THE

# Proceedings

OF THE

# ROYAL SOCIETY

OF

# QUEENSLAND.

**1884.**

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VOL. I. PART I.

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# PROCEEDINGS

OF THE

# Royal Society of Queensland.

## INAUGURAL MEETING, 8TH JANUARY, 1884.

His Excellency Sir ANTHONY MUSGRAVE, K.C.M.G., &c., &c., in the chair.

The Hon. Secretary, reporting progress, intimated that there were sixty-seven members on the roll; that several papers on the various topics within the scope of the Society had been proffered, and that so far it was in a favourable financial position.

### DONATIONS.

"Solution of the Celebrated Fundamental Question of Dynamics," by MARTIN GARDINER, C.E. 1883. From the author.

"Results of River and Rain Observations made in New South Wales during 1882," by H. C. RUSSELL, Government Astronomer of New South Wales.

"Results of Meteorological Observations made in New South Wales during 1879." From the Government Astronomer of New South Wales.

"The Sydney Observatory, its History and Progress," with a list of papers which have emanated from the Government Astronomer's department, by H. C. RUSSELL, B.A., F.R.A.S. From the author.

"The Spectrum and Appearance of the recent Comet," by H. C. RUSSELL, B.A., F.R.A.S., Proc. Roy. Soc. N.S.W. 6th July, 1881. From the author.

"Anniversaray Address," by H. C. RUSSELL, B.A., F.R.A.S., President. Proc. Roy. Soc. N.S.W. 3rd May, 1882. From the author.

"Rapport Medical sur les Accidents qui ont suivi plusieurs blessures par flèches prétendues empoisonnées, dans les îles du Pacifique. Avec Rapport de la Commission instituée par le Gouveneur, 1883, à l'effet d'examiner la nature du poison," &c Nouméa, 1883. From the Colonial Secretary.

"Atti della Società Toscana di Scienze Naturali Processi verbali," Pisa, vol. iii. Adunanza del dì iluglio, 1883. From the Society.

"Myology of Chlamydosaurus Kingii, *Gray*," by CHAS. DE VIS, B.A., Proc. Lin. Soc. N.S.W., 1883. From the author.

The President, Hon. A. C. GREGORY, C.M.G., F.R.G.S., delivered the Inaugural Address.

# INAUGURAL ADDRESS

Hon. A. C. Gregory, C.M.G., F.R.G.S., M.L.C.

It is in accordance with the usual practice of kindred associations that an address should be delivered by the President of the Society at its annual meetings, adverting to its progress, and also to the general advancement of science in the division to which its labors are more especially directed.

As regards the past history of the Royal Society of Queensland there is little to say, as our previous meetings have been devoted to the arrangement of details of construction; and of the Philosophical Society, with which the new Society has been incorporated, it is sufficient to observe that it has had existence from the time Queensland became a separate province, and that as regards the result of its labors it can point to the Queensland Museum as having taken an important part in the inauguration of that successful and popular institution.

Thus it may be said of our joint concern that it is only to-day that our new vessel has been finally launched on the ocean, where it is to be hoped that we shall enjoy a full proportion of favorable breezes, and that the unavoidable head winds will be only sufficient to keep the crew in training ready for emergencies.

As to the future, the Society has selected Natural Science and its practical application, as the field of investigation—one which cannot be deemed a narrow one, as the limits have not yet been approached, so that there is still ample room for all to extend their researches, each in the direction which may be most congenial, as one of the important functions of societies such as ours is to bring together the results of the speculations of individuals, so as to render them available for the use of the community. The time is not so remote but that it comes within the scope of my own observation when speculative science adopted such an elevated platform that it was almost inaccessable to the practical man, and when theory and practice were viewed as though separated by so wide a chasm as to be scarcely compatible. There were few books on scientific subjects which were written in a style to be intelligible to any but the highly educated, and the bulk of the community were left under the impression that as so little of any practical value or use was apparent, scientific investigation was only a waste of time and avoidance of real work.

The education of the masses has, however, raised them to a position to understand, at least to some extent, the value of theoretical investigation; while what are termed the applied sciences have provided a bridge between theory and practice, by which the daily work of our hands may be rendered easier, or at least more effective, in its results. Even professional men in the early part of the present century were content to follow the practice and custom of their predecessors, and had little data on which to base improvement; and the outcome was that our structures, machines, and implements were ill-proportioned, involving great waste of labour and material, with inadequate results. Take, for instance, our ships, which in the recollection of those present used to take thrice the time now usual in the voyage from England to Australia. That increase in speed has only been attained through scientific investigation of the forms of least resistance; while the iron of which our huge steamers are constructed could never have been manufactured without the aid of the scientific chemist and his knowledge of chemical equivalents. Nor could the steam engines have been brought to their present perfection but for investigation of a very high order into the specific heat of bodies, and the amount of force developed in their combinations. How 1 lb. of carbon requires 12 lbs. of atmospheric air for its combustion; that 1 lb. of water requires as much heat to change it into steam as would heat 966 lbs. of water 1 degree; and also that the amount of heat required to heat 1 lb. of water 1 degree is equivalent to a force capable of raising 772 lbs. one foot.

On the other hand, turning to machines for freezing, science shows us that to cool 1 lb. of water from 62 degrees to 32 degrees, even in a perfect machine, a force equal to lifting 23,160 lbs. one foot must be expended, and that to change it into ice an additional force of 109,624 foot pounds is absorbed, so that making no allowance for loss of power through friction of machines and the radiation of heat, the manufacture of a pound of ice absorbs as much power as would lift nearly 60 tons a foot.

It has been suggested that the meat supply of Brisbane should be frozen, but have our city fathers realised the fact that to freeze a single bullock as much steam power is required as would lift the Town Hall and all its belongings a yard high above its foundations, or lift one of the ocean steamers out of the river on to the wharf.

Electrical science has perhaps made the greatest advance of late years. The telegraph, telephone, electric light, and motors have sprung into practical existence in a comparatively short period, and so extraordinary has been their progress that many have been led to expect that electricity would supersede steam power and gas light; but here science shows that as one pound of carbon will absorb ten times the quantity of oxygen as a pound of zinc, which is the most energetic direct source of electricity, so also does carbon develop ten times the energy which is given by an equal weight of zinc; and in actual practice it has been found that the coal-burning steam engine is the most economical source of electricity, whether used for power or light. And though the gas engine has been advantageously applied for this purpose, it is only successful where limited space and intermittent demand make it convenient to burn part of the coal at the gas works, in making the gas which is to be burnt at the place where the power is used. Thus the gas engine is equally a coal-burning motor with the ordinary steam engine.

One of the more important results of the scientific investigation of heat, light, electricity, magnetism, and gravitation or motive force is, that they are all convertible forms of one and the same condition of matter: a condition for which our language has not yet supplied a separate specific term, and it has therefore been provisionally designated "Energy." Energy, like sound, has not a substantive existence, but is only the vibration of a substantive medium through which its undulations or waves are transmitted.

The development of these facts has further led to the important discovery, that though the nature of our terrestial atmosphere is such that we cannot compute it to have a thickness of 100 miles—which is a mere film on the earth's surface—yet there must be some elastic medium occupying the space beyond to the full extent of the visible universe, for light, being only a vibration, could not traverse an absolute vacuum, as there would be no medium to vibrate and convey its undulations.

Here we enter a vast field for speculative investigation with data which tend to the expectation that our present theories regarding the conditions of the celestial bodies may be considerably modified.

The sun, for instance, has been assumed to be a hot mass, which radiated heat in the same manner as a ball of heated metal; and Sir I, Newton and others have computed that it must be many thousand times hotter than red-hot iron, because if heat consisted of substantive particles flowing radially from the solar surface, the temperature would decrease as the square of the distance of the point of observation. When, however, we examine the sun's disc with a telescope black spots are observed, and these are not masses of opaque matter floating on its surface, but holes or depressions, which pass through the bright photosphere and render visible a central body, which shows no signs of incandescence, and the heat of which must, according to our present knowledge, be less than that of red-hot iron; and it therefore appears that the condition of energy which emanates from the sun is not solely that of light or heat, and that the thermometric temperature of the sun may not exceed that of the flame of a common candle.

In thus straying into the regions of theoretical enquiry, I have perhaps transgressed the proper limits of an address to a Society whose objects are specially to render science available for practical uses, and will therefore leave the "Celestial" (who by the way is not very popular just now) and return to our own national requirements.

It may perhaps be asked how it is that the vast resources of science which have been open to the world have been availed of in such a tardy manner, but it may be answered the extremely conservative character of the British workman has always presented a material obstacle to improvement. Their fathers and grandfathers did things in such or such a way, and did very well, why then should new-fangled methods be adopted? What would be the use of the workman's present knowledge if he had to learn something new? And the only remedy, which has proved in any degree effective, has been the education of the nation, so as to enable them to see and hear things with their own eyes, ears, and intelligence, and not solely through those of past generations.

I have seen crowds of men assembling to destroy thrashing machines, have known them to disable reaping and other labor-saving machines, under the impression that machinery decreases the demand for manual labour; and it is not so many years since agricultural machines, railways, and sewing machines were held to be equally subversive of the public weal, as the employment of colored labor is at the present time.

The actual result of machinery has been to vastly increase the employment of labour, and to enable the workman not only to profit by the use of his hands, but also of his head.

It has been the teaching in schools, supplemented by the instruction gained by moving about the world and contact with new conditions in new countries, which has rendered the British Colonist a much more intelligent and successful citizen, and it has been from similar causes that such great improvement has been made in America in the method of constructing so many of our domestic appliances.

Thus we see how important it is to the community as well as to the individuals composing it, that a knowledge of practical science should be extended, and that societies like ours are not mere associations for the discussion of fanciful theories, but that they are institutions for the collection and utilization of information which is of the utmost importance to the state and to our social and material progress, and I trust that each member of the Royal Society of Queensland will, according to his opportunities, lend a helping hand in collecting material for such important work.

## TUESDAY, FEBRUARY 12, 1884.

THE VICE-PRESIDENT, J. BANCROFT, M.D., IN THE CHAIR.

### DONATIONS.

"Cultural Industries for Queensland," 1st Series, by LEWIS ADOLPHUS BERNAYS, F.L.S., Brisbane, 1883. From the Author.

"Report on the Mines of Herberton, Western and Thompson Creek Districts, and the Silver Mines of the Dry River, Queensland," by R. L. JACK, F.G.S., Government Geologist, Brisbane, 1883. From the Author.

"The Treatment of Tin Ore in Europe," by Z. WAGEMANN, Melbourne, 1883. From the Author.

Specification of Patent to Henry Harris Lake, for "Process for Extracting Metals from their Ores," London, 1883. From A. J. THYNNE, ESQ., Brisbane.

"On Ogyris Genoveva, *Hewitson*, and its Life History," by W. H. MISKIN, ESQ., Brisbane. Trans. Ent. Soc., 1883, Part IV. From the Author.

# CONTRIBUTIONS TO THE QUEENSLAND FLORA

BY

F. M. BAILEY, F.L.S.,

Government Botanist of Queensland.

The subject of the present paper is an enumeration of the plants which have been found since, or that were overlooked in compiling the "Synopsis of the Queensland Flora," to which work this may be taken as a first supplement.

Thus it will be seen that from specimens received from the Endeavour River, BARON VON MUELLER has founded the new genus Husemannia, an addition to the Order Menispermaceæ. He has also added to Rhamneæ two new plants—a Ventilago from Rockingham Bay, and a Stenanthemum found at Stanthorpe, also to the Order Thymelæaceæ one to the already large genus Pimelea.

It will be also seen that while at Helidon a few months ago I was fortunate enough to meet with a new species of Rubus, the well-known genus of Rosaceæ. The favourite Order Orchideæ has been increased by six new Dendrobiums, four of which have been received from Northern and two from Southern Queensland. The Ophiopogon mentioned as having been found at Enoggera Creek is interesting, being the first plant of the tribe Ophiopogoneæ as yet met with in Australia, but I think it might be well before claiming this as indigenous that further specimens should be met with

Lycopodiaceæ has been increased by the addition of a pretty species of Selaginella from the Johnstone River, whilst a Trichomanes and an Asplenium from the Johnstone River, and a Polypodium from Helidon have been added to our Fern Flora. It is an interesting feature also to find that out of the 80 species of Fungi recorded, about one-third are new, and have been described and several figured in the last year's transactions of the London Linnean Society by the celebrated mycologists, Messrs. Berkeley and Broome.

ORDER MENISPERMACEÆ.

Husemannia, *F.v.M.*, *South. Sci. Rec. May*, *1883.*

H. protensa, *F.v.M.*

Hab. Daintree River, Pentzke ; Endeavour River, Persieh.

ORDER PORTULACEÆ.

Portulaca napiformis, *F.v.M*

Hab. Emerald. P. A. O'Shanesy,

# ERRATA.

Page 7, line 2 from top, for "Fitlicula" read "Filicula."
Page 7, series A, should be under Tribe Polypodieœ.
Page 8, line 7 from top, for "esectum" read "resectum."
Page 8 line 15 from top, for "resembiing" read "resembling"
Page 9, line 4 from top, for "laccatimus" read "laccatinus."
Page 9, line 19 from top, for "Panu's" read "Panus."
Page 9, line 14 from bottom, for "lateritiuse" read "lateritius."
Page 9, line 9 from bottom, Polyporus should be placed over the species.
Page 9, line 7 from bottom, for "orcadideus" read "dorcadideus."
Page 10, line 6 from bottom, for "Kays" read "Kaye."
Page 11, line 2 from bottom, for "cucurbitarium" read "cucurbitarum."
Page 12, line 1 top, after Bowen, add Park.
Page 12, line from top, for "Tennison-Woods" read "Tenison-Woods."
Page 12, line 2 from bottom, for "Chile" read "Chili."

P. australis, *Endl.*
Hab. Emerald. P. A. O'Shanesy.

### ORDER MELIACEÆ.

#### TRIBE CEDRELEÆ.

Flindersia Schottiana, var, pubescens, *F.v.M. Fragm V.* 142.
Hab. Rockingham Bay.

This tree is worthy of notice here as being another of our tropical trees that will thrive in the southern parts of the colony. This has been fully proved by the trees planted by Mr. Hill in the Wickham Terrace Reserve, which are forming fine heads, and bid fair to become the best shade-giving trees on the Reserve.

