besides Lake Eyre there are numerous smaller lakes of very similar aspect. These appear to have been formed by the collection of water from the neighbouring country, holding salt in solution.

I have found in several instances by digging in these lakes or salt plains that after passing through a layer of salt from one to two inches thick a layer of mud or clay is found, next a layer of salt, and again a layer of mud.

SECTIONS of STRATA traversed in BORING for water in the country between Cooper's Creek and Warburton River.* Communicated by G. L. Debney.

No. 1 Site, three and a half miles North of Cooper's Creek and twenty miles east of Lake Eyre:—

	FT.	IN.
Surface soil, clay-loam	2	0
Yellow clay	14	0
Gypsum bed	3	0
White sand	1	6
Yellow clay, mixed with red	20	0
Clay, mixed with gypsum	14	0
Fine white sand, resembling sea sand ...	1	0
Coarse yellow and white sand, with salt water	10	0
	65 ft.	6 in.

No. 2 Site, two miles farther North from No. 1:—

	FT.	IN.
Surface soil, reddish-yellow sand ...	5	6
Yellow sand	3	0
White sand	2	6
Red clay and gypsum	4	0
Red clay	1	0
Red clay and gypsum	2	0
Blue clay	1	6
Blue clay and sand	1	6
Bluish sand	1	9
Blue clay and salt water	1	3
	24 ft.	0 in.

No. 3 Site, ten miles North of No. 2:—

	FT.
Surface soil, dark clay-loam	1
Yellow clay	32
Yellow clay, mixed with gypsum	16
White sand	2
Yellow sand, mixed with red	22
Bed of gypsum	2
Clay, yellow, mixed with gypsum ...	6
White sand	1
Yellow clay	6
	88 ft.

No water, obliged to remove camp on account of water drying up.

* For topography, consult sketch map of the Lewis' Exploring Party.—ED.

No. 4 Site, twenty-five miles North-East of No. 3, and twenty-eight South of Cowan's Station, on the Warburton River :—

	FT.
Yellow clay...	6
Reddish clay	6
Soft rock, reddish	4
	16 ft.

Solid rock, could not penetrate with boring tools. Tried in several places with same result. Sunk shaft 101 feet.

	FT.
Yellow clay...	6
Reddish clay	8
Rotten red rock	6
Solid red rock, resembling jasper, spotted with yellow	13
Rotten red rock	3
Pipe clay, mixed with sand	4
Soft white sandstone, red streaked ...	31
Brackish water; fit for stock.	
	101 ft.

No. 5 Site, four miles North-West from Lake Kopperamma, on Cooper's Creek :—

	FT.
Sand	2
Clay, yellow	6
Sand, yellow...	2
Clay, yellow	10
Sand, clay, and boulders of red stone, with petrified wood	12
Clay, yellow	6
Yellow sand	2
White sand	2
Yellow sand-drift, with water quite fresh.	
	42 ft.

All the above beds dipping slightly to the North-West.

Rocks and Minerals.

Hydraulic limestone in the form of an oblong concretionary nodule, about six inches, covered with a layer of gypsum half-an-inch thick; there is no organic nucleus. A chemical analysis proves it to be a superior hydraulic limestone. It was found at the Primrose Springs in association with the *Belemites.*—(Com. by J. Chandler).

Pitchstone and obsidian bombs.—"They are plentiful on the plains" (Com. by J. Chandier, of the Peake). Similar speci_ mens have been communicated by Mr. Canham, of Stuart's Creek, as also various specimens of *conglomerated sand*—globular, botryoidal, and stalactitic in form, from the neighbourhood of Dalhousie Springs (see also Vol. iii., p. 179).

Fibrous hæmatite in the form of a complex crystal, one and a half inch long (Communicated by Mr. Boyer, Eudunda).

Jurassic Fossils from Central Australia.

Avicula Barklyi, Moore, "in the bed of the Peake Creek."

Avicula Corbiensis, Moore, Quart. Journ. Geol. Soc., vol. xxvi., t.11., f 7., and

Belemnites, n. sp. "were found at the Primrose Springs."

Natica variabilis, Moore, *Avicula Barklyi*, Moore, *Corbula* n. sp., and *Chione* (?) sp., were contained in a "shelly black limestone, collected at this place (Peake). I visited the place, and find that there is no definite bed showing above the surface, but that the stone is largely distributed over a flat down through which a small water-course runs, and which has in places laid bare small surfaces of the rock."—(Com. by J. Chandler).

Avicula Corbiensis (?)—In three much worn valves, "got close to Lake Eyre on this run, on the surface in company with flints, pebbles, and some rough agates."—(Com. by J. Canham).

Miocene Fossils.

A paper on "Fossil Chilostomatous Bryozoa from Victoria," by Mr. A. W. Waters, F.G.S. (Quart. Journ. Geol. Soc. vol. 37, August 1, 1881), is a valuable contribution to Australian Tertiary Palæontology, seventy-two species are described, and most of them figured. As the result of direct comparison, twenty-three of the species occur in the Mount Gambier beds, but the number of identical species from Victoria and South Australia will no doubt be increased by a study of the species so abundantly and well preserved in the River Murray Cliffs and at Aldinga.

Occurrences of Remains of Pliocene Mammalia.

Phascolomys sp. from the Drainage Works, Islington, represented by an entire lower jaw received from Dr. John Rees. This jaw matches very well with the skull which was obtained last year at the Willows, Adelaide, and which is referred to in last year's Transactions on p. xxviii. They belong in all probability to *P. Pliocenus*, McCoy, Pal. of Victoria, Decade, a ramus of the lower jaw of which has also been found by Prof. Tate beneath volcanic sand at Mount Gambier.

Diprotodon sp.—Mr. J. Chandler writes in a letter dated Peake, April 16, 1881, "That a short time ago, while some men were sinking a well at the head of one of the mound springs on the Cootanoorina Run, they discovered several teeth of some very large animal. These teeth were secured by the Police-trooper Rolland. The well is down from 26 to 30 feet, but the water coming in very quickly stopped further discoveries. The teeth are in an excellent state of preservation—the enamel being still on them—one is doubled-fanged with two distinct ridges, another has a single fang; they are two to three inches long, including portion of the fangs, by one and a half inch diameter; well worn on the crowns."

Baron F. von Mueller writes that "*Diprotodon* (identified by Prof. McCoy with *D. australis*) has turned up on the west side of the Great Bight, where tusks, teeth, and other bones have been disentombed. Thus it is shown that this huge creature roamed quite across *your* territory. I bought the bones from the finder." For other records of *Diprotodon*, see pp. 155, 156.

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia,

For 1880-81.

Ordinary Meeting, Nov. 2, 1880.

Mr. T. Harry in the chair.

Messrs. Sydney C. Holder, University Scholar, and Richard S. Rogers, University Scholar, were elected Associates.

The list of donations to the Library was read.