### ORDER RHAMNEÆ.

#### TRIBE VENTILAGINEÆ.

Ventilago ecorollata, *F.v.M.*, *South. Sci. Rec.* 1883.
Hab. Rockingham Bay, Dallachy, Endeavour River. Persieh.

#### TRIBE RHAMNEÆ.

Stenanthemum, *Reissek.*
S. Scortechinii, *F.v.M.*, *Melb. Chem. and Druggist*, 1884.
Hab. Stanthorpe. Rev. B. Scortechini.

### ORDER LEGUMINOSÆ.

#### TRIBE PODALYRIEÆ.

Oxylobium ellipticum, *R. Br.* var. angustifolium.
Hab. Point Danger. H. Schneider.

#### TRIBE BAUHINIEÆ.

Bauhinia Cunninghamii, Benth. Flinders, F. v. Meuller : Etheridge River, E. W. Armit.

### ORDER ROSACEÆ.

#### TRIBE RUBEÆ.

Rubus Muelleri, *Sp. Nov.*

A large scrambling shrub. Branches glabrous, armed with scattered recurved prickles. Leaves pinnate 3 to 9 in. long, of 3 to 9 ovate, acuminate or when small often obtuse leaflets, coarsely and doubly toothed ; flowers white in terminal panicles of 4 to 10 flowers. Bracts narrow, laciniate ; sepals slightly hoary, points subulate. Petals spreading not so large as in *R. Rosæfolius.* Fruit red, glossy, nearly globular, ½ to 1 in.

diameter. Carpels small and numerous, succulent with an agreeable acid flavor. Hab. Near Waterfalls, Helidon. Bailey.

This differs from *R. rosæfolius*, *Sm.*, its nearest ally, in its stronger more scrambling habit, in wanting the usual pubescence of that species, and in the form of pinnæ being ovate or obovate, never approaching lanceolate, and the much longer petiolules. The inflorescence is more like *R. moluccanus*, *Linn.*

ORDER EPACRIDEÆ.

TRIBE STYPHELIEÆ.

Leucopogon virgatus, *R. Br.*
Hab. Point Danger. H. Schneider.

ORDER PROTEACEÆ.

Hakea pedunculata, *F.v.M. Melb.*, *Chem. et Drugg.*, 1883.
Hab. Endeavour River. W. A. Persieh.

ORDER THYMELÆACEÆ.

TRIBE EUTHYMELÆEÆ.

Pimelea penicillaris. *F.v.M.*, *Melb. Chem. and Druggist*, 1883.
Hab. Southern Queensland.

ORDER ORCHIDEÆ.

TRIBE EPIDENDREÆ.
SUB-TRIBE DENDROBIEÆ.

Dendrobium speciosum, *Sm.* var. nitidum. *

Stems strong and numerous, forming large masses like *var. Hillii*, from 1½ to 2 ft. high, of a nearly even diameter of about ½ in., usually smooth and shining, fluted, nearly free from torn bases of old leaves; leaves 3 to 5, lanceolate, 6 to 7 in. long, 1½ to 2 in. broad, coriaceous, the upper surface usually shining. Racemes 6 to 8 in. long, bearing from 24 to 30 flowers, at first yellowish green, afterwards pure white, pedicels over 1 in. long, spur short, outer segments 6 to 7 lines long, and about 2 lines broad, the inner segments or petals about the same length, but narrower than the outer. Labellum short, the lateral lobes marked with transverse purplish lines, the middle lobe apiculate, the longitudinal plates yellow. Hab. Cairns. Collector unknown.

Described from plant blooming at Bowen Park. This form differs from others chiefly in its short dense raceme and glossy foliage.

* NOTE.—The three plants marked with an asterisk (*) were published in the newspaper report of the last meeting of the Queensland Philosophical Society, a publication scarcely meeting the requirements of scientific currency.

Dendrobium speciosum, *Sm.*, var. delicatum. *

Stems forming dense wide patches on rocks, 6 to 9 in. high, swelling into pseudo-bulbs, at the base like *D. Kingianum*, fluted, and more or less clothed with the torn bases of old leaves. Leaves 3 or 4, from 3½ to 4½ in. long, and ¾ to 1¼ broad, the apex obtuse or emarginate, in texture resembling those of *var. fusiforme.* Racemes 1 or 2, from 7 to 8 in. long, bearing 8 or 9 distant, fragrant white flowers, the outer segments 6 to 8 lines long, the inner ones about the same length, thin and delicate and much narrower, the spur rather long and curved. Labellum of a very delicate texture, white speckled with purple, the middle lobe apiculate, the longitudinal plates of the disk yellow, column white.

Hab. Main Range. Collected by B. Crow aud C. H. Hartmann.

Dendrobium Keffordii, *Sp. Nov.*

Stems clustered, very numerous, slender, 1 to 4 ft. high, the lower part naked and cane-like or more or less clothed by the torn bases of old leaves, the upper half leafy. Leaves linear lanceolate, the apex rather obtuse, 3 in. long, and about 3 lines broad near the base, of a thin texture, the sheathing base prominently striate. Racemes lateral, numerous, shorter than the leaves, 2-flowered. Flowers yellowish speckled with purple; pedicels 4 lines long. Sepals or outer segments from a broad base tapering to filiform points, about 1 in. long, the basal spur short. Petals or inner segments similar to the sepals but smaller. Labellum 3 or 4 lines long, the lateral lobes embracing the column, the middle lobe bordered by a dark purple fringe, the point elongated and recurved. Disk bright yellow with two lines of prominent calli, column slender.

Hab. Johnstone River. Collected by W. R. Kefford.

This addition to the large genus Dendrobium in foliage and inflorescence approaches *D. agrostophyllum*, *F.v.M.* and *D. Baileyi. F.v.M.*, while in the form of flowers it closely resembles *D. tetragonum*, *A. Cunn.*

Dendrobium Kingianum, *Bidw.*, var. pallidum. *

Stems clustered, often forming broad dense matted masses of several feet in diameter, the height of stem from 2 to 4 in, slender except the base which is enlarged into pseudo-bulbs, all more or less covered by the torn bases of old leaves. Leaves 2 or 3, somewhat thin, 2 to 3 in. long, and about ½ in. broad near the base, oblong-lanceolate. Racemes slightly exceeding the leaves, slender and bearing about 3 or 4 white or lilac stained flowers.

Hab. on rocks Main Range, collected by B. Crow and C. H. Hartmann.

This variety differs from the usual form in being much smaller, forming more dense masses, and in the colour of the flowers.

Dendrobium Stuartii, *Sp. Nov.*

Stems slender, prominently striate, 6 to 18 in. long, leafy, of a purplish color, the old leafless ones, bearing numerous short racemes of usually 3-flowers. Leaves lanceolate, 1 to 2 in. long. Racemes axillary, the rhachis about ½ in. long, and pedicels of about the same length. Sepals and petals narrow lanceolate, yellowish-green, ½ in. long. Spur straight about 3 lines long. Labellum tomentose with fringed undulate edges, the disk plates not prominent, obtuse ovate ¾ in. long including the claw which is articulated to the base of the spur, (as in Bulbophyllum) without lateral lobes, beautifully marked with forked red veins, which are crossed by two longitudinal ones. Column short, white, the very narrow wings with a purple edge. Flowers very fragrant.

Described from a single plant now flowering in the Brisbane Botanic Gardens, sent from near Herberton by J. W. R. Stuart, Esq., from whom several other rare and perhaps new species have been received.

Dendrobium uniflos, *Sp. Nov.*

Rhizome creeping, much matted, and clothed with the torn old sheaths. Stems numerous, erect, 2 to 3 in. high, 1 line diameter, bluntly ribbed and bearing at the top a single leaf and flower. Leaf about 2 in. long, 4 lines broad, sharply keeled, oblong with an emarginate apex, articulate by its broad base to the stem. Pedicel at the base of the leaf, 6 lines long, curved and supported at the base by a scarious ribbed bract about 3 lines long and 1 line broad. Sepals oblong-ovate about 2½ lines long, spreading, white, the dorsal one narrower than the lateral ones, which latter are produced with the column into a short broad spur. Petals narrow, white, incurved. Labellum shortly connate with the basal projection of the column, lateral lobes very narrow, middle lobe cordate, about 1 line broad, the surface glandular, texture thick, transversely furrowed, orange coloured. Column prominent, the wings narrow, ending at the top in a sharp incurved tooth. Anther lid purple. Near Herberton. J. W. R. Stuart.

Described from plant in Brisbane Botanic Garden.

Dendrobium striolatum, *Reichb.* var Beckleri, *F.v.M.*, *Fragm. V.* 95. Figured in Fitzgerald's Orchids : Part VI.

Hab. Enoggera Ranges. D. Macpherson.

ORDER HÆMODORACEÆ.

TRIBE OPHIOPOGONEÆ.

Ophiopogon, *Ker. in Bot. Mag.*
O. japonicus, *Ker. in Bot. Mag. t.* 1063.
Hab. Enoggera Creek. W. R. Kefford.

There may be some doubts as to whether this Japanese plant is truly indigenous. It was found at Enoggera Creek by Mr. Kefford at a spot not favorable to the idea of its having been introduced Of the plants found some may be seen at Bowen Park, and others at Mr. Bernays', who drew my attention to it a short time since when the plant was in full flower.

ORDER RESTIACEÆ

Hypolæna fastigiata, *R. Br.*
Hab. Point Danger. H. Schneider.

ORDER LYCOPODIACEÆ.

Selaginella leptostachya, *Sp. Nov.*

Stems creeping and branching as in *S concinna*, but a more rigid robust plant, leafy throughout as in that species. Larger leaves in two rows, distichously spreading, lanceolate, acute or obtuse, about 1 line long, the inner ones somewhat falcate, the lower part appressed, the upper part spreading, all shortly keeled, margins serrate. Spikes terminal, 1 to 1½ in. long, and scarcely 1 line in diameter. Bracts acuminate, keeled, and closely imbricate in 4 rows, the tips scarcely spreading.

Hab. Johnstone River : W. R. Kefford. Nerang Creek : H. Schneider.

ORDER FILICES.

TRIBE HYMENOPHYLLEÆ.

Trichomanes caudatum, *Brack : Ferns U. S. Expl. Exped.*
Hab. Nerang Creek : H. Schneider. Fraser Islands : W. Hill.

T. Filicula, *Bory.*
Hab. Tropical Queensland. F. M. Bailey, W. R., Kefford.

This small "bristle fern" has been frequently collected in tropical Queensland but mostly in a sterile state, and the specimens mixed with those of its near ally *T. pyxidiferum, Linn.* Indeed more than ten years ago Dr. Prentice pointed out to me specimens of it mixed with those of the latter I had brought from Rockingham Bay. Now happily the occurence of *T. Fitlicula* in Queensland is placed beyond doubt by the excellent specimens of that species brought from the Johnstone River by Mr. Kefford. It may here be pointed out that the principal distinguishing mark between these two ferns is in the form of indusium, that of *T. Filicula* being prominently two-lipped, while that of *T. pyxidiferum*, although dilated at the mouth is scarcely lipped.

Trichomanes Johnstonense, (Pl. I.). *Sp. Nov*.

Rhizome long, creeping, rigid, knotted, clothed with black bristle-like scales. Stipes somewhat angular, scarcely winged, 2 to 4 in. long, of a dingy brown color, the immediate base scaly as the rhizome. Fronds bipinnate with deeply pinnatifid or bipinnatifid pinnules, 3 to 6 in. long, 1½ to 4½ in. broad, the rhachis slightly winged, the linear segments very narrow, 1-nerved. Indusia few on the lower lateral segments of the pinnule, free, erect, much tapering towards the base, the orifice two-lipped. Receptacle exserted usually long. Hab. Johnstone River. W. R. Kefford,

In the general appearance of the frond this new species somewhat resembles the Jamaica form of T. rigidum, from which however it is readily known by its creeping not tufted habit, and form of indusium.

## SERIES A.

### Tribe Polypodieæ.

Asplenium resectum, *Sm.*, var australiense.

Rhizome shortly creeping. Stipes close together, slender, 4 to 12 in. long, glossy, nearly black. Fronds pinnate, membranous, 6 to 13 in. long, with a rather long caudate, serrate apex, lower pinnæ 3 or 4 in. long, and about ½ in. broad at the base, from which they gradually diminish in size until they reach the tail-like apex of the frond. Pinnæ distinctly petiolulate except at the apex, where the frond becomes pinnatifid, subfalcate, and the sterile ones often obtuse, but the fertile ones usually with elongated points, superior base, truncate parallel, with the rhachis never auricled, inferior base for a third or more of their length cut off as it were in a curved line, so that the costule here becomes the margin, the whole of the rest of the pinna evenly serrated, veins forked. Sori oblong occupying the centre of pinna, about an equal distance from the margin as from costule. Hab. Johnstone River. Collected by W. R. Kefford.

The meeting with this fern in Australia is of more than usual interest, as by its short rhizome, &c., it fully connects Swartz's West Indian species, *A. lœtum*, with the Old World species, *A. resectum*, of Smith. I am led to this conclusion not only from published descriptions, but from examination of a fine specimen of Swartz's rare fern in Lady Musgrave's excellent collection of Jamacia ferns.

Asplenium marinum, *Linn.*, var. difforme, Hab. Nerang Creek, H. Schneider.

Doubtless *A. obtusatum*, *Forst.* approaches in some of its forms too near to *A. marinum*, *Linn.*, to be retained as a distinct species. I have therefore thought it well to follow Baron Mueller and the Rev. Dr. W. Wools in placing the above variety under the Linnean name.

## SERIES B.

Polypodium confluens, *R. Br.*, var. lobatum. Hab. Pearson' s Waterfalls, Helidon. F, M. Bailey.