Mr. Stirling Smeaton (for Mr. Chas. Todd, C.M.G.,) produced specimens of *Camponotus inflatus*, Lubbock, from Barrow's Creek, Central Australia, and read, from "Crooke's Quarterly Journal of Science," some interesting particulars concerning an allied species named *Myrmecocystus Mexicanus*.

Professor Tate, F.G.S., said there were only two known species of these honey-secreting ants in the world—one was found in Mexico, and the other in Australia. The habits of the two species were in every way identical, some ants in the case of each being set apart to store honey for the rest of the community, and, as Sir John Lubbock remarked, they were veritable honey-pots.

Mr. Stirling Smeaton also produced a species of Pennatulidæ, found cast upon the sea-beach near Marino. It most nearly resembled the *Sarcoptilus* of Grey, but differed in having polyps on both sides of the pinnules.

Mr. F. G. Waterhouse, C.M.Z.S., on behalf of the Governors of the South Australian Institute Museum, exhibited a series of land, estuarian, and marine shells collected at the Aru Islands by Mr. F. W. Andrews in an expedition to New Guinea carried out by Mr. — White, of the Reedbeds, near Adelaide, South Australia.

Mr. ANDREWS, who was present, described the localities in which the shells were found, and also produced some stream tin obtained from the Palmer River, Queensland.

Professor R. TATE, F.G.S., showed a branch of *Acacia melanoxylon*, having true pinnate leaves terminating the phyllodia. He also produced a collection of fossils and other specimens of natural history forwarded by Mr. J. Canham, of Stuart's Creek, and said that probably the most interesting of these were some pebbles of obsidian and pitchstone. The origin of their present distribution is still an unsolved problem. It has even been seriously asked, are they of lunar origin? There were no volcanoes in the central part of Australia which would account for their presence, and even if there had been we would expect to meet with other signs of their pre-existence. The pebbles were regarded as very precious by the natives.

The Hon. Secretary (Mr. W. RUTT, C.E.,) produced particulars respecting a well-boring at Stirling North, near Port Augusta, as forwarded by the Hydraulic Engineer. A depth of 285 feet had been reached, and brackish water obtained in a yellow sand. Professor R. TATE, F.G.S., thought the boring should be continued to the bed rock, where it was possible the desired subterranean water would be met with coming from the Flinders Range.

Professor R. TATE, F.G.S., read a paper upon "Geological Observations near Wellington, South Australia." (See page 144).

The CHAIRMAN, in view of the gypsum deposits proving of commercial value, asked if it was on public land. Professor TATE said some of it was on a Government reserve, but much was on private property. With respect to our soils, he thought they had plenty of lime in them, and he thought that sulphate of lime was not needed. Mr. MOLINEUX mentioned a case where a person at Salt Lake, near Port Vincent, put black mud from a salt swamp containing much gypsum upon his poor land with very beneficial results.

ORDINARY MEETING, DEC. 7, 1880.

His Honor Chief Justice WAY, President, in the chair.

The list of donations to the Library was read.

Messrs. G. GOYDER and A. MOLINEUX were elected Fellows.

Rev. J. KEMPE, of Finke (MacDonnell Ranges), and Mr. J. R. Y. GOLDSTEIN, Secretary, Microscopical Society of Victoria were elected Corresponding Members.

NOTES AND EXHIBITS.

Professor TATE exhibited on behalf of the Hydraulic Engineer, fragments of crocodilian scutes, obtained in the Port Augusta boring.

Professor TATE exhibited and made remarks on some South Australian plants (see p. 135).

Mr. RUTT exhibited, in illustration of his paper, a miniature section of the strata gone through in the Port Wakefield bore, on the scale of half an inch to a foot, contained in a number of long narrow boxes having a glass front to each.

Mr. C. A. WILSON read some extracts and offered a few remarks upon Mr. A. R. Wallace's new work "Island Life."

The following papers were read :—

1. "On the Propagation of Cymodocea antarctica," by Mr. J. G. O. TEPPER, F.L.S., Corr. Mem. (see p. 1).

2. "Notes on boring at Port Wakefield," by Mr. W. RUTT, Hon. Sec. (see p. 41).

ORDINARY MEETING, MARCH 1, 1881.

Professor R. TATE in the chair.

A list of donations to the Library was read.

Mr. A. L. HARROLD was elected a member of Council, in the room of Dr. S. J. Magarey, resigned,

Messrs. F. N. BURCHELL and WM. YOUNG, B.A., were elected Fellows.

Mr. F. M. BAILEY, Government Botanist, Brisbane, Queensland, was elected a Corresponding Member.

NOTES AND EXHIBITS.

The Natural Science Director exhibited fossils, minerals, and shells forwarded by Mr. Chandler, of the Peake (see p. 148) ; and fossils from the Ardrossan limestones, further corroborating the Lower Silurian age previously assigned to them, forwarded by Mr. Tepper (see p. 145) ; and minerals sent by Mr. Boyer (see p. 149).

Professor TATE showed a specimen of gold immersed in galena, from Ballarat.

The Curator of the South Australian Institute Museum, on behalf of the Governors, exhibited a remarkably fine specimen of a crayfish (*Palinurus ornatus*), peculiar to the Mauritius, measuring from the tail to the end of the antennæ 4 ft. 8 in., presented to the Museum by Mr. J. Jacobs, member of the Royal Society of Arts and Sciences, Mauritius; also, some specimens of an extraordinary species of ant found in Central

Australia (*Camponotus inflatus*), commonly called the honey ant.

Specimens of the destructive potato-moth (*Lita Solanella*) were exhibited in illustration of Mr. Tepper's paper.

Mr. A. Molineux mentioned some supposed discoveries which he had recently made with respect to the reproductive organs of the shark and ray tribes, and it was suggested that the question might be easily proved by a microscopic examination of the fluids in connection with a passage, &c., mentioned by him.

The following paper was read—" On the Potato-Moth," by Mr. J. G. O. Tepper (see p. 57). A short discussion followed, in which it was stated that Mr. Merrick had given an opinion that the micro-lepidoptera of Australia comprised at least 10,000 species.

Ordinary Meeting, April 5, 1881.

Mr. Thomas D. Smeaton in the chair.

The list of donations to the Library was read.

NOTES AND EXHIBITS.

Professor Tate said, in reference to the potato moth, that it had already been the subject of a paper by Mr. Meyrick in the Proc. Linnean Society of N.S.W. for 1879. He read an extract from that paper, and said that he had forwarded specimens to that gentleman, who replied " that the specimens in question are certainly to be referred to *Lita Solanella*, Boisduval." The insect had been introduced to the colonies, and was probably a native of Algeria, but it throve in all dry climates, and would, without doubt, give a good deal of trouble. It was not found in America, and therefore must first have fed on some other solanaceous plant than the potato. Mr. Tepper had also written again, saying that the insect had been found in potatoes at Yorke Valley.

Professor Tate read, by way of supplementing, some remarks made at the last meeting by Mr. Molineux, an extract from a paper by Baron Maclay, published in Proc. Linn. Soc. N.S.W., vol. iii., p. 327, 1879, alluding to the external genital organs of the male Port Jackson shark, and wherein reference is also made to Dumeril's work upon the same subject.

The Natural Science Director exhibited a fossil skull of a wombat, a new South Australian bat, and three species of South Australian snakes (see " Miscellaneous Contributions," pp. 149, 138, 139).

The following papers were read:—

1. " A Census of the Cryptogamic Flora of South Australia," cnmpiled by Prof. R. Tate (see p. 5).

2. "On the Butterflies of South Australia," by Mr. J. G. O. Tepper, F.L.S. (see p. 25).

3. "On the Geology of the Neighbourhood of Saddleworth," by Mr. Gavin D. Scoular (see p. 37).

Ordinary Meeting, May 3, 1881.

His Honor Chief Justice Way, President, in the Chair.

The list of donations to the Library was read.

NOTES AND EXHIBITS.

The Curator of the Adelaide Museum, on behalf of the Governors of the S. A. Institute, showed specimens of jawbone of *Diprotodon australis*, containing molar teeth, and two upper incisors, lately found and presented to the Museum by Mr. W. N. Pethic, of the Surveyor-General's Department. These were found near Millicent (South-East District) at a depth of six feet below the surface, embedded in peat mixed with shells; also, some specimens, presented by Mr. M. F. Weidenbach, of the Amphioxus or Lancelot, from the Mediterranean.

Dr. Gaze laid on the table a specimen of a legless lizard, which had been found on the sandhills at Glenelg.

Professor Tate exhibited a very fine adult example of *Semicassis paucirugis*, collected by the Rev. C. G. Taplin on the coast near Lake Hamilton.

Professor Tate exhibited a portion of a large collection of New Zealand fossils presented to him by Dr. Hector, Director of the Geological Survey of New Zealand. The specimens exhibited were selected chiefly to indicate the close similarity between the Older Tertiary species of South Australia and those of New Zealand; several species are common to the two regions, and by them the exhibitor correlated the River Murray beds and the polyzoal sands of Aldinga Bay with the Trellissick group in New Zealand. The latter Dr. Hector assigns to the Upper Eocene; whilst Professor Tate, in his "Outlines of South Australian Geology," places their probable equivalents in South Australia in the Oligocene period, rather in conformity with the Victorian classification than as a fixed opinion of his own. The inferior beds of the Aldinga section he has always maintained to belong to the Eocene period. Nevertheless the generalizations arrived at by independent observers touching the period of deposition of the Older Tertiaries in South Australia, Victoria, Tasmania, and New Zealand do not materially differ one from another.

The following papers were read:—

1. "Notes on the Physical Features of the Country Bordering the East side of Lake Eyre," by Mr. G. L. Debney (see p. 145).

2. "Sketch of the Geological and Physical Features of the Hundreds of Cunningham and Maitland, Y.P.," by Mr. J. G. O. Tepper (see p. 61).

A topographical map (1 inch per mile), a geological map ($\frac{1}{2}$ inch per mile), and three profiles, and corresponding diagrammatical sections served to elucidate the subject.

Mr. Molineux differed from Mr. Tepper with respect to his conjecture about the subsidence that he alleged was going on. There might be a subsidence in one part and not in another. Mr. J. Buik, of Kangaroo Island, directed his attention to a continual rise in the locality of American River. The water was much shallower than it had been, and in one place an oyster-bed had been raised so high that the molluscs could not live.

Professor Tate said neither Mr. Molineux's nor Mr. Tepper's impressions might be correct. There might be rising land while the sea was still ploughing away at it. He referred to the waste of the coastline of England since the Saxon Period.

Mr. Molineux stated that the fishermen in the locality had informed him that the Frenchman Rock at Western Cove, Nepean Bay, had a considerably less depth of water over it than used to exist in former years.

Professor Tate acquiesced that that was a fair case in point.

Ordinary Meeting, June 7, 1881.

His Honor Chief Justice Way, President, in the chair.

The list of donations to the Library announced.

Mr. S. Politzer was elected a Fellow.

EXHIBITS.

Mr. Waterhouse, Curator of the South Australian Museum, exhibited a fossil fragment of a rib-bone of an extinct animal, possibly that of a gigantic wombat, or of a Diprotodon, found at a depth of six feet below the surface at Thebarton, and presented to the Museum by Mr. John Battersby.

Dr. Gaze exhibited a collection of South Australian moths, in illustration of his paper.

Mr. C. A. Wilson exhibited two species of South Australian cicindelidæ (*Tetracha australis* and *T. sp.*)

The following papers were read:—

1. "On the Comet," by Mr. Chas. Todd, C.M.G. (This paper has been withdrawn by permission of the Council.)

The subject of the paper was a conspicuous object in the south-western sky during the early evening in the latter part of May and the earlier part of June. The paper was illustrated by maps, diagrams, and an orrery.

A discussion followed, in which several questions were put to and answered by Mr. Todd, chiefly relative to theories extant with respect to the constitution of comets and their motions.

2. "On South Australian Nocturnal Lepidoptera," by Dr. W. H. Gaze. (For abstract and discussion see p. 141.)

3. Mr. C. A. Wilson then read some extracts from A. R. Wallace's "Geographical Distribution of Animals," and from various papers, in which it was shown that our knowledge of insects and their numbers and varieties, although far in advance of that of a century ago, is far from being complete, and that entomologists nowadays are more dubious about the number of varieties than they were in the earlier days; but they estimate the number at "probably" 300,000 species. He remarked that he had taken a metallic blue butterfly many years ago, of which he had not seen a specimen since. He concluded by giving several interesting particulars regarding South Australian insects, which, however, have at various times appeared in print.

Ordinary Meeting, July 5, 1881.

His Honor Chief Justice Way, President, in the chair.

The list of donations to the Library was read.

Mr. E. Meyrick, M.A., Sydney, was elected a Fellow.

NOTES AND EXHIBITS.

Mr. F. G. Waterhouse, on behalf of the Governors of the South Australian Institute, exhibited a number of specimens of malachite from the Burra Burra Mine, and portion of a very large collection of copper ores lately presented to the South Australian Museum by Sir Henry Ayers.

The Secretary read a report from the Hydraulic Engineer's Department of the results of boring at Stirling North, near Port Augusta. It was stated that a depth of 407 feet below the surface had been reached. [The publication of details of this boring is deferred until the completion of the work.]

Professor Tate made some remarks about a fossiliferous limestone rock found in a well at Mitcham by Mr. Wilcox. He said it left no doubt that there were beds of the Miocene period preserved in this locality beneath the Pliocene Drift. He also referred to a fine crystal of rutile embedded in granite obtained from near Encounter Bay, and exhibited by Mr. T. D. Smeaton.