This differs from the normal form by its fronds being variously and deeply lobed, resembiing in this respect the fronds of P. pustulatum, *Forst.*

## ORDER FUNGI.

### Suborder Hymenomycetes.

Agaricus, *Linn.*

(Lepiota)

A. dolichandos, *Berk. et Br.* Brisbane River. (Bailey.)
A. cepæstipes, *Sow.* Edge of Enoggera Dam. (Bailey,)

(Pleurotus)

A. thozetii, *Berk. et Muell. Jour. Linn. So. Vol.* 18.

(Nancoria)

A. melinoides, *Bull.* Toowong Road. (Bailey.)

(Psatyrella)

A. semiliber. *Berk. et Br.* On bark of scrub trees, Enoggera. (Bailey.)

(Clitocybe)

A. rheicolor, *Berk.* On a stump in 3-Mile Scrub. (Bailey)

(Collybia)

A. laccatimus, *Berk. Journal of Linn. So., Vol.* 18. Amongst dead leaves, Moreton Bay.
A. coagulatus, *Berk. et Br.* Brisbane. (Bailey.)

(Armillaria

A. melleus, *Vahl.* Enoggera. (Bailey.)

(Tricholoma.)

A. civilis, *Fries.* Brisbane. (J. F. Bailey.)
Russula sanguinea, *Fries.* Burnett River. (Watson.)
Marasmius Muelleri, *Berk.* Herbert Creek. (E. M. Bowman.)
M. equicrinis, *B. v M.* Dalrymple Creek. (Lieut Armitage.)
M. exocarpi, *Berk.* Rockhampton. (A. Thozet.)
Lentinus catervarius, *Berk et Br.* 3-Mile Scrub. (Bailey.)
L. exasperatus, *Berk. et Br.* Brisbane. (Miss A. R. Mills.)

L. punctaticeps, *Berk. et Br.* Brisbane River. (Bailey.)
Panu's suborbicularis, *Berk. et Br.* On bones of a whale in the old Museum yard. Brisbane. (Bailey.)

Xerotus albidus, *Berk. et Br.* 3-Mile Scrub. (Bailey.)
X. lateritius, *Berk. et Cooke.* 3-Mile Scrub. (Bailey.)
Boletus hædinus, *Berk. et Br.* Ironbark Ridges. (Bailey.) I think it probable this is the fungus which forms those large masses of mycelium often met with in turning up the soil of the hard stony ridges about Brisbane.
Polyporus, *Fries.*

(Pleuropus)

P. orcadideus, *Berk. et Br.* Trans. Linn. Soc. Vol. II. 3-Mile
D. Scrub. (J. F. Bailey.)
P. Guilfoylei, *Berk et Br.* Maroochie. (Bailey.)
P. grammocephalus, *Berk et Br.* Enoggera Creek. (Bailey.)
P. nephridius, *Berk.* Taylor's Range. (Bailey.)

(Anoderma)

P. pelliculosus, *Berk.* Maroochie. (Bailey.)

(Placoderma)

P. ochroleucus, *Berk.* On fences, Brisbane. (Bailey.)
P. lineato-scaber, *Berk et Br.* Daintree River. (J. E. Tenison Woods.)

P. testudo, *Berk.* Maroochie. (Bailey.)

(Inoderma)

P. luteo-olivaceus, *B. et B.* var tenuis. Maroochie. (Bailey.)
P. anebus, *Berk.* Maroochie. (Bailey.)

(Resupinaria)

P. hispidus, *Fries.* 3-Mile Scrub. (Bailey.)
P. medulla-panis, *Fries.* Enoggera Creek. (Bailey.)
P. eriophorus, *Berk. et Br.* On dead pine twigs. (Bailey.)
P. callosus, *Fries.* On the rafters of the old Works Office. (Bailey.) Very destructive to pine wood.

Dædalea scalaris, *Berk et Br.* Main Range. (B. Crow.)
Hexagona rigida, *Berk.* Brisbane River. (Bailey.)
Merulius Baileyi, *Berk. et Br.* Enoggera. (Bailey.)
M. lacrymans, *Schumacher.* Main Range. (J. Anderson.)
Radulum, *Fries.*
R. molare, *Fries.* On old Peach tree, Brisbane. (Bailey.)
Grandinia, *Fries.*
G. granulosa, *Nees. var. ochracea.* Rockhampton. (A. Thozet.)
Thelephora caryophyllea, *Pers.* Burnett River. (Watson.)
Thelephora, (stereum) spongiæpes, *Berk.* Logan River. (Rev. B. Scortechini.)

Stereum spathulatum, *Berk.* Brisbane. (Bailey.)
S. illudens, *Berk.* On a stump, Cleveland Road. (Bailey.)
S. simulans, *Berk. et Br.* Enoggera. (Bailey.)
S. complicatum. Taylor's Range. (Bailey.)
Hymenochæta rubiginosa, *Lév.* Taylor's Range. (Bailey.)
Corticeum bambusicola, *Berk. et Br.* On old bamboo (Bailey.)
C. anthochroum, *Fries.* On she oak, Rockhampton. (A. Thozet.)
Clavaria portentosa, *Berk. et Br.* Brisbane River. (W. Ewart.)
C botrytis, *Pers.* Brisbane River. (W. C. Kays.)
C, miltina, *Berk.* Brisbane. (Bailey.)
C. cristata, *Holms.* Near Connell Town. (Bailey.)
C. lætissima, *Pers.* Lockyer Creek. (C. H. Hartmann.)
Calocera cornea, *Fries.* On sawn timber of a bridge near Brisbane. (Bailey.)

SUB-ORDER GASTEROMYCETES.

Phallus quadricolor, *Berk. et Br.* South Brisbane. (Thos. Weedon.)

Geaster floriformis, *Vitt.* Cunningham's Gap. (Bailey.)

Lycoperdon cælatum, *Fries.* Logan River, on dead timber. (Bailey.)

Tilmadoche mutabilis. *Rostaf.* On rotten gum wood, Rockhampton. (A. Thozet.)

Chondrioderma difforme, *Pers.* On young grass 3.Mile Scrub. (Dr. Bancroft.)

Arcyria incarnata, *Pers.* On old logs, Enoggera (Bailey.)

Cyathus pusio, *Berk.* On Gum wood, Rockhampton. (A. Thozet.)

C. fimicola, *Berk* Rockhampton. (A. Thozet.)

C. pezizoides, *Berk.* Rockhampton. (A. Thozet.)

SUB-ORDER CONIOMYCETES.

Tilletia epiphylla, *Berk. et Br.*, *Trans, Linn. So. Vol. II.* On leaves of maize. (Dr. Bancroft.)

Æcidium nymphoidearum, *Berk. et Br. Trans. Linn. So. Vol. II.* On Linnanthemum indicum. (F. R. Hall and Dr. Bancroft).

SUB-ORDER HYPHOMYCTES.

Thozetia, *Berk. et Muell.*

T. nivea, *Berk.* Rockhampton. (A. Thozet.)

Sphærostilbe cinnabarina, *Tul.* On bark, Enoggera. (Bailey.)

S. dubia, *Berk.* On Ægiceras, Rockhampton. (A. Thozet.)

Rœstelia polita, *Berk. Trans. Linn. So. Vol. II.* On Jacksonia scoparia R. Br. (Bailey.)

Oidium leucoconium, *Desm.* Considered by Mr. Berkeley a young state of Erysiphe pannosa. On pumpkin leaves. (Bailey.)

SUB-ORDER ASCOMYCETES.

Peziza thozetii, *Berk. Linn. So. Vol. XVIII.* Rockhampton. (A. Thozet)

Ascobolus Baileyi, *Berk. et Br.*, *Trans. Linn. So. Vol. II.* On cow-dung.

Glœosporium cucurbitarium, *Berk. et Br.* On water melon fruit. (Bailey.)

Lith. Price Brisbane

Trichomanes Johnstonense n.sp.

Hypocrea discoidea, *Berk. et Br.* On a Japanese plant at Bowen. (Bailey.)

Hypoxylon serpens, *Fries.* On Wood, Brisbane. (Bailey.)

H. concentricum, *Grev. Var. Minus. Berk et Br.* Enoggera. (Bailey.)

Graphiola phœnicis. *Fries.* On Date palms. (Bailey.)

Sphæropsis Tricorynes, *Berk. et Br.* On Tricoryne anceps, Tropical Queensland, (Rev. J. E. Tennison-Wood.)

Capnodium elongatum, *Berk et Desm.* On a native shrub infested by scale insect. (Dr. Bancroft.)

Meliola corallina, *Mont. Fl. Chile. Fig. Trans. Linn. So. Vol. II.* On leaves, Maroochie (Bailey.)

# HOT SPRINGS AND MUD ERUPTIONS ON THE LOWER FLINDERS RIVER.

By E. PALMER, Esq., M.L.A.

(Plate II.)

These are somewhat similar in appearance to springs found between the Warrego and Darling Rivers near Bourke, and evidently owe their origin to the same natural causes. A few small ones occur on the Barcoo below "Inniskillen," and Stuart the explorer mentions similar in his overland journey through Central Australia, and also one or two hot springs. In latitude 29° 17′ 43″ he particularly describes the "Elizabeth" and "Beresford" Springs; the latter has a strong flowing stream, sufficiently strong to drive a flour mill. The hill from which the stream issues is one hundred feet above the level of the plain, the water coming from the very top. Stuart's horse got bogged on the top and he had some difficulty in getting it out. He also mentions the fact, that while some have a peculiar disagreeable taste of soda, others are fresh and sweet.

On the Lower Flinders they occur in separate clusters, each consisting of innumerable small eruptions, surrounding one or two large central or main springs, within a radius of a mile or so, and all more or less in a state of activity, that is, they emit streams of thin mud or water intermittently. They are found on either side of the river, and seem to have no connection with, or influence on, the water in the river, which may be said to be only a surface water. Although possessing a striking similarity to each other, still any connection between them must exist beneath the present course of the Flinders, which is cut out of the level plains by the annual tropical rains, and is a river of recent times; no hollow or valley exists where the course of the river runs, the banks are nearly perpendicular, but not very deep, while the level plains extend right up to the bank of the river. The springs belong to an older formation than the present river system, and must derive their force from some very distant inland mountainous country.

From where the river leaves the high country (which consists of a lava overlying the original sandstone) to its entrance into the Gulf of Carpentaria, its course is through level, treeless plains of cretaceous formation, with occasional belts of fine sandstone, sometimes bearing fossil shells. The course is generally a little to the north of west, and is over 500 miles in length. The only elevations are Mount Browne, in about 20° south latitude, a low, stony rise of ironstone and granite, rising from the plain and about a mile from the river on the right side; and Fort Bowen, twenty miles west, similarly situated with regard to the river, and rising also abruptly from the open plains. These are the only rises of any consequence near the river. And at both of these small mountains numbers of springs and mounds of erupted mud, coated with a whitish crust of soda, lie scattered about, with stumps of large tea-tree and reeds, and pools of discoloured water throughout; while at Mount Browne occur two hot springs on the south side, with a temperature of 120° Farenheit at the surface. The water stands in a large baisin on a mound raised many feet above the level of the plain, and covered with gigantic tea-trees (Melaleuca leucadendron), amongst the matted roots of which the hot water steams in clear, shining, crystal pools. The basin, or cavity, is fathomless, while the roots and branches lying in it are coated with a soft, green vegetable matter, with air bubbles attached, small bubbles of carbonic acid innumerable, which are continually rising to the surface. The water is too hot to bear the hand in for any length of time, but when cooled is good for use, and always bright and clear, and free from any taste, while that in the adjoining cold springs is extremely disagreeable. No change has been observed in the hot springs in level or temperature since 1865, when a cattle station was settled there by Mr. James Gibson. The ground round all these springs is treacherous, is hollow, shakes to the tread, and feels like a huge blister, merely covered with a skin of soil, held together by roots and rushes, over which one can walk. At times the pressure from below forces the thin crust upwards, and a flow of thin brown liquid mud spreads about, sometimes in great quantities. In one of the springs at Mount Browne flakes of granite are forced up, and lie on the surface. It seems as if a connection existed down by the side of the mountain to subterranean regions, whence the hot water flows, and is kept at one constant level and temperature. Most of the mud springs have formed large mounds, or cones, by constant overflow, and the water now stands on the top, while the surrounding parts are spongy, and liable to break through when stock comes near them ; at others lagoons are formed, and kept at a uniform level by the flow of water. The occurrence of these hot and cold mineral springs, suggests the possibility of obtaining supplies of water on the artesian principle over some portion at least of these extensive plains. Some mud springs, as they are called, opened at Manfred by a small shaft at the side, produced a permanent flow of good water. The overflow from some of the mineral springs deposits a white incrustation, "which on analysis by Dr. Flight, under the direction of Professor Maskelyne, afforded :—

| | |
|---|---|
| Water ... ... ... | 27·793 |
| Silica ... ... ... ... | 0·600 |
| Chlorine ... ... ... | 3·369 |
| Sodium ... ... ... | 2·183 |
| Carbonic acid ... ... ... | 33·735 |
| Soda ... ... ... | 31·690 |
| | 99·370 |

The sulphuric acid, of which there was a small portion, was undetermined." (Daintree, Quart. Geolog. Journ. Vol. xxviii, p. 285.)

Fresh ground keeps continually breaking up, or is forced up, while old cones are sometimes falling in, forming hollows half-full of reddish water, strong as lye, and quite undrinkable. None of the springs are isolated, but confined to the vicinity of one or other of the half-dozen groups which compose the collection on the Lower Flinders. The direction of these groups is in a north and south course from each other, with the Flinders River dividing them, and they are comprised within a line or distance of eighty miles. Above Dalgonally Station, on Julia Creek, some very extensive mounds are an indication of the force of the pressure from below, while an open spring between it and the Flinders has numerous small fish in it. A thoroughly scientific description of these numerous and wonderful displays of natural forces would prove very interesting and instructive. The vegetation surrounding them is peculiar, and somewhat distinct from that of the plains. The locality of any of the groups of mineral springs is indicated by the presence of gigantic tea-trees surrounding them, and many of the mounds present a pleasing green appearance, from being covered with a sward of Fimbristylis in such masses, fallen or recumbent, as to form a safe carpet, yielding and soft, but dense enough to support cattle going in to feed on the various grasses found there.

In ancient days the same springs have proved a trap for too confiding animals, as is proved by the fact of some bones having been ejected in the mud from one of them; the bones are coloured, but in a good state of preservation.

A collection of plants made at a dry time of the year from one or two of the springs near Fort Bowen afforded :—

1. Melaleuca leucadendron, *Linn.* The large tea-tree. Also a smaller species of melaleuca, with hard, thin bark, and of a dwarfed or stunted growth.

2. Chenolea (or Bassia) diacantha, *F. v. M.* A prickly "roley-poley," found in bare places in large bunches, with terrible spines half an inch long and very sharp.

3. Pennisetum compressum, *Rich Brn.* A grass, three feet high, found all through the springs, with a large terminal reddish flower.

4. Pluchea, *sp.* Herb, eighteen inches high, in quantities round the springs.

5. Typha augustifolia, *Linn.* The common rushes, with cylindrical brown tops.

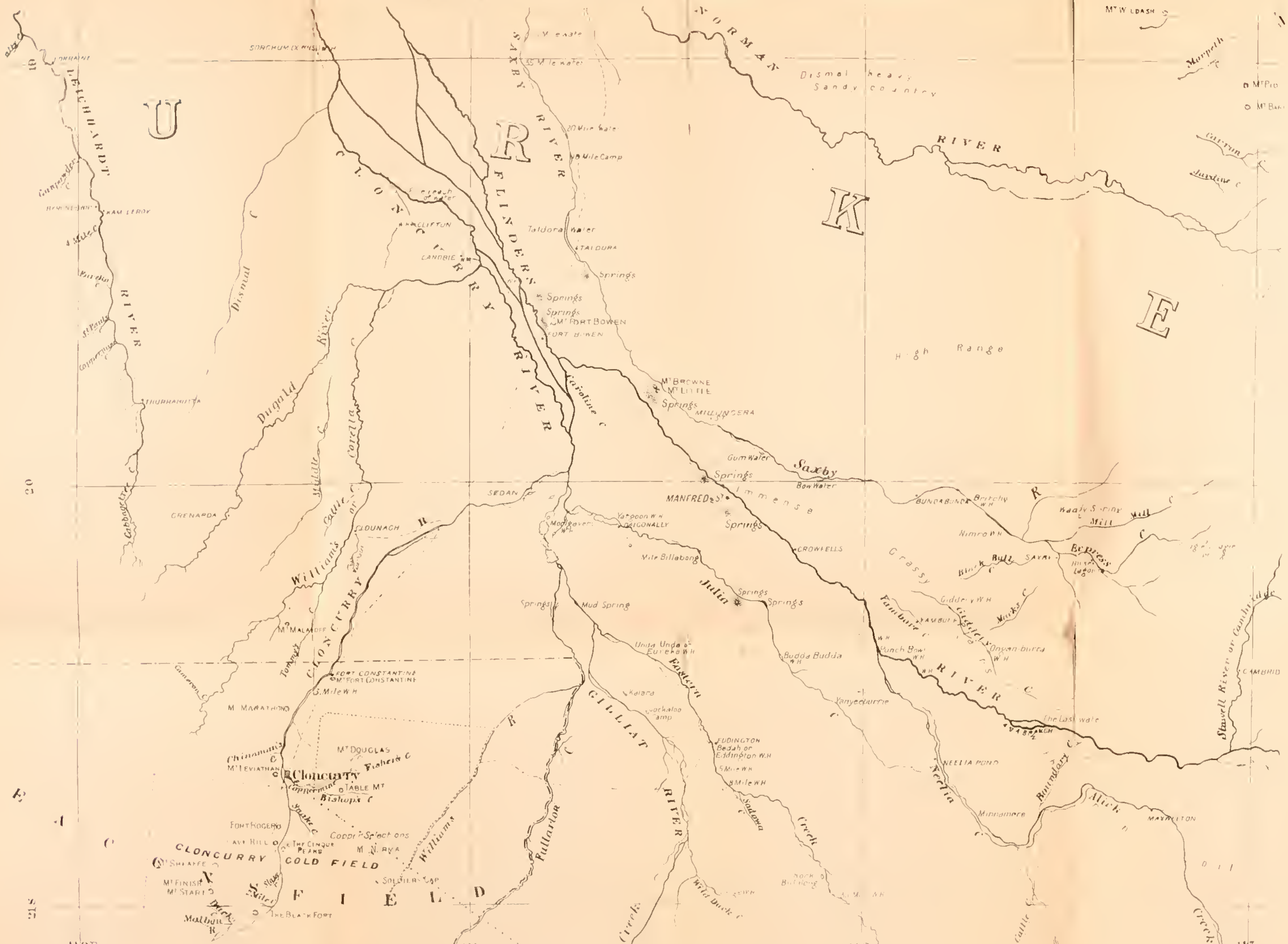
6. Teucrium integrifolium, *F. v. M.* Herb, one foot high, with small white flower, leaves opposite, lanceolate. Very plentiful.

7. Trianthema crystallina, *Vahl.* Herb, with short, fleshy leaves and reddish stems; grows in bare places round springs.

8. Portulaca filifolia, *F. v .M.* Herb, erect, eighteen inches high, branching, bright yellow flowers. Plant very brittle.

# POSITION OF SPRINGS ON THE LOWER FLINDERS

Plate II



9. Fimbristylis, *sp.* Rush, growing densely over soft springs, forming a compact mass.

10. Eragrostis, *sp.* A grass about two feet six inches high.

11. Schoenus, *sp.* Grass, two feet high, in large, strong bunches, growing over the hot springs and through the water.

12. Phragmites Roxburghii, *Kunth.*

Some springs with similar characteristics are found about ten miles north of Gamboola Station, on the Mitchell River, with Pandanus growing very plentifully through them.*

A spring on the Ennasleigh River, about thirty miles from Georgetown, is hot enough to maintain a state of ebullition. This last occurs near a great outflow of lava, and may be accounted for by assigning the same cause to both it and those of the Flinders.

* Mr. Mar, the Government Analyst, reports as follows, on a rather earthy sample of the saline incrustation from these springs :—

| | Per Cent. |
|---|---|
| Soda | 37·54 |
| Lime | 2. 8 |
| Oxide of iron | 2 19 |
| Sand | 31·72 |

The acids are undertermined, but carbonic acid is chiefly represented. The water of the spring is alkaline carbonated.

# THE MOA (DINORNIS) IN AUSTRALIA.

By C. W. DE VIS.

(Plates III. and IV.)

Though now for nearly fifty years it has been known that Australia of yore, like New Zealand of late, was the home of massive flightless birds, our knowledge of that dead race has not hitherto gone beyond the opening stage. The existence of one such bird in our post-pliocene age was first declared in the year 1836 by Sir Richard Owen. His judgment was delivered upon a thigh bone, 13 inches long, from the Wellington Valley, so broken, crushed, and cased by its stony matrix that nothing could be said of it more than that it had belonged to a large bird of the Ostrich family. Thirty-three years subsequently Queensland yielded up from a well sunk on the Peak Downs another struthious femur, and one sufficiently well preserved to enable Sir Richard Owen to discern its affinities and make it the subject of a memoir in the transactions of the Zoological Society of London for 1873. As the result of that examination the ancient bird of Australia was pronounced to be more nearly akin to the living Emu than to the extinct Moas of New Zealand, to which it had been previously referred by the late Mr. Krefft; and the enquiry so encouraged Sir Richard Owen in the opinion which he had long held, namely, that the struthious types of New Zealand had never extended to the adjacent islands, much less to the far away continent of Australia, that he added in a foot-note (Trans. Zool. Soc., vol. viii., pt. 6, 383) "I can now in 1872 repeat with more confidence the remark in my memoir of 1846, "no remnant of a Dinornis has yet been found in any of the contiguous islands, and I have in vain searched for such in the post-pliocene fossils of Australia." It appears to be beyond dispute that the bone which led Sir Richard Owen to maintain that the occurrence of a Dinornis in Australia would be so exceptional an extension of the New Zealand fauna as to be looked upon with doubt, does in its external characters more resemble a bone of the Emu, Dromœus, than of the Moa, Dinornis, but, in all diffidence, it may be questioned whether in naming this bird Dromornis, (Emu bird), the describer did not too greatly subordinate the important structural difference between the fossil bone and that of the Emu, the comparative absence of an air chamber in the former, for this certainly points to a lower grade of the whole bird economy, such as obtained in the Moas, but is left behind by the Emus. That the bird was not a Dinornis is quite clear, but that it was so foreign to Dinornis as to make it probable that Dinornis would never be found in Australia is not equally clear. However that may be, the palœontologist has ever since the discovery of Dromornis been expectant of other low forms of the Struthionidœ among the bird relics of our bone-bearing drifts, since it is hardly probable that so vast an area inhabited at the present time by at least three ostrich-like birds should in older and more prolific days have nurtured but one. It was therefore with more interest than surprise that part of a struthious femur was recognized in a collection of bones from King's Creek, presented to the Queensland Museum by Mr. J. Daniels, late of Pilton. Surprise, however, took the upper hand when, as the little adhering matrix was removed from the bone, Dinornine characteristics grew apparent. But it is not easy to rid ourselves at once of the preconception that a bone such as this is more likely to a be third example of the femur of Dromornis than anything else. It is therefore a matter of regret that a cast of the Dromornis femur cannot be placed, for purposes of comparison, beside the fossil under examination. The original is in the Sydney Museum, and Mr. Haswell courteously regrets that he has not a facsimile at command. However, in the figure given of it by its describer, we have a sufficient corrective to any bias in favour of its identity with the fossil before us This bone is in much the same peculiar state of mineralization as the great majority of the Darling Downs fossils. It consists of somewhat more than the upper third of the left femur, minus the upper part of the head (h) and trochanter (t.ma.) These have been lost by abrasion while projecting above the surface of the creek bed. It measures five inches in breadth anteriorly from the head to the lower end of the great trochanter, four inches posteriorly from the head to the upper angle of the trochanter, and five inches externally across the trochanter. These are precisely the measurements yielded by a specimen of Dinornis crassus, *Owen.* The shaft, at its place of fracture, is rather more rounded than in D. crassus, measuring two inches two lines in breadth, and half an inch ten lines in fore and aft thickness. Its section is a full, irregular oval, as in D. elephantopus, very dissimilar to the pure oval of Dromornis, but somewhat less unlike that of the emu's femur, in which the inner side is rather more convex than the outer. The base of the head presents a strong annular constriction (a.c.) which, as in Dinornis, renders the head quite distinct from the neck (n.), and contrasts it with the subsessile heads of Dromœus and Dromornis. The depression for the ligamentum teres is in the emu scarcely perceptible, the ligament in this bird being attached to the centre of the almost continuously convex articular surface of the head; behind it a smooth concave tract slopes down towards the pneumatic foramen. In Dinornis crassus there is a subcentral pit nearer to the hinder part of the periphery of the head, and excavated to a moderate depth. In the fossil (L. ter.) it is in a similar position, but deeply sunken, and its hinder edge is raised into a rough ridge. In neither D. crassus nor in the fossil is there a concave slope behind the ligament pit. The neck (n) of our subject is distinctly longer and narrower than in D. crassus, and consequently more divergent in both respects from that of Dromœus. The neck at its junction with the epitrochanterian surface (ep. t.) is far more deeply hollowed than that in the emu, and therefore conspicuously unlike that of Dromornis, in which the upper outline is nearly horizontal. The saddle so formed is in fact more deeply seated than in D. crassus. The outer surface of the trochanter (ect. t.) is nearly flat, devoid of the submarginal convexity shown in Dromœus, and the muscular attachments (m) are in two shallow depressions raised above the level of the bone by tubercular outgrowth, as in Dinornis, instead of into two excavations from the surface, separated by a bridge, as occurs in the emu. The mode of origin of the great trochanter of the fossil strongly resembles that of the moa—it rises abruptly from the shaft, and forms immediately a prominence, which curves over towards the inner aspect of the bone, and overlooks the markedly concave anterior surface between it and the head. In the subject of Sir R. Owen's figure of Dromornis the form of this surface is obscured by mutilation, but in the recent Dromœus it is comparatively flat and the trochanter rises from the shaft by a gradual and smoothly rounded increment; and it is only near its upper end that it forms a re-curved edge. The large air channel into the interior bone of the Emu, so intimately connected with the excursive habits of the typical birds, is wanting in all the fossils under consideration, but in the moa and in our fossil alike it is foreshadowed by three small foramina just beneath the hinder edge of the neck. Commensurate with these feeble means of communication with the outer air the internal chamber (*cav.*) is but feebly developed within the substance of the shaft. The linear dimensions of its section are less than a fourth of those of the whole section enclosing it. In Dinornis the lesser trochanter is hardly appreciable, it is represented by a mere thread on the surface of the shaft; in the Emu it is a well-developed outstanding ridge. The upper part (*t. mi.*) of this linea aspera, as it exists in the Moa, is preserved in the fossil. There is in Dinornis a large oval rugosity for muscular insertion nearly in the centre of the inner and concave surface between the head and the origin of the trochanter major (*t.ma.*) This feature also is very evidently repeated in the Australian fossil, whereas in the Emu we perceive but a faintly rough surface much nearer to the head. In an ordinary case it would have been sufficient to point out the several characters of the object under review in order that we might arrive at a judgment upon its systematic claims, but since those claims tend to modify the experience of the most eminent of modern palæontologists it is expedient that we should briefly revert to the grounds on which they appear to rest. The chief particulars in which the femur in question differs from that of Dromornis, are a long sloping neck, constricted at its junction with the head, a full and irregularly oval shaft and a broad outer trochanterian surface. These are precisely the characters by which the corresponding part of the thigh bone of Dinornis is differentiated by Sir R. Owen from that of Dromornis, and in all of them our fossil agrees almost exactly with the femurs of D. crasus and D. elephantopus. It is needless to recapitulate its differences from Dromæus since the divergencies of Dromæus from Dromornis are but exaggerations of those of the latter from Dinornis. With Dinornis in direct comparison it agrees not only in the salient features referred to, but in most of its subordinate characters, for example, in the linear condition of the lesser trochanter, (*t. mi.*) and the three foramina beneath the hinder edge of the neck. At the same time our fossil has distinguishing marks of its own. Of similar dimensions to D. crassus and similar massive form to D. elephantopus it differs from the former sufficiently in its slenderer head and neck and deeper saddle between the head and trochanter, and from the latter abundantly in detailed measurements. These differences from its nearest allies taken in conjunction with its continental habitat, leave us, we may conclude, no alternative but to regard it as specifically distinct from any Dinornis on record. Its habitat emboldens us to propose for it the name D. Queenslandiæ not with any idea that it was a species restricted in its range to north-east Australia, but merely that the name, like that of Nototherium Victoriæ, may remind us of the colony that gave the first hint of its existence.