The following papers were read:—

1. "The Geology of the Neighbourhood of Port Wakefield," by Prof. R. Tate, F.G.S. (see p. 45.)

2. "Notes on the Natural History about Franklin Harbour," by Prof. R. TATE, F.G.S. (see p. 143).

3. "Notes on the Ethnology of the Zulus," by Mr. D. C. F. Moodie.

The author dwelt after a somewhat detailed manner on the remarkable points of similarity between the races from Palestine to Natal, throwing out the hint that the Zulus were connected with the ancient Canaanites. He drew attention in the course of his remarks to the fact that the interior of Africa, which English papers spoke of as the continent of the future, would never be opened up unless elephants were used, as they were the only animals that were proof against the climate, the lion, and the tsetsee. At the present time, instead of being used by the merchant, the ethnologist, or the missionary, they were being shot down for their ivory.

A discussion followed, and Mr. Moodie's theory, while being criticised freely, was felt to be one that would provide refreshing food for ethnologists.

ORDINARY MEETING, AUGUST 2, 1881.

His Honor Chief Justice WAY, President, in the chair.

NOTES AND EXHIBITS.

Professor R. TATE, F.G.S., produced a nodule, found by Mr. J. G. O. Tepper under and among the root-stocks of the mallee, and which he (Professor Tate) believed to be of fungoid origin. There was a covering upon it which might be due to lichen ; it was the same sort of leathery material, evidently of organic origin. It was worth while inquiring into. He intended to examine the nodule sent by Mr. Tepper more minutely. He could not understand its always growing in the same form, as he thought it would take something of the formation of the root.

Mr. R. S. ROGERS exhibited a live lizard, identified by Prof. Tate as *Silubosaurus Stokesi*.

Professor TATE directed attention to a statement made by the President of the Geelong Field Naturalists' Club, and suggested the advisability of forming such a Club here.

The following papers were read :—

1. "Further Notes on the Propagation of Cymodocea antarctica," by Mr. J. G. O. Tepper (see p. 47).

2. On the "Manners, Customs, &c., of the Aborigines of the neighbourhood of Port Darwin," by Paul Foelsche, illustrated with photographs of members of the various tribes, and supplemented with specimens of medicines and medicinal plants used

by them. (In consequence of the time required to print copies of the negatives of these photographs, the Council have decided to postpone the publication of this paper in the Transactions until next session).

Ordinary Meeting, September 6, 1881.

His Honor Chief Justice Way, President, in the chair.

Mr. E. P. Nesbit, Jun., was elected to audit the accounts.

NOTES AND EXHIBITS.

Mr. F. G. Waterhouse, C.M.Z.S., Curator, on behalf of the Governors of the South Australian Institute Museum, exhibited specimens of natural history and ethnological specimens lately collected at Cooper's Creek by Mr. E. B. Sanger, and by him presented to the South Australian Institute Museum. The natural history specimens comprise:—Grammatophora maculata, and G. ornata, two very handsomely marked and coloured species of lizards; Crustacea, including a very curious species of freshwater crab; a species of shield shrimp (Apus), very small, and with a circular shell, and specimens of a Cypris, as large as a grain of rice, of a rich brown colour, the two shells looking much like those of a mussel. The ethnological specimens comprised a fishing-net made from fibre of a rush, and called by the natives "Pillee;" an aboriginal garment known by them as Anpah, being a twined fringe made of opossum or wallaby fur, worn suspended as a kilt or girdle; another similar garment, known has Oolpooroo, made of twine twisted from human hair. A necklace made from short pieces of grass stems, and known as Culta-culta; a net for the hair, made from grass fibre, and called Wanoo; a bone from an emu, used for piercing the cartilage of the nose, and called Wanaparya; a portion of bone from the wing of a pelican, called Padamookoo, used as an ornament in the nose; and a piece of hornstone or chert, used in the rite of circumcision. The nets, &c., were dyed in two colours, red and yellow.

The following papers were read:—

1. "Mineralogical and Chemical Notes from the Laboratory of the Wallaroo Smelting Works," by Mr. T. C. Cloud, F.C.S.

2. "Geographical Relations of the Pulmoniferous Mollusca of Victoria," by Prof. R. Tate, F.G.S.

3. "Descriptions of New Species of Australian Mollusca," by Prof. R. Tate, F.G.S. (The publication of this paper is unavoidably postponed.)

Annual Meeting, October 4, 1881.

His Honor Chief Justice Way, President, in the chair.

The list of donations to the library was read.

Dr. E. C. Stirling, M.A., was elected a Fellow.

NOTES AND EXHIBITS.

Mr. Stirling Smeaton exhibited living specimens of *Amphipeplea papyracea.*

Mr. F. S. Crawford, in reference to the weed known as Cape Marigold, Dandelion, &c. (*Cryptostemma calendulacea*), now growing so plentifully over the country, stated that he had been experimenting with a view to seeing whether there was any foundation for the belief that the pollen caused what was known as the "dandelion fever." The result of his experiments was in his opinion the pollen did not float in the air, but was carried by insects, as the dandelion belonged to the order of plants which insects sought for the honey, and it did not trust to the air for extending its fertilising powers. He covered glass sides with paper, leaving a hole, and coated the vacant space with glycerine and spirits of wine; put some of them on posts, and carried others, exposing them to air where the weed grew plentifully, but of twenty-eight exposed in that way not one showed a deposit of pollen. The pollen grain was so well marked that it could not be mistaken.

Professor Tate said the experiments might bring considerable relief of mind to some people, for there were many who believed that they were affected by the dandelion, because they had some little ailment at the time. The majority of our native plants were not wind fertilised. He would rather look among our grasses for the cause of hay fever.

Dr. Davies-Thomas said he was not aware of any reliable experiments on the subject at all, except Mr. Crawford's. He was quite sure the ailments were much exaggerated, and he could not recall an obvious case as being due to that cause at all. He himself was rather sceptical about the alleged prevalence of the fever. At the season of the year that dandelions were about the weather was changeable, and the people not being careful enough of themselves in the way of clothing were subject to colds.

Mr. Todd had experienced hay fever in England, and agreed with Dr. Thomas that at this season of the year in Australia the sudden changes of temperature affected some persons.

The following papers were taken as read:—

1. "Descriptions of New South Australian Plants," Translated by Mr. Stirling Smeaton.

2. "Descriptions of South Australian Staphylinidæ," Translated by Mr. S. E. Holder.

3. "A Supplement to the Census of South Australian Plants," by Professor R. Tate.

4. "Description of two New Species of Plants," by Baron F. von Mueller.

The annual report and balance-sheet were read and adopted, and ordered to be printed (see p. 163).

During the discussion which ensued—

Mr. CHARLES TODD, C.M.G., said he hardly agreed with the paragraph with respect to the popular lectures having been a failure, and he thought the Society should not be discouraged with a single attempt, because it proved a failure. The Society might take up other matters of interest apart from purely scientific subjects. It was a pity that other Societies more or less competed with the Royal Society, and tended to detract from its interest. There were matters taken up by the Chamber of Manufactures and the Microscopical Society which could fairly claim the attention of the Royal Society.

Dr. DAVIES-THOMAS considered that the Society might be made more popular in various ways. The hour of meeting—half-past seven—was considered inconvenient. The Society might be popularised by means of lectures of an entertaining character ; it could show the public that the Society could deal with outside subjects and practical evils. Last year an interesting debate took place at the Society regarding the mortality of young children. The matter was one concerning the general welfare, and the exertions of the Society could perhaps do much good in bringing out practical ideas in that direction. There was one disease very prevalent here, viz., hydatids, and he had been investigating the subject. The Society might seek information and invite discussion on the subject. He intended to bring the matter before the Society. He found that South Australia had by far the largest proportion of the disease. In Mount Gambier Hospital, for instance, one patient out of fifty-six had hydatids. The Society might take steps to ascertain the conditions leading to that disease—if the attention of the intelligent observers in the South-East were drawn to certain points, for instance, to what extent diseased sheep and oxen distributed the disease. The ova might gain access to the human system through infected water imbibed by persons while quenching thirst, and there were other ways by which hydatids could reach human beings.

Mr. ROWLAND REES thought that it would be the means of doing much good if the subject initiated by Dr. Thomas were discussed at length, and at the earliest convenient opportunity. Subjects connected with earth, air, fire, and water could be profitably discussed by the Society, and would be the means of enlightening the youth of the colony and directing their attention to scientific subjects. In various other ways the Society could extend information and benefit the community at large.

The President, in reference to increasing the attendances at the meetings, expressed the opinion that an alteration in the time of meetings and the obtaining of a better room would do much to increase the number of visitors. Conversaziones would go a long way to popularising the Society. Dr. Davies-Thomas had introduced a subject of much value and interest, and a paper contributed by him would encourage further observations.

The following officers were elected for the ensuing year:—President, His Honor the Chief Justice; Vice-Presidents, Messrs. C. Todd, C.M.G., and D. B. Adamson; Hon. Treasurer, Mr. T. D. Smeaton; Hon. Secretary, Mr. W. Rutt; members of the Council, Professor Tate, Dr. Mayo, and Dr. E. C. Stirling, M.D., and Mr. F. Chapple, B.A., B.Sc.

ANNIVERSARY ADDRESS.

The President stated that in consequence of official duties he was prevented from preparing an address in time for the annual meeting, but that at his request Professor Tate had kindly undertaken the delivery of one.

Professor Tate delivered the anniversary address, taking for his subject "Geology in its Relation to Mining and Subterranean Water Supply in South Australia."

A vote of thanks was accorded to Professor Tate for his address, and it was decided that the address should be printed with the Transactions of the Society.

Report of the Council for 1880-1.

At the close of this the first year of the Society's existence under its present title the Council are happy to be able to state that the work of collecting and recording scientific facts has been vigorously carried on, as will be seen on a perusal of the following list of papers which have been submitted to the notice of the Fellows:—By Professor R. Tate, F.G.S.—"Geology about Wellington;" "Mosses, &c., of South Australia;" "Geology about Port Wakefield;" "Geological, Mineralogical, and Botanical Notes on Country about Franklin Harbour;" "Geographical Relations of the Pulmoniferous Snails of Victoria;" "Descriptions of new species of Australian Mollusca;" "Supplement to Census of South Australian Plants." By C. A. Wilson—"Notes upon Wallace's 'Island Life;'" "Entomological Notes." By J. G. O. Tepper, F.L.S.—"The Propagation of Cymodocea" and "Further Notes on the Same;" "The Potato Moth;" "Butterflies of South Australia;" "Geological and Physical History of the Hundred of Cunningham." By Walter Rutt—"Well-boring at Port Wakefield." By G. D. Scoular—"Geology about Saddleworth." By G. L. Debney—"Physical Features of the Country East of Lake Eyre." By Charles Todd, C.M.G., F.R.A.S.—"The Comet of 1881." By W. H. Gaze, M.D.—"Notes on some South Australian Lepidoptera." By D. C. F. Moodie—"Notes on the Ethonology of the Zulus." By Paul Foelsche—"The Aborigines of Northern Australia." By T. C. Cloud, F.C.S.—"Mineralogical and Chemical Notes from the Laboratory of the Wallaroo Smelting Works." By Stirling Smeaton, B.A.—"Descriptions of New South Australian Plants." By S. E. Holder—"Descriptions of South Australian Staphylinidæ." By Baron F. von Mueller—"Descriptions of New Species of Plants." The interest of the meetings has been increased by numerous exhibits of natural history specimens and other objects worthy of scientific notice. For some of these the Society is indebted to the courtesy of the Governors of the South Australian Institute, who have placed upon the table the most noteworthy donations to the Institute Museum; but the larger portion has been forwarded through the Natural Science Director by Fellows and Corresponding Members and other persons interested in scientific pursuits. It is, however, to be hoped that a greater number will take advantage of the facilities offered by the Natural Science correspondence department of the Society for the identification of specimens and the registration of observed phenomena. The "Transactions and Proceedings" for 1879-80, which were published in the early part of this session, show a decided advance both in the quantity and in the value of the matter which has been collected by the Society, and it is believed that in the volume for the present session the same standard of progress will be maintained. Owing to the scattered nature of the Society's membership the attendance at the monthly meetings is necessarily small, and the true value of its work can only be estimated from its publications; that its value is appreciated beyond the limits of the colony is shown by the recognition accorded to the Society by other scientific bodies which have received copies of its Transactions. It was intimated in the last annual report that it was intended to supplement the purely technical papers with lectures of a more popular character upon scientific subjects, but the result of the one attempt in this direction was not such as to encourage the Council to continue in this course. The membership of the Society is not as large as the Council feel it has a right to expect. The number in all classes is now 102, the same number as at the last annual meeting. In addition to the members enrolled in the various classes, nine gentlemen have been appointed local correspondents by the Council in accordance with Rule 25.

The death of our honorary member, Mr. J. L. Young, has removed another of the small band of pioneers in scientific research who founded the Adelaide Philosophical Society in January, 1853, and one who, while closely identified with the Society in its early days, was also distinguished for his efforts to imbue the youth of the colony with a taste for science.

The balance-sheet shows that the finances of the Society continue in a sound condition, but it must be remembered that as the value of the Society's work increases, so also will the cost of publication of its Transactions, which already forms the chief item of expenditure.