The moas have lived in New Zealand almost down to our own days, and the presence of Dromornis and Dinornis in Australia shows that on the main land this heavy-limbed branch of the struthious stock is comparatively ancient. It has, indeed, a molluscan longevity. It was a contemporary of fresh water shells which were here before the surface of the land was modernized, and are here now while we examine the feathers and tendons of the last of the moas. The Australian species were in all likelihood exterminated long ages ago, for we nowhere find their remains strewed and heaped on the surface, nor their destruction traceable to human agency. The absence of carnivorous mammals has been held sufficient to account for their longer survival in New Zealand, but how is that absence itself to be explained, more especially now that we find on the continent bones of Dinornis, Thylacinus, Sarcophilus, and of the dog lying in apparently the same drift. The migration of the beasts of prey was surely as easy as that of the sluggish, wingless birds.

Have New Zealand and Australia, or at least its eastern ranges, ever been parts of the same land, with a fauna like that of New Zealand? Geology is as yet far from favouring the supposition, which moreover would compel us to assign to the moas an enormous duration. We must await more light. Meanwhile it is not without interest that we see so distinct a breach open in the wall of exclusiveness surrounding the New Zealand fauna.

## TUESDAY, 11TH MARCH, 1884.

THE VICE-PRESIDENT, J. BANCROFT, M.D., IN THE CHAIR.

DONATIONS.

"Transactions and Proceedings of the Royal Society of South Australia," vol. vi., Adelaide, 1883. From the Society.

"Journal and Proceedings of the Royal Society of New South Wales," vols. xiv., xv., xvi., Sydney, 1881-1883. From the Society.

The following papers were read:—

## WATER SUPPLY: SPRINGS AND THEIR ORIGIN.

By JOHN FALCONER, C.E.

(PLATES V. to X.)

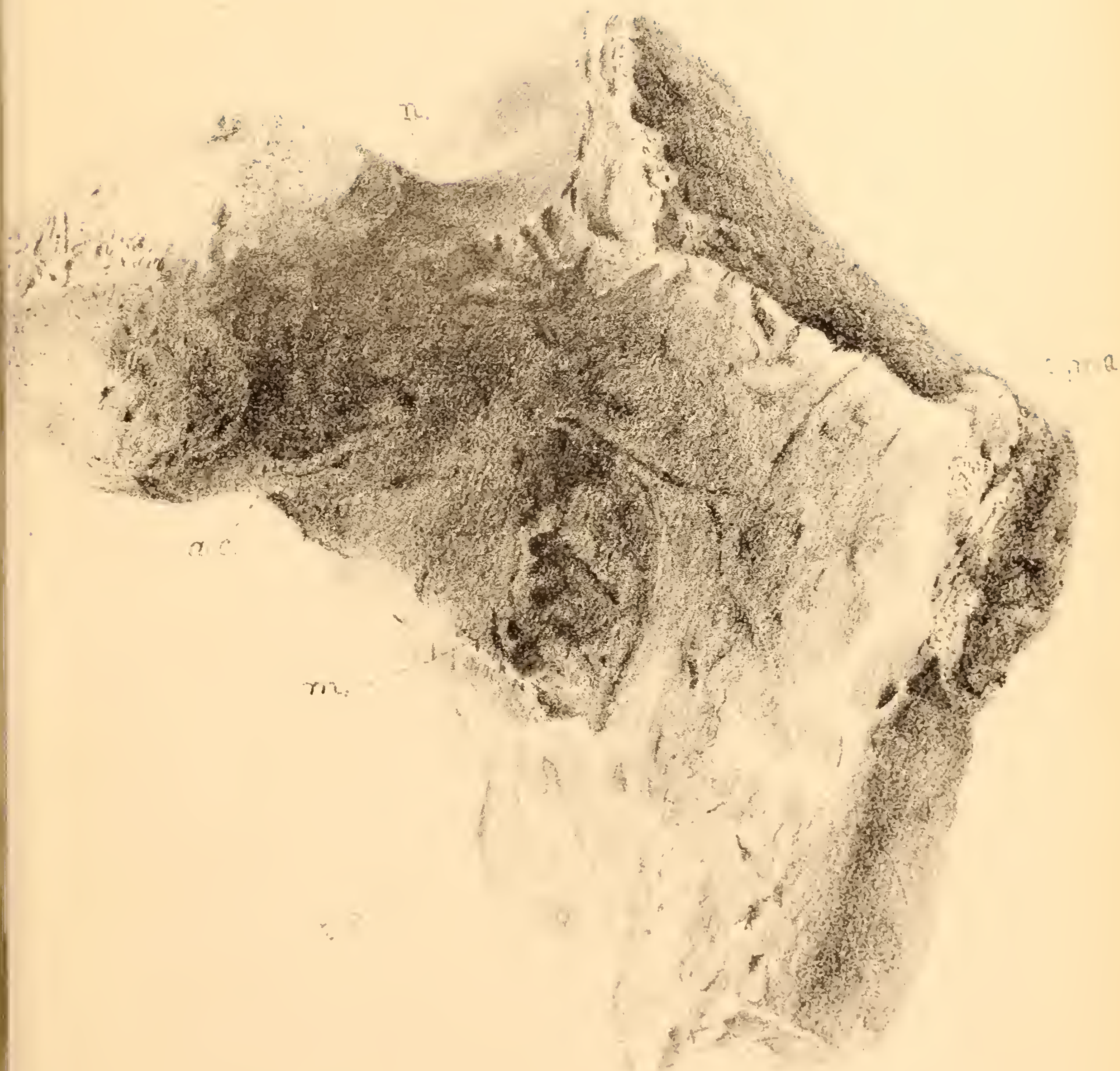
CLASS I.—Natural Springs caused by the inclination and dislocation of the Strata.

SPRINGS of this class exist in the Cape Colony, on the inner slopes of the Main Range (plate V. fig. 1) which is situated about the same distance from the sea as the Coast Ranges in this Colony. In the Cape of Good Hope the sedimentary rocks dip from the high table land in the interior of the Continent towards the Coast Range, and about one hundred miles from the top of this Range the formation commences to rise again, thereby damming the water back into the strata. Part of this water finds its way to the surface through dislocations at the change of inclination,

Plate III


Dinornis Queenslandiae.

Plate II.




Dinornis Queenslandiae.

...or del.

thereby supplying the Cape farmers with splendid springs, about twenty miles apart. The early Dutch settlers "Treyked" northward from spring to spring, as a Dutchman never thought of settling down where he could not get flowing water at some point above his homestead. Some of these springs are sufficient to drive two or three water mills, and they run through every street in their Townships.

This water has been tapped by boring in the interior over what is known as the "Great Karoo," and the water generally rises to the surface and sometimes overflows.

In some of these wells the material gone through consists of deposits similar to those found in the Western Downs of this Colony, near Roma. The depth of the Alluvial deposit overlying the Lacustrine shales, varies, but in every instance once through that into the cretaceous sandstones and coal measures water is a certainty. (Pl. vi., fig. 1.)

On the Western Plains of Queensland the rocks nearly all dip from the Main Range to the South-west, over which the water coming down the creeks travels at nearly right-angles to the outcrops and dip.

On a line drawn parallel to the top of the Main Range, and spurs, and about thirty miles distant from it, water may be struck at a depth of about two-hundred feet, measuring from the bottom of the alluvial deposit, due to erosion, which, in sinking wells, has been seldom taken into consideration.

### Class II.—Springs of Volcanic Origin.

This description of spring, existing in Queensland, is due to the overflowing of liquid lava or basalt into the old water system of the Colony, the water now getting in round the lip or edge of the basin filled up, flows underneath in the old river beds between the lava and the original surface.

These springs exist all over Queensland, and their presence may be indicated by patches of red soil, or decomposed basalt. The "Hummocks" are opposed to the hollows or valleys in the bed rock and indicate nearly the original height of the lava plain, and they remain in consequence of having been more consolidated (and so less liable to subaerial denundation) by the extra weight due to the depth of the valley filled up; whilst the less consolidated deposited over the original ridges has disappeared by erosion. Thus it happens that in boring through the basalt in almost every case water has been found lying in the old river hollows. (Pl. vi., fig. 2.)

On Ban Ban station, in the Burnett district, there is a large spring of this character which flows under a basaltic plain twenty miles square. Between the Normanby River in the Cook district and Deep Creek, you have a spring also of the same description, with the exception that it bursts forth in the middle of the lava plain, and forms what are called the upper springs on the Palmer Road, repeating the operation twelve miles further down. The Toowoomba water supply is another instance, only that the old mouths of the spring are within two hundred yards of the old post office, and could have been opened out at a small expense Wherever a patch of black soil occurs in a red soil country you have an old mouth of a spring now silted up.

In the neighbourhood of Bundaberg, and in several other places, springs of this class occur, due to a lava stream which started about Gayndah, flowing into and filling up the old bed of the Burnett River (Pl. vii.), and where the ancient water-course existed you have now the celebrated Bingerra and Wangerra scrubs, under which a large quantity of water is found at a depth varying from forty to one hundred feet.

Springs of this kind exist at—Ban Ban, Burnett; Deep Creek, Cook; Toowoomba, Darling Downs; Helidon, Moreton; Highfields, Darling Downs; Barolin, Bundaberg; Wongerra, Bundaberg; Spring Creek, Logan; Springfield, on the old Cleveland Road; Allingham Creek, Nulla Nulla, 140 miles west of Townsville, where there are four strong running springs; Pandanus Creek, near Townsville; hot and soda springs on Byrne and Flinders; a large spring at Kilcragie, on the Burnett; Amby Downs, in the Maranoa District. Water may be found underneath the volcanic deposits which form Redland Bay, Wellington Point, Cleveland, Victoria Point, St. Helena, and Humpy Bong, in Moreton Bay.

There are two or three splendid permanent water-falls in the Cook District which must be included in this class.

### Class III.—Springs Due to Faults or Dislocations.

An example of this kind of spring, which exists in every district in Queensland, is found in the neighbourhood of Bundaberg, due to a fault in the coal formation, about eighteen miles long with thirty-two feet of a drop to the east. This fault supplies the water to the springs in that neighbourhood. (Pl. viii. a, and viii. b.

On the sea-side of the Main Coast Range the rocks generally dip towards the sea, and the islands and coral reefs which lie off the coast are the remains of a range which formed the eastern lip of a basin which is now Torres Straits. On a good many, and probably on all, of these islands good water may be obtained by boring into the strata, which dip towards the west. The large springs on the Lizard Island, and on No. 1 Howick Group, close to which Mrs. Watson and her baby died of thirst, are examples of springs supplied by the main land. The water accumulates between the strata coming out at the outcrop which forms the Barrier Reef. A good deal of this water, however, which gets in on the sea slopes of the Coast Range, bubbles up under the sea, as between Noosa and Double Island Point, or on the islands off the coast. The places where fresh water gains the surface beneath the sea are indicated by an immense growth of oysters and other shell-fish and coral, as life of this description seems to flourish best where the salt water is diluted. Where there is no coral, an an opening through the reef occurs, it is observed that the nearest head-land on the main-land is granite.

### Class IV.—"Billa-Bongs."

"Billa-Bongs" (Pl. ix.) are due to the water in its course along the beds of old channels already filled in, being dammed back by the occurrence of natural barriers. These originate at times of periodical floods, when the surface water, in sweeping over the land, is charged with the smaller particles of loam which, by accumulation, form beds of impervious clay at points favoring their occurrence in these channels. The water being dammed back rises to the surface, and forms springs or water-holes, in which it is maintained at a constant level by the continuous supply from above. In the absence of springs of this description, driven tube wells will generally make these waters available on the surface, and have been very successfully applied in this country and Abyssinia.

Water exists at a depth of from twenty to fifty feet in all the Spinifex and Desert country.

On Wonaminda Station, Mitchell, a good sized creek looses itself in a gorge, and flows underground. It in all probability lodges somewhere between there and the southern border of the colony, and may supply the springs both hot and cold which appear at Cooper's Creek, and which have very likely formed the opal beds in that neighborhood, which appear to be only dried-up hot springs. This creek is highly charged with silica, and in eroding its way through the rock has lined the gorge with a coating of natural glass, some of which is of just the same composition as opal, and exhibits a somewhat similar play of colors.

All the Tidal Creeks may be dammed, so as to keep out the salt water and retain the fresh, and the water raised by appliances for irrigation, as was proposed to the land owners of Doughboy Creek fourteen years ago.

The remedy for the past state of things, the droughts so frequently experienced, lies in adopting the State-aid system, as in vogue in Scotland, enabling land owners to obtain money for special improvements on mortgage from the State.

## PSEUDOMORPHISM IN MINERALS.

By H. F Wallmann.

In the course of an examination of the minerals in the Queensland museum special attention has been paid to those processes of decomposition which have resulted in pseudomorphism, and as it is a subject which, to judge from mineralogical reports, does not seem to have been studied in Australia, it has been thought desirable to invite the attention of the society to it by means of a few illustrations drawn from Queensland mining-fields. The present communication refers only to certain ores of copper occurring at the Cloncurry mines.

None of our waters, whether rain or spring, are the pure chemical combination $H_2O$—in its integrity it does not indeed exist in nature; natural water always contains in solution extraneous gases or solids derived from the atmosphere or the earth. The usual compounds introduced from these sources are carbonated alkalies, double carbonate of lime, magnesia, or iron oxides, silicates of alumina, common salt, and nearly always minute percentages of ammonia. Probably from the oxidizing action of electric discharges upon the last element small quantities of saltpetre and soda nitrate are also communicated.

One portion of the rainfall rises again immediately by evaporation to perpetuate the circulation of moisture. The other is more permanently absorbed and re-appears eventually as spring water. The latter portion in its passage downwards through clefts and fissures acts upon the materials in its path with forces which are irresistible. The most compact mineral and rock masses yield to the unceasing action maintained in its descent.

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Plate V.