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THE TREASURER IN ACCOUNT WITH THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Dr.	£	s.	d.	Cr.	£	s.	d.
October, 1880.				By Cost of Transactions	118	8	10
To Balance brought forward	187	5	9	Assistant Secretary's Salary	21	0	0
Subscriptions	66	7	6	Do. Sending out Transactions	2	2	0
Government Grant	91	7	0	Advertising and Stationery	15	2	0
Sale of Transactions		13	0	Rent &c.	12	0	0
				Postage of Transactions	3	13	5
				Balance carried forward	173	7	0
	£345	13	3		£345	13	3
Balance brought forward	£173	7	0				

Audited and found correct,

E. PARISS NESBIT.
Auditor.

4th October, 1881.

THOMAS D. SMEATON,
Treasurer.

LIST OF FELLOWS, MEMBERS, &c.,

November 2nd, 1881.

Those marked (F) were present at the first meeting when the Society was founded. Those marked (L) are Life Fellows. Those marked with an asterisk have contributed papers.

HONORARY FELLOWS.

Name	Address	Date of Election.
Angas, Geo. French, F.L.S., C.M.Z.S.	Norland-square, London ...	1879
Barkely, Sir Henry, G.C.M.G., K.C.B.	... ...	1857
Ellery, R. L. J., F.R.S.	Observatory, Melbourne ...	1876
*Garran, A., L.L.D.	Sydney	1853
*Hull, H. M.	Hobart Town	1855
Jervois, H. E. Sir W. F. D., G.C.M.G., C.B.	Government House ...	1878
Little, E.	... ...	1855
Macleay, W., F.L.S.	Sydney	1878
*Mueller, Baron F. von., K.C.M.G., F.R.S., &c.	South Melbourne	1879
Russell, H. C., B.A., F.R.A.S. ...	Observatory, Sydney ...	1876
Warburton, Col. P. Egerton ...	Beaumont	1858
*Wilson, C. A.	Supreme Court	1853
*Woods, Rev. J. E. Tenison, F.L.S., F.G.S., &c.	162, Albion-street, Surrey Hills, Sydney	1877

CORRESPONDING MEMBERS.

Bailey, F. M., F.L.S.	Botanic Gardens, Brisbane ...	1881
Canham, J.	Stuart's Creek	1880
*Cloud, T. C., F.C.S.	Wallaroo	1881
Chandler, T.	Peake	1881
*Foelsche, Paul	Palmerston	1880
Goldstein, J. R. Y.	Office of Titles, Melbourne ...	1880
*Hayter, H. H., F.S.S.	Government Statist, Melbourne	1878
*Kempe, Rev. J.	Finke, MacDonnell Ranges...	1880
Richards, Mrs. A.	Fowler's Bay	1880
*Scoular, Gavin	Blair, Smithfield	1878
*Tepper, J. G. Otto, F.L.S. ...	Clarendon	1878

FELLOWS.

*Adamson, D. B.	Angas-street	1867
Addis, W. L.	Currie-street	1879
Angas, J. H.	Collingrove, Angaston ...	1874
Biggs, Col. J. H....	Edwardstown	1878
Brunskill, George	Morgan	1878
Burchell, F. N.	Survey Office	1881
*Chalwin, Thomas	Currie-street	1877
Chapple, F., B.A., B.Sc.	Prince Alfred College ...	1876
Cleland, R., M.D.	Parkside Asylum	1879
*(L) Cook, E., M.P.	South-terrace	1876
Cox, W. C.	... ...	1880
Crawford, F. S.	Surveyor-General's Office ...	1865
*Davenport, S.	Beaumont	1856

Dobbie, A. W.	Gawler-place	1876
Elder, Sir Thomas	Grenfell-street	1871
*Fletcher, Rev. W. R., M.A. ...	North-terrace, Kent Town ...	1876
Florance, W.	Clarendon	1881
Gall, D.	Tynte-street, N. Adelaide ...	1865
*Gaze, W. H., M.D.	New Zealand	1880
*(F) Gosse, William, M.D., F.R.C.S....	North-terrace	1853
Gosse, Chas., M.D.	North-terrace	1877
Goyder, G., Jun.	Government Offices ...	1880
*Hamilton, George	Adelaide Club	1868
Harrold, Arthur L.	Hindley-street	1876
Harry, Thos.	Exchange	1878
Hay, Alexander	Beaumont	1861
Hopkins, Rev. W.	Glenelg	1880
Hull, W. B., Assistant Hydraulic Engineer	Hydraulic Engineer's Office	1874
Hullett, J. W. H.	Port Augusta	1876
*Ingleby, R., Q.C.	King William-street ...	1861
Johnston, J. A.	Alfred Chambers, Currie-street	1875
*Joyce, J. F., M.D.	South-terrace	1880
*(F) Kay, R., Secretary South Australian Institute	College Town	1853
Knevett, S.	Carrington-street	1878
*Laughton, E.	Currie-street	1874
*Lloyd, J. S.	Lefevre-terrace, N. Adelaide	1856
*Macgeorge, Jas.	King William-street ...	1855
Madley, L. G., Principal of Training College	Whitmore-square	1879
Magarey, A. T.	Barton-terrace, N. Adelaide...	1873
*Magarey, S. J., M.B.	North-terrace	1874
Mayo, G., F.R.C.S.	Morphett-street	1853
Mayo, G. G.	Engineer-in-Chief's Office ...	1874
Meyrick, E., M.A.	Sydney	1881
Molineux, A.	Kent Town	1880
(L) Murray, David	North Adelaide	1859
Nesbit, E. P., Jun.	King William-street ...	1875
Nesbit, W. P., M.D.	North Adelaide	1880
Pollitzer, S., C.E.	Engineer-in-Chief's Office ...	1881
Rees, John, M.D.	Hindmarsh	1880
Rees, Rowland	Waymouth-street	1874
Russell, W.	Commercial-rd., Port Adelaide	1879
*Rutt, Walter	Engineer-in-Chief's Office ...	1869
Salom, M.	North Adelaide	1881
*Schomburgk, R. Doctor Ph., &c. Director	Botanic Gardens	1865
*Smeaton, T. D.	Bank of South Australia ...	1857
Smith, R. Barr	Torrens Park, Mitcham ...	1871
Smith, William	Hydraulic Engineer's Office...	1880
Sparks, H. Y.	Glenelg	1878
Stirling, E. C., M.D.	Lefevre-terrace	1881
Stuckey, J. J., M.A.	Victoria Chambers, King William-street	1878
*Tate, Prof. Ralph, F.G.S., University of Adelaide	Buxton-street, N. Adelaide ...	1876
Telfer, W.	Wallaroo Hospital ...	1880
Thomas, J. Davies, M.D.	North-terrace	1877
Thomas, R. G. Sec. of Board of Health	Unley	1877

Thow, W., Locomotive Engineer ...	S.A. Railway	1878
Tietkens, W. H.	... ...	1881
*Todd, Charles, C.M.G., F.R.A.S., M.S.T.E., Postmaster - General, Observer, and Sup. of Telegraphs	Observatory	1856
Townsend, W., M.P.	King William-street ...	1878
Umbehaun, C.	General Post Office ...	1879
*Verco, Joseph C., M.D.	Wellington-square, N.A. ...	1878
Vickery, G.	Meadows	1868
Ware, W. L.	Victoria Chambers, King William-street	1878
*Waterhouse, F. G., C.M.Z.S., &c., Curator of Museum	S.A. Institute	1859
Way, His Honor S. J., C.J. ...	North Adelaide	1859
Way, E. W., M.R.C.S.	North-terrace	1878
Wragge, C. L., F.R.G.S.	Care of R. Ingleby, King William-street ...	1877
Wyatt, Wm., M.D.	Burnside	1859
Young, W. M., B.A.	Model School, Hindmarsh ...	1881

ASSOCIATES.