J. Falconer delt

PLATE VI



fig. 1

*Spring in Down Country*

CLASS 1

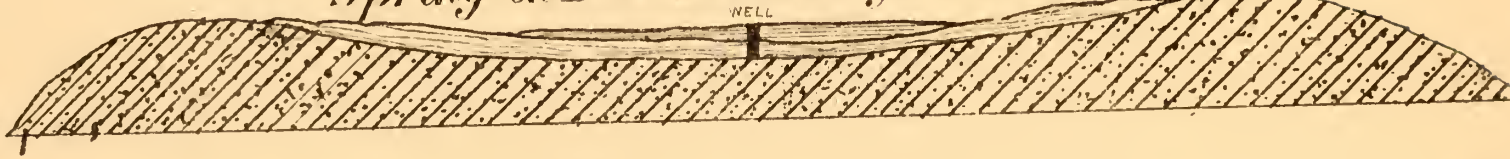
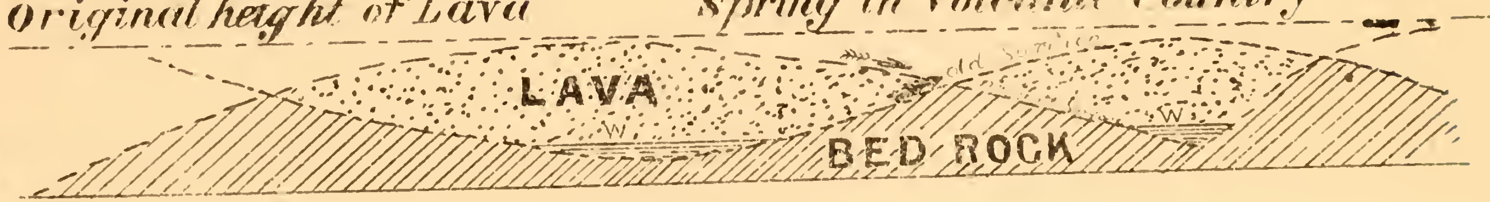



fig 2

*Original height of Lava* *Spring in Volcanic Country*

CLASS 2




J. Falconer delt

# LAVA STREAM

PLATE VII

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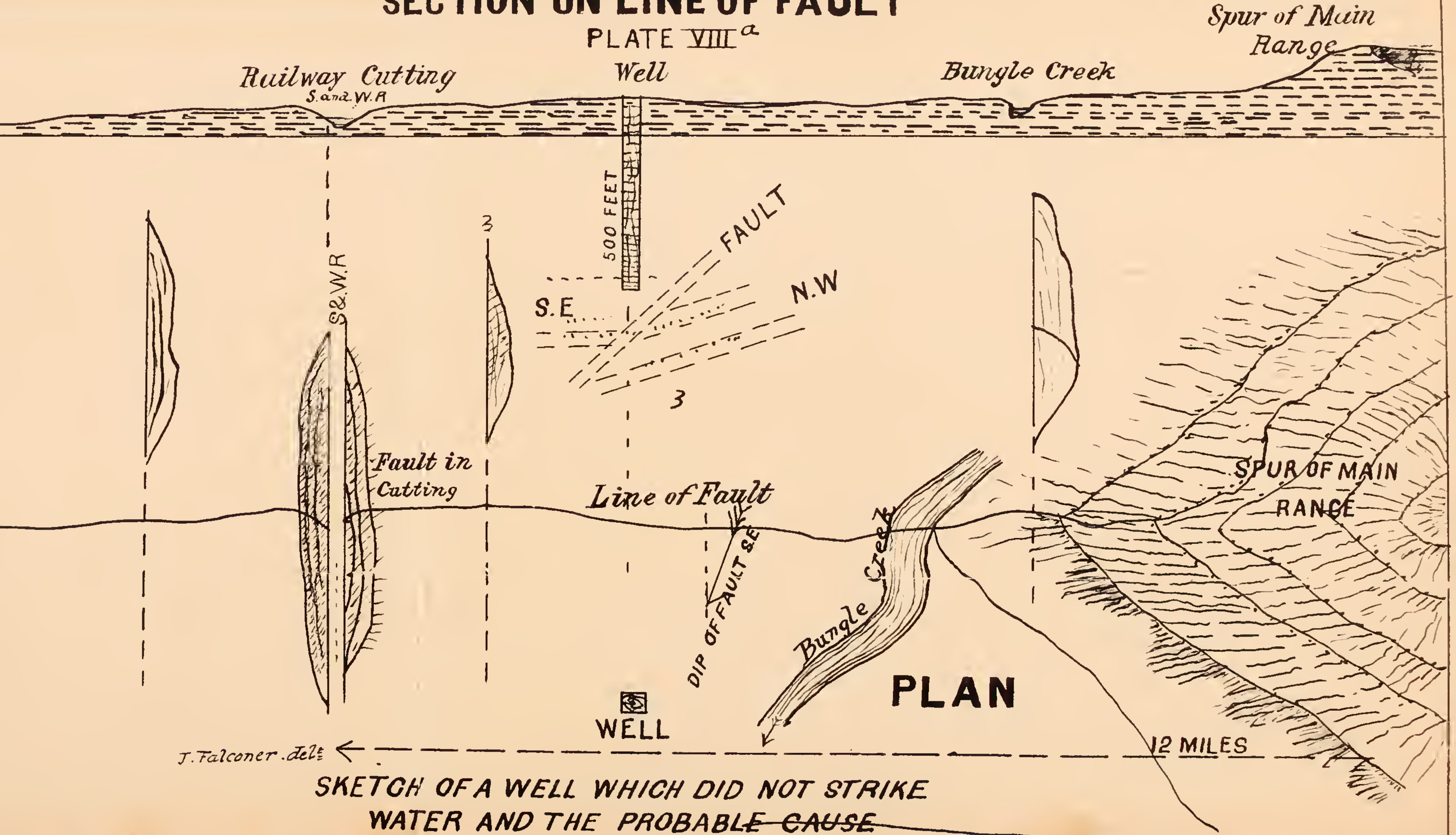
Vol I. Pt I.

# SECTION ON LINE OF FAULT

PLATE VIII a

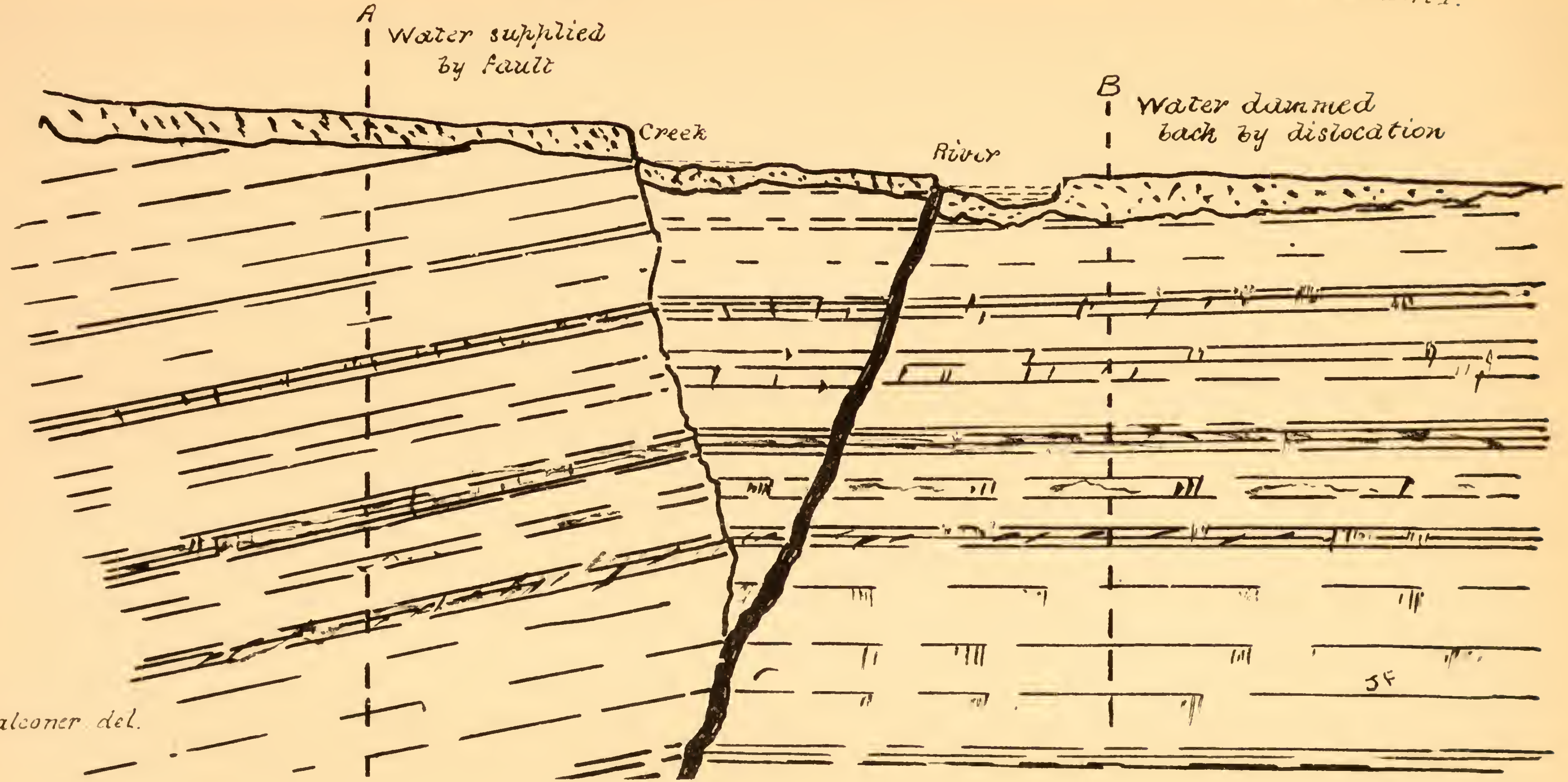



SKETCH OF A WELL WHICH DID NOT STRIKE WATER AND THE PROBABLE CAUSE

PLATE VIII°

Sketch of a Dislocation

Proc. Roy Soc. N.S.W.




J. Falconer del.

# BILLABONGS

PLATE IX

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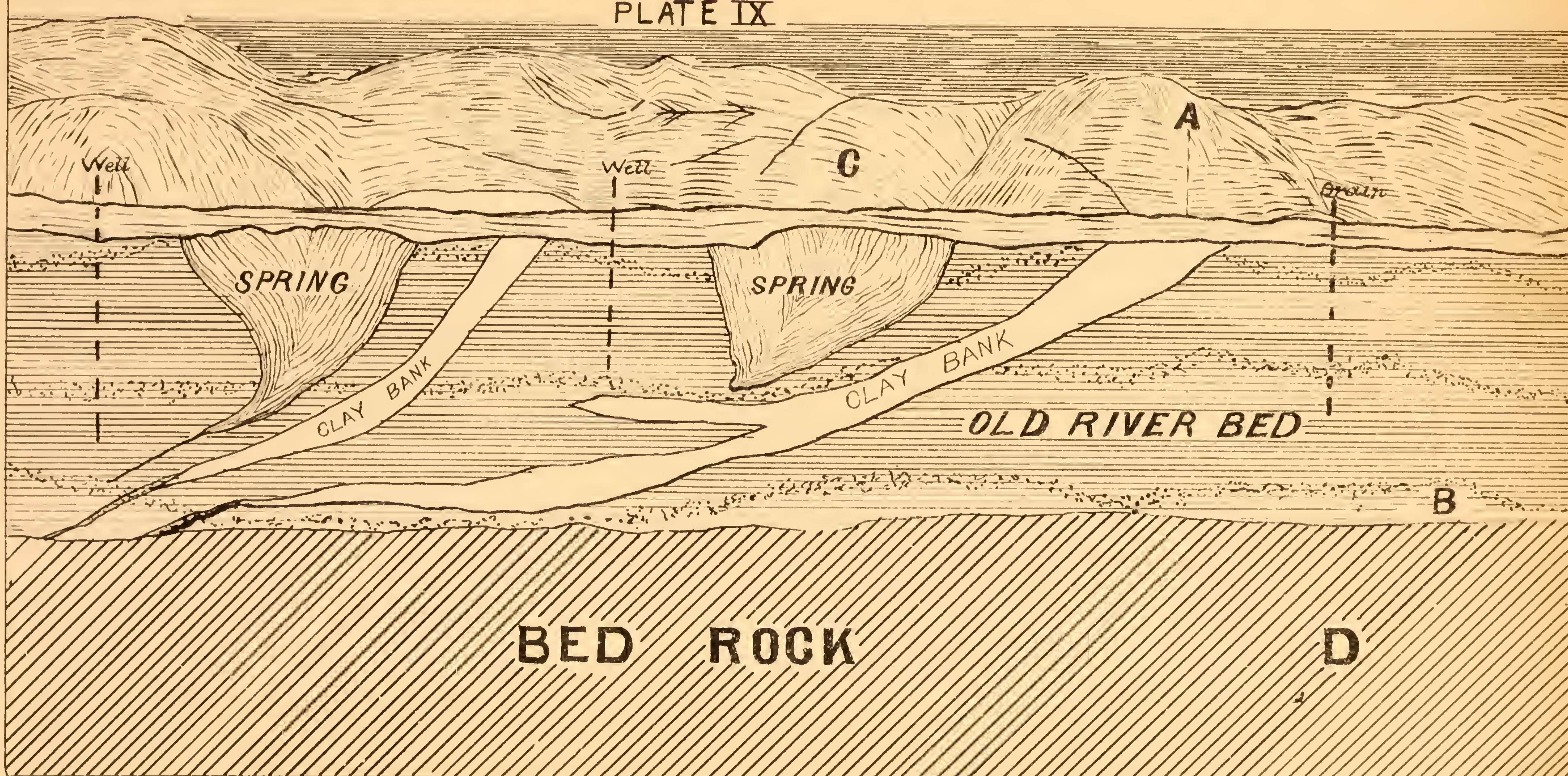



J Falconer del.

It is not the mere force of its pressure that is able to break up the obdurate resistance of compact limestone or quartz, or of even the glassy mass of obsidian or pitchstone, or of the beds of unctous clay; it is its constantly renewed impact, which, together with other causes, gradually increases the means of infiltration by the fissures, and at the same time intensifies the chemical disturbances which it commenced.

To this we trace the origin of all zeolites, and of most decomposition products, which subsequently appearing as specific minerals, are again liable to be similarly affected by that circulation of water to which their existence was due.

What wonder then that we find in the cavities of basalt the water-born zeolites—in nuggets of melaphyre amethyst, or in limestone caves the pendent stalactites.

But not to go out of our way to explain the various theories respecting the action of water on the rocks, we will turn at once to the phenomena of decomposition and recomposition which are illustrated by the minerals under notice.

Take first of these the cosmopolitan mineral, Cuprite or red oxide of copper, $Cu_2O$, with tesseral crystals appearing as cubes, octahedrons, dodecahedrons, or in combinations and twins after octahedrons. The colour is cherry, or different shades of red, the streak brownish red.

Next, a green mineral, Atacamite, a hydrous oxy-chloride of copper, $HCu_2O_3Cl$. The crystals are rhombic in short or long prisms. They occur in groups, and massive lamellar. The colour is different shades of green to blackish green. Translucent to semitransparent, with vitreous lustre and apple-green streak. The origin of this decomposition product of copper is briefly due to the action of rain or spring water holding chlorine or chlorides in solution. The tesseral $Cu_2O$ passes by substitution into the rhombic $H_3Cu_2O_3Cl$, with a loss of hardness and specific gravity. Wherever there are copper ores and chloriferous water this reaction is to be expected, either complete or incipient, but near the surface or in the fissures of the ores.

A third product of alteration is Malachite, a hydrous carbonate of copper, $Cu_2CO_4 + H_2O$, of a green colour and with a green streak. The crystals are monocline, generally microcrystalline, needle or hair-like, in thin plates, racemose or kidney shaped, and the chemical composition is $72\,CuO\ \ 20\,CO_2 + 8\,H_2O$. Where-ever copper occurs Malachite appears under the influence of the carbonates contained in air or water.

Again we have a blue mineral, also a hydrous carbonate of copper, namely: Azurite, $Cu_3 C_2 O_7 + H_2O$, with a streak like its colour—smalt blue. The crystals are monocline, in the form of thin plates, or short prisms, not seldom however in long prisms, mostly in tufts or groups, also in compact or earthy varieties. The chemical composition, is 69 CuO, 26 CO + 5 $H_2O$.

The minerals already mentioned are enough for our present purpose We may now consider the modes whereby a new compound is produced in the shape of another from the decomposition of which it has originated, that is of a pseudomorph, the accepted meaning of pseudomorph being a mineral occurring in a form which does not naturally belong to it, which form it has assumed by the gradual substitution of the atoms of another mineral by its own. Of this nature is the rhombic Atacamite or hydrous oxy-chloride of copper when it appears in the tesseral shape of cuprite, the red oxide of copper, in octahedrons and cubes. Here we appear to have cuprite crystals, with a green colour and a green streak; the red oxide is in fact substituted by the chloride. Not only do its tesseral crystals pass into atacamite, but they even renew the fine lustre of that mineral. In short it is atacamite in a false form. There can be no doubt that this change, or rather partial change, has been effected by interpenetration of chlorine in one state or another, among the molecules of the cuprite. On a larger scale, veins of atacamite are frequently to be seen penetrating the mass, and occupying fissures, or at least lines of least resistance, to reactionary force. Should the decomposing agent reach an open space in the substance of the mass, and meet there no crystalline form of the ore, it lines it with its own proper crystals, but if it there finds crystals of the oxide it removes them by slow degrees, replacing them by atacamite, and so producing a pseudomorph.

To have a clear idea of this class of pseudomorphism we must suppose changes resulting from the reception of new elements entering from within.

Specimens are met with having one portion of their cuprite crystals completely translated into atacamite, another in which the operation is not yet perfected, and another in which it has not yet commenced.

In another pseudomorph, however, we have proof that the direction of the agency of decomposition has been reversed. The blue hydrous carbonate of copper, azurite, with its prismatic crystals, beautiful blue tint, and transparency, are accompanied by crystals, some of which show partly the green colour of malachite, others which have altogether passed into malachite. Not only are their peculiar colour and transparency lost, but the specific form of the crystals themselves is affected. Malachite appears in the form of azurite, one carbonate has the crystalline aspect of the other. Why? Simply as the result of a loss of carbon and a compensation of that loss by water and copper oxide; a process which goes on in the mass from without inwards.

In contrast with this latter action we may lastly notice two other and different effects of pseudomorphic causation.

In the first a covering of malachite is formed over crystals of cuprite. The encasing may be partial or entire. The cuprite form of crystal is retained and we have malachite in octahedrons, cubes, twins after octahedrons, and other forms of the system—a change of form, which is accompanied by an important loss of specific gravity. The pseudomorphs of this kind from Cloncurry are equal in size and beauty to those of Chessy, near Lyons, in France.

The second of this class of pseudomorph indicates the same process. Malachite covers and fills the crystal form of carbonate of iron, siderite.

These last two kinds of pseudomorph are indeed well known, but a notice of them appeared necessary to render our review of the various modes of pseudomorphism complete.

I have to thank the Trustees of the museum for permission to exhibit the specimens on which these observations are founded.

# ON THE BOWEN CYCLONE OF 30 JANUARY, 1884.

By Mr. JAS. THORPE.

(Plate X.)

On 30th January last a storm of an unusually severe character passed over the portion of N. E. Australia near 20° S. and 148° E.

This storm was of a well-marked cyclonic character, and as it possessed some features peculiar to itself I have thought it worth while collecting what information was possible from various sources with reference thereto. The results I lay before you, together with chart showing, by the recorded variations of the wind, the path of the storm's centre. By these aids you will perceive that it (the storm centre) passed inland from the sea in a direction nearly due west.

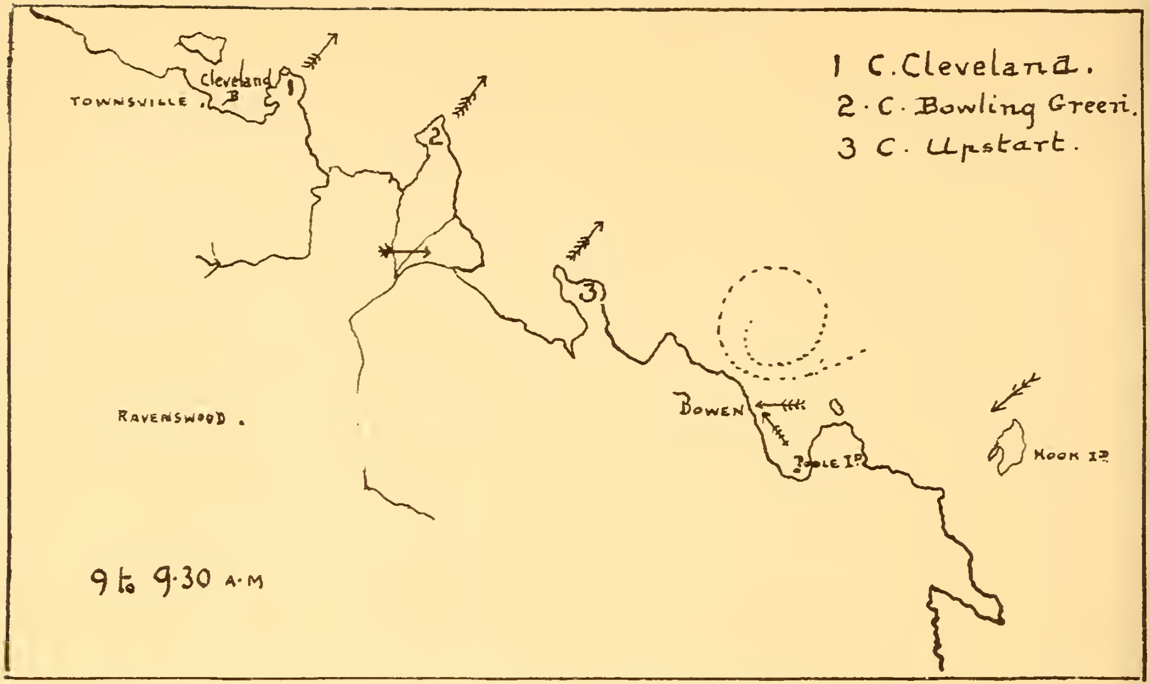
For some days previously a northerly wind had been blowing along the coast, changing during the night of the 26th and early morning of 27th to S., and so to S.E. during the 27th, 28th, 29th, and 30th, increasing in force to a gale, with very dirty weather. The northerly wind reasserted itself on the 30th.

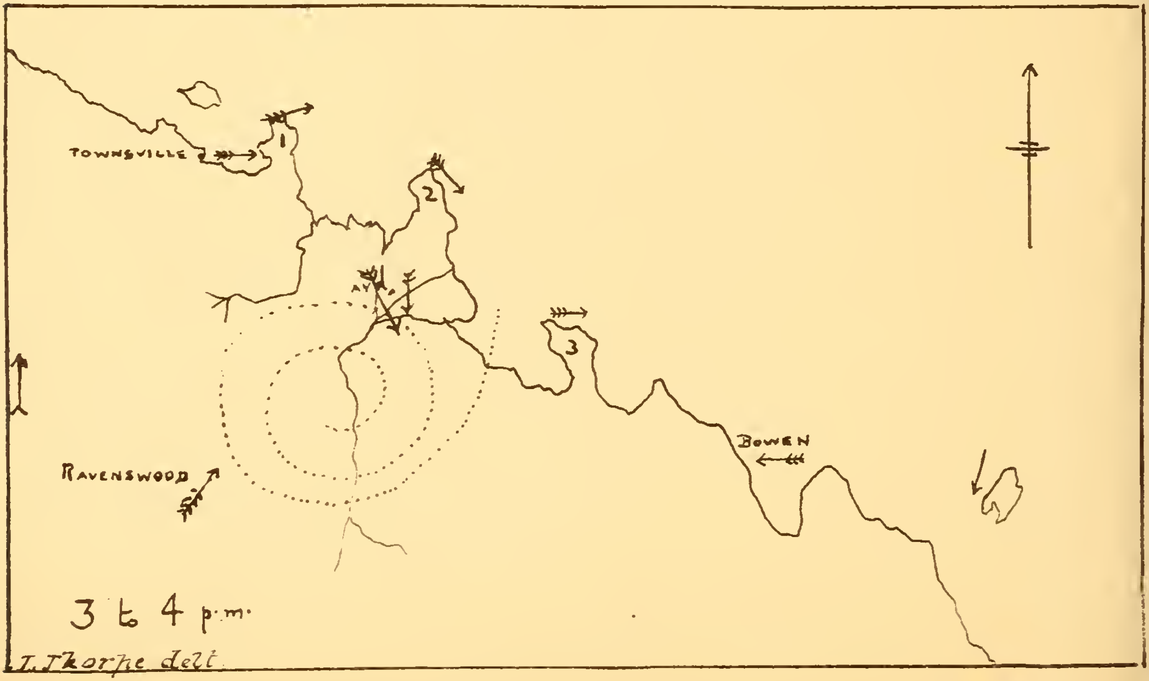
The first shift of wind noted is from the log of the "Pearl," Queensland Government schooner, off Hook Island;—"Midnight, wind veering from S.E. to N.N.E. Hurricane." Between 6.30 and 9.30 a.m. the centre passed to the north of Bowen, the wind at that place shifting from S.E. to E. at the latter time, and blowing furiously. Continuing its westward course, the centre passed to the south of Cape Upstart between noon and 1 p.m. The "Catherine Jane" had been beached in Upstart Bay early in the morning, Wind S.W.; heavy gale. Captain French says:—"At 12.30 p.m. for twenty minutes there was a flat calm, then suddenly the wind sprang up from the opposite side of the compass, and blew stronger than ever."

The Ayr reports give wind directions as —8 a.m. W.; 2 p.m. N.W.; 4 p.m. N. Finally, at 9 p.m., the cyclone had dissipated itself over the country to the west of Ravenswood.

I append an account of the storm as felt at Poole Island in Edgecombe Bay, and extracts from other public and private sources serving to show its exceptional severity. With regard to Mr. Christison's account of the course of events at Poole Island, his experience is exceptionally interesting, inasmuch as he shows a further veering of the wind from N.E. to a point west of north. The same fact shows in the Dent Island report, a light station on the coast about forty miles W.S.W. of Poole Island. This can be accounted for by what we may term a subsidiary depression on the outer edge of the main one. The barometer gave very little warning at Bowen of the coming storm. It had been falling gradually during the early morning, but not until the centre was nearly due north of that town did the mercury fall rapidly, and then it fell ·25in. in an hour. I am unable, for various reasons, to give readings useful for comparison from other stations. At Cape Upstart, a little to the north of centre, readings are taken at 9 a.m. and 3 p.m. At 9 a.m. the centre was to the east, and at 3 p.m. to the west of the station, thus the minimum reading about noon is not registered. At Cape Cleveland the same. At Townsville the official record shows no trace of the passage

Charts showing path of cycl



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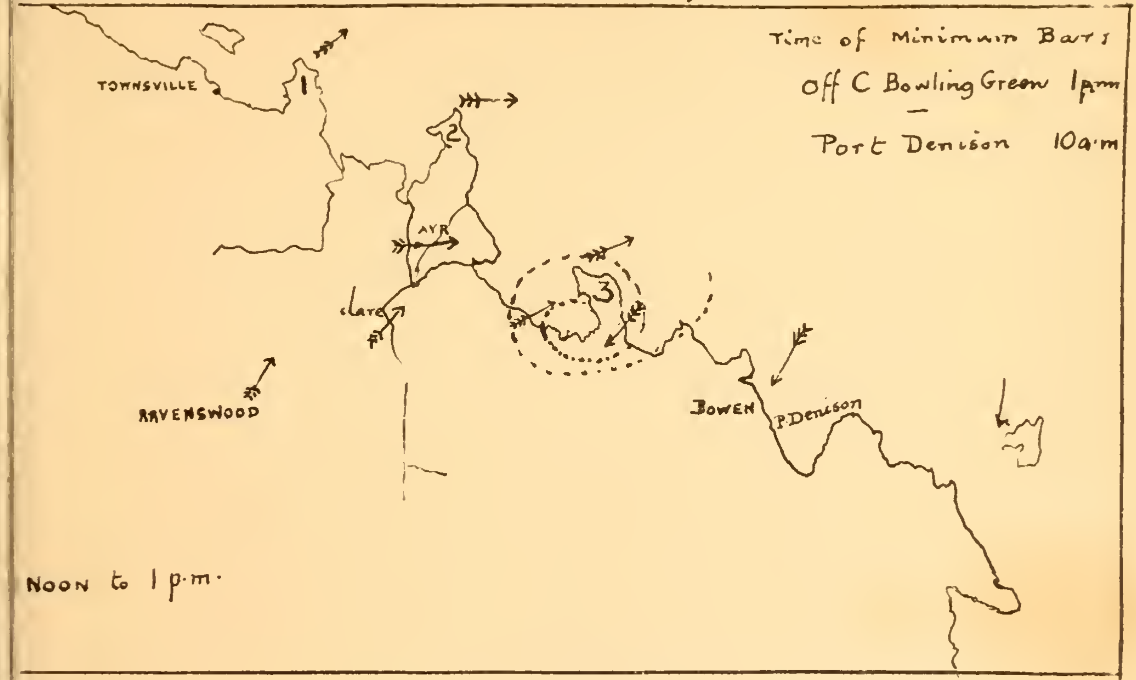