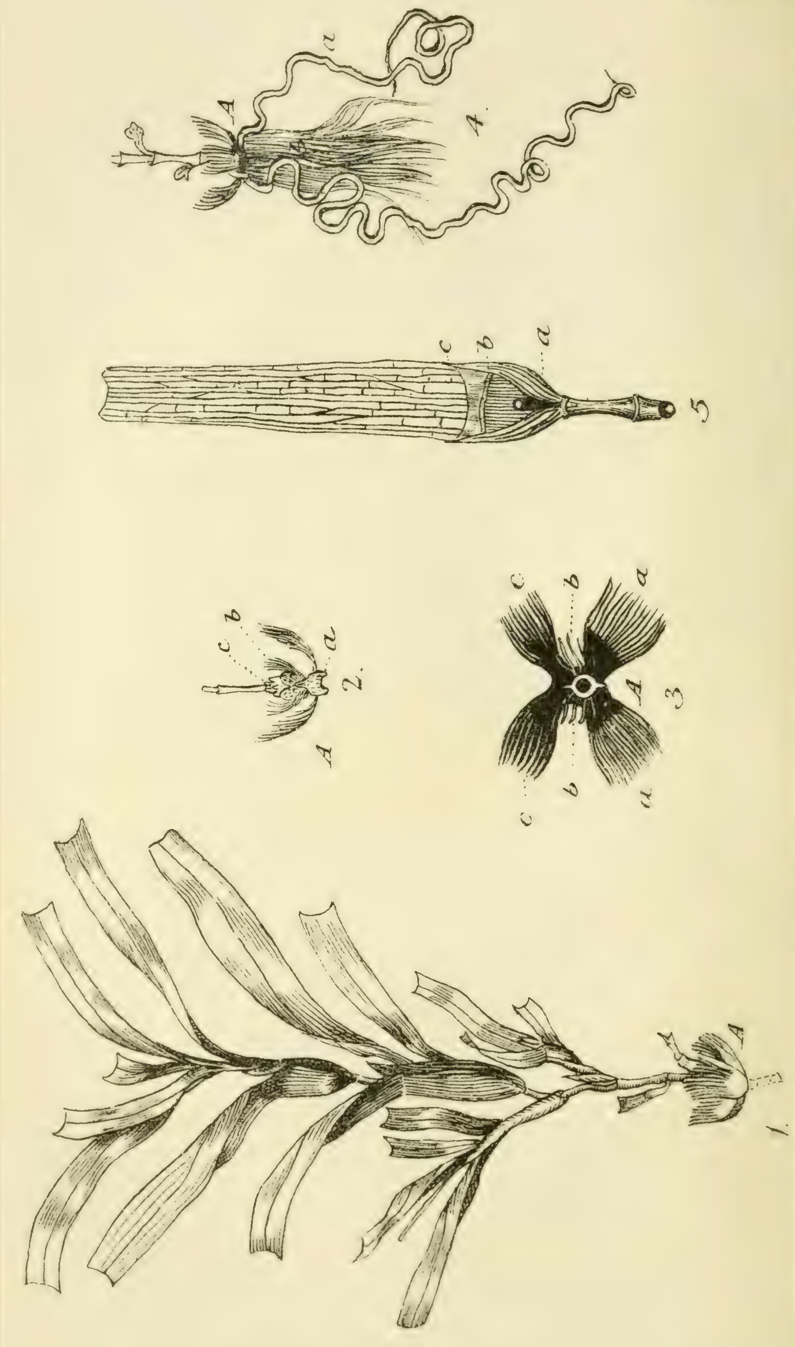
*Holder, Sydney E.	Parade, Norwood	1880
Rogers, R. S.	Bailey's Gardens, Hackney	1880
*Smeaton, Stirling, B.A.	Medindie	1878

LOCAL CORRESPONDENTS.

Salter, W. H., Blinman
Boyer, E., Eudunda
Courderst, A. H., Fremantle, W.A.
Lattorff, H., Whittata
Fowler, W., Yarroo
Debney, G. L.., Crystal Brook
Guest, E., Balhannah
Williams, W., Eucla

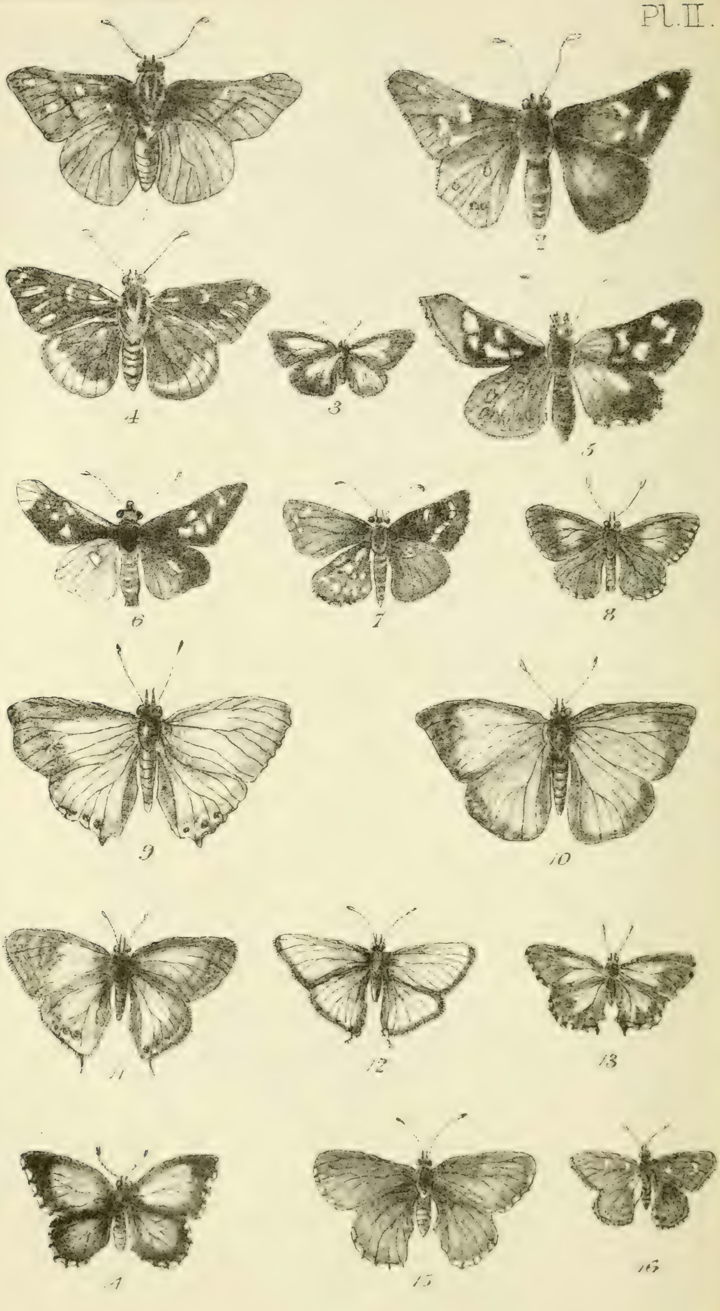
Webb, Vardon, & Pritchard, Printers, Gresham-street, Adelaide.