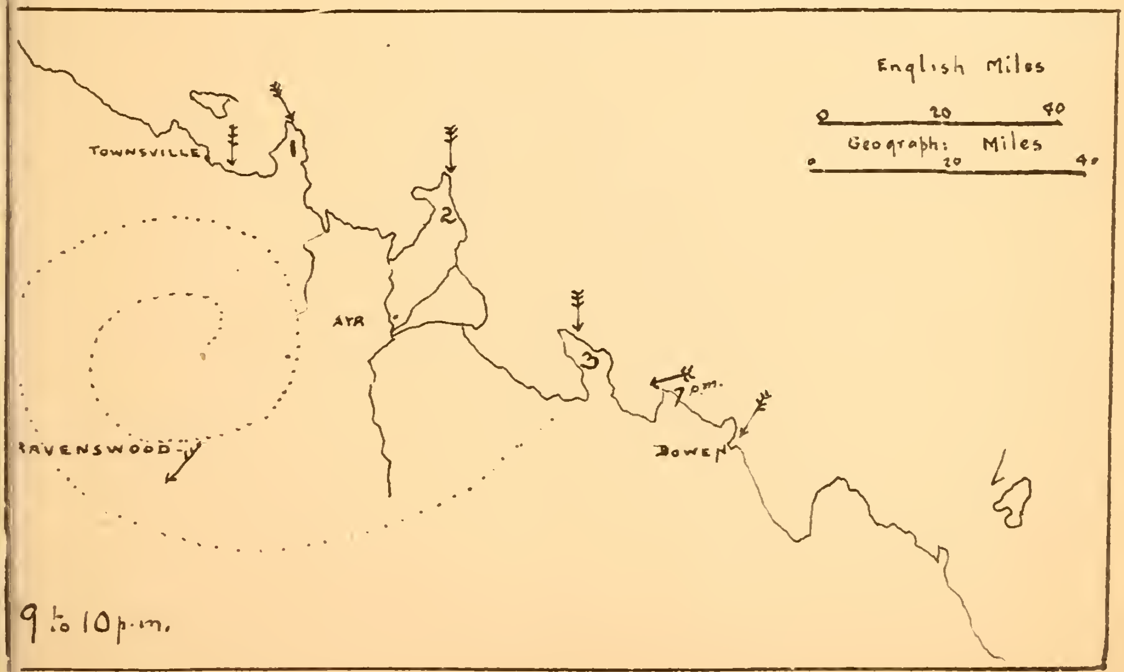

of the cyclone either in barometer, wind, or rain columns. This record is valueless. At Biralee on the Bowen River "the wind was S.E., gusty, never approaching a gale."

The barometer (aneroid) on board the "Fiado" at Bowen, at 9.30 a.m., registered 28.50 inches; on board the "Maranoa," at Flat Top Island, 30.29 inches—a difference of nearly an inch and three-quarters in 130 miles, and presuming that the readings require little or no corrections, this gives a resulting gradient of 80, steep enough to account for the exceptional severity of the gale.

A peculiar phosphorescent appearance was noted from Bowen, and also from Poole Island. (See appendix.)

As to the cause of this cyclone I am unable to do more than speculate. Probably it had its origin not far from the coast. We see on the coast north of Bowen a disposition to northerly winds; south of Bowen, a south-east gale. Where these opposing currents meet a gyratory movement is set up, intensified by the force of the wind itself. The northerly wind, in this case, remained master of the situation, the south-east gale changing away into E.N.E., N.E., and N., sending the eddy whirling away inland, instead of (as the theory of cyclones would lead us to expect) recurving on the coast, and going off in a south-easterly direction. The actual rate of progression of the centre of depression westward was about ten or twelve miles an hour. The actual force of wind can only be judged of by its effects, even had there been an anemometer available at the beginning of the storm (which there was not; in fact, I suppose there is not more than one in the colony), it would not have been there when the storm ceased.

I have to thank Captain Wyborn and the Assistant Superintendent of Telegraphs, Bowen, Mr. R. O. Bourne, for the assistance they have rendered me.

The wind and weather symbols in the Appendix are according to the Beaufort scale.

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## APPENDIX.

### Stations to North of Cyclone's Path.

Cairns.—16th to 26th, northerly winds. 27th to 29th, south-east winds. 30th and 31st, northerly winds and fine weather.

Cape Cleveland.—17th to 26th, northerly winds and fine weather. 27th to 29th, south-easterly winds and fine weather.

| | | | | | |
|---|---|---|---|---|---|
| 30th, 9 a.m. | S. W. | 7 | p. q. | 29.70 | 80 |
| 3 p.m. | W. S. W. | 4 | m. d. | 29.90 | 83 |
| 9 p.m. | N. W. | 5 | m. p. | 29.96 | 77 |

Misty, and passing showers. 31st, northerly wind, rain, thunder, and lightning.

Cape Bowling Green.—17th to 26th, northerly winds and fine weather. 27th to 29th, easterly winds, dull.

| | | | |
|---|---|---|---|
| 29th, 9 p.m. | S. W. | 5 | g. |
| 30th. 7 a.m. | S. W. | 9 | q. r. |
| 11 a.m. | S. W. | 10 | q. r. |
| 1 p.m. | W. | 11 | q. r. |
| 7 p.m. | N. | 6 | r. t. l. |

Winds south-west to north, force, 6 to 11 all day, whole gale; heavy squalls at intervals, thunder and lightning at night. 31st, northerly winds, unsettled weather.

Cape Upstart.—17th to 26th, northerly winds. 27th to 29th, easterly winds.

| | | | | |
|---|---|---|---|---|
| 29th 9 p.m. | S.W. | strong | 30·08 | u. g. m. |
| 30th 7 a.m. | S.W. | ,, | 29·75 | q. r. |
| 3 p.m. | W. | ,, | 29·85 | q. r. |
| 9 p.m. | N. | ,, | 30·00 | r. t. l. |

Heavy squalls, with thunder and lightning. 31st northerly wind, unsettled weather

Ayr.—Cyclone commenced at 5 a.m, wind from west, increasing till 2 p.m., when wind veered to north-west. At 4 p.m. the wind veered to north and gradually abated.

Stations to the South of Cyclone's Path.

Extract from Private Letter from Bowen.—"On the Tuesday, 29th, the wind was very strong from the south-east. The sky had a leaden appearance, which I did not like, and I referred very frequently to my barometer, one of Fitzroy's Storm Barometers (mercurial), also an aneroid which is adjusted to it. Much to my surprise the mercury went up slightly and stood about 30·4, about ·2 above its average, the wind freshened about 11 p.m., when I went down to the beach to see after our boat, the glass still same. Wind blew hard all night, during which time some buildings fell; at 5 a.m. I got up to have a look at things, found glass still same, verandahs were then flying freely. At about 6.30 the glass commenced to fall rapidly, and in less than half-an-hour stood with me at 29·4, but this was too late for any warning, for the wind came at same time, and all went before it, just like a pack of cards in a breeze; the wind to 9.30 was south-east, and then shifted to east, and blew with additional force, for it was then that most large buildings fell, those which had gone earlier were only light ones; this lasted for three-quarters of an hour, the wind veered to the north-east, and blew with less force until noon, when it fell off to a strong breeze; the mercury rose about 11 a.m. and went up until noon, when it stood at 30·00. The storm then followed the direction of telegraph line from here to Clare, 73 miles, and swept line before it, broke forty poles off level with the ground, and blew out numbers of others. Strange to say, on my inquiring how poles leaned from here to Clare, line being nearly east and west, they say one mile is leaning one way to north, and the next to the south. The storm struck Clare at noon, and then came from the south-west (mind, I do not vouch for points of compass, except Bowen), but it must have been near that, because it blew the old telegraph office on the western side into new office, and then there was a smash. At Ravenswood storm seemed to have begun at 10 a.m., but maximum at 3.30 p.m., or three hours later than Clare. Wind south and south-west. This is 30 miles south of Clare. At Ayr, 20 miles north of Clare, they are said to have got it from north-west, the maximum about 4 p.m.; duration, 8 a.m. to 6 p.m. I cannot give you any other barometer readings. The captain of "Fiado" steamer, which broke her cable with 150 fathoms out, and came on the beach, complained to me of the uselessness of his aneroid, for the wind came before it moved, and that was my experience."

"FIADO," S.S.—Captain Ennis forwards the following readings corroborating above, but differing slightly from the Pilot Station and Poole Island reports, below:

30th, 6.30 a.m. 29·4 S.E. hurricane, barometer, (aneroid) falling rapidly.
9.30 a.m. 28·5 S.E. changing rapidly to N.E.; min., barometer reading.
11 a.m. 30·0 N.E. gale moderating.

No N.W. wind or even N., it remaining to E. of N.

PILOT STATION, PORT DENISON.—27th to 29th, south-east wind. 29th 10 p.m. Sea had a very bright phosphorescent appearance, like as if on fire, or that the light of day was breaking upon it; this continued until 3 a.m. 30th, when it gradually disappeared. The barometer fell gradually until 9 a.m. on 30th, after which it fell suddenly.

| | | | | | |
|---|---|---|---|---|---|
| 30th 9 a.m. | S.S.E. | 12 | o. r. q. | 29·30 | 74 |
| 10 a.m. | | | | 29·06 | |
| 3 p.m. | E. | 11 | o. r. t. | 29·40 | |
| 9 p.m. | N.E. | 10 | o. r. t. l. | 29·62 | |

31st, northerly wind. Barometer gradually rising.

Queensland Government schooner "Pearl," Jan. 29th, morning, S.E. by S.; midnight S.E. by E. to N.N.E. hurricane; off Hook Island.

30th, morning, E.N.E. gale; afternoon, N.N.E. gale; off Dent Island.

31st, all directions between E. and N. Feb. 1st, N.N.E., 2 p.m. by N. to N.W.

POOLE ISLAND, EDGECOMBE BAY.—29th, 10 p.m. "An ominous silence proclaimed a change from the northerly weather which had prevailed for some time past. It lasted but a short time, when a strong wind arose from a point S. 25° W., increasing in velocity and pursuing a complete circle. When it reached S 45° E. about 1 a.m. 30th, it blew with terrific violence. Two miles out at sea, forming two-thirds of a circle, there appeared a continuous phosphorescent light, very brilliant, * * * as day broke the wind veered to N. 20° W., leaving but a small space to complete the circle. The cyclone was at its height from daylight till noon * * Rocks of tons weight disappeared from their beds, and stones fully 100 lbs weight were thrown in masses 30 feet high.

DENT ISLAND.—16th to 26th, northerly winds. 27th to 29th, south-easterly.

| | | | | |
|---|---|---|---|---|
| 30th, 6 a.m. | S.S.E. | 9 | o. g. q. r. | 75 |

6 to 9 a.m., wind baffling between S.E. and N.E., causing heavy sea.

| | | | | |
|---|---|---|---|---|
| 12 noon | N. | 5 | o. g. r. | 77 |
| 6 p.m. | N.W. | 3 | | |

31st, north-westerly winds.

S. S. "MARANOA," FLAT-TOP ISLAND.—29th, 6.15 p.m., strong south east gale all day. S.E., terrific squalls all night; two anchors down, and ship having to steam to her anchors.

30th, noon, wind veered to E.N.E., violent gale and blinding rain. Midnight, same, with thunder and lightning.

31st, gradually moderated. The barometer during the whole time only ranged 6-100ths, namely 30·24 in. to 30·18 in.

# CERATODUS FORSTERI POST-PLIOCENE.

By C. W. De Vis.

The story of the Ceratodus, destined to close in Australia, opens in other lands and far bygone times. There is indeed an interest peculiarly our own in the pages of its record, for Queensland alone has been able to preserve in life the sole and probably the last descendant of its ancient race. But the first appearance of this strange lung-breathing fish was in the beginning of the middle ages—the mediæval era, so far as is known, of terrestrial life. It lived during the deposition of the mesozoic beds from the Keuper to the Oolite inclusive, and in the care of these sediments left occasional traces of the few forms in which it existed, then to all appearances it died out abruptly. The relics it gave to the rocks were by the nature of its organization rendered obscure and enigmatical, they consisted merely of bodies of one kind so strangely fashioned as to require all the ichthylogical skill of an Agassiz to enable him to identify them as fish organs. He pronounced them to be teeth or rather dental plates, armed on their edges with horn-like projections, and, moved by the resemblance, he named the creature of whose personality they had formed part Ceratodus or 'horned-tooth.'

Unfortunately the specimens at the command of the great ichthyologist were but few in number, more unfortunately scarcely two of them were sufficiently alike to allow him to refer them to the same species; the necessary result was that he established almost as many names as he had examples. Shortly a greater body of materials was brought together in public and private collections, and the fact then became apparent that to continue to give to each different form a distinctive name would end in a reductio ad absurdum, for almost every individual would constitute a species. Observers were therefore forced to the conclusion that whatever the number of species might actually be, the individuals of each differed excessively in the form of their dental plates. Of many hundreds of specimens the majority were believed (and probably, rightly believed) by Professor Miall, their monographer, to belong to a single species, which he aptly named polymorphus: the rest were grouped under at most three or four other specific names. Beyond some surprisingly accurate conjectures of Agassiz respecting the structure, habits, and rank in life of their possessor, no knowledge of their life history was obtained, and it seemed as though nothing