PLATE I



G. H. STROTHER, DELT. J. WILLIAMS, LITH. ADELAIDE.

Pl. II.



Pl. III

PLATE. IV.

Fig 1. Horizontal Section across Valley of the Upper Gilbert

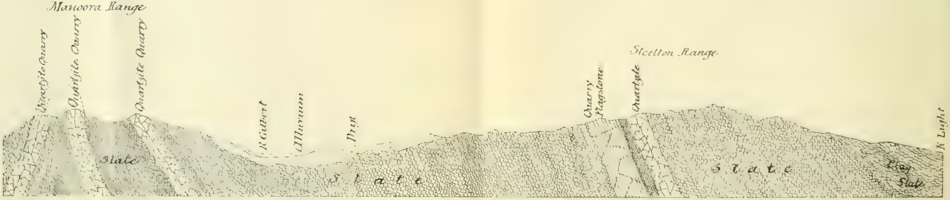
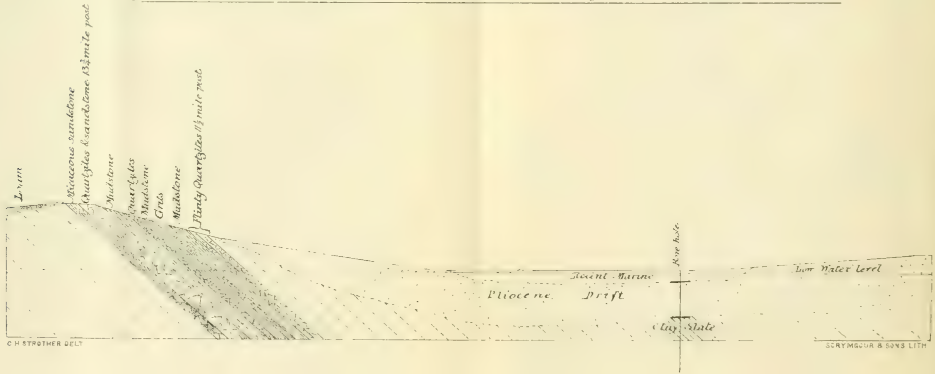
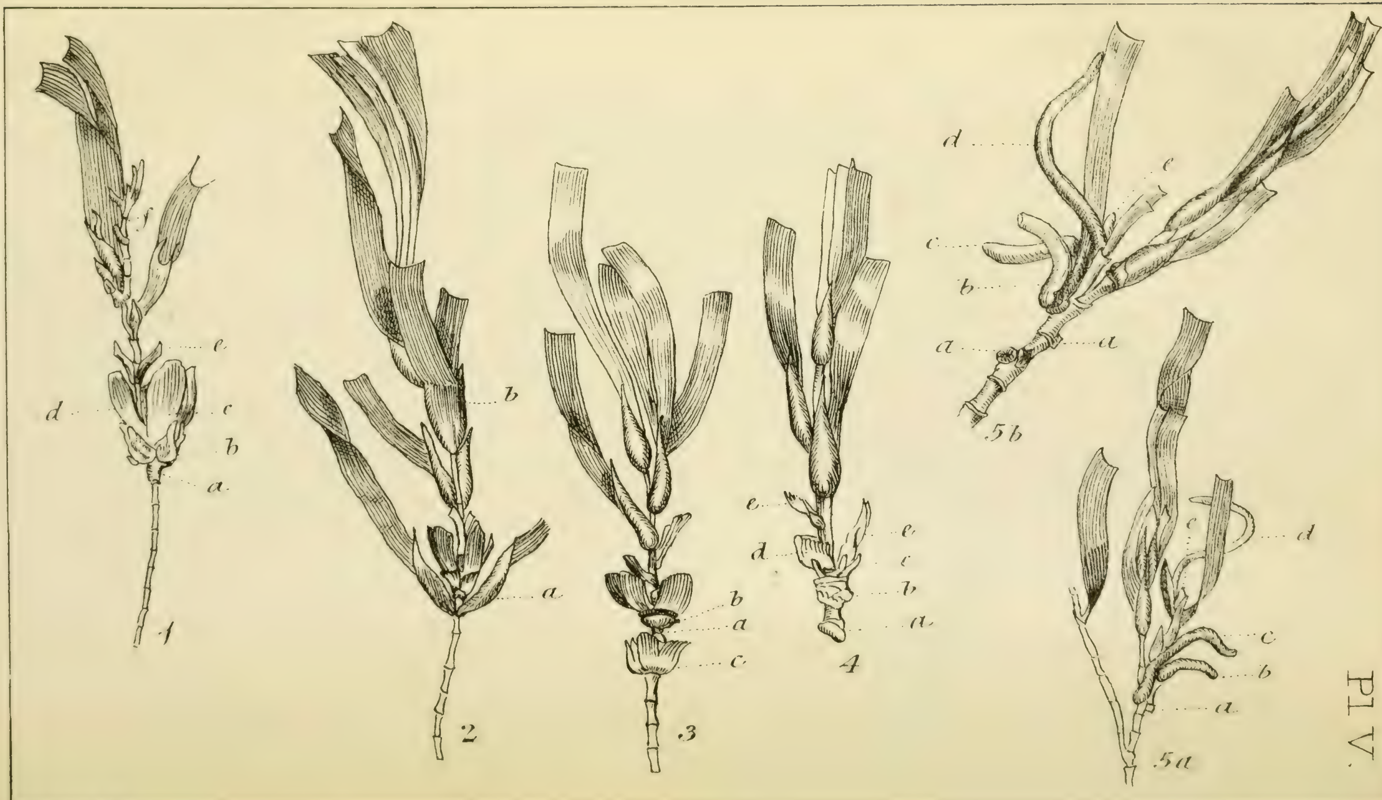


Fig 2 Horizontal Section from Summit of Railway to Port Wakefield Flats



C H STROTHER DELT

SCRYMGOUR & SONS LITH



C.H.STROTHER, del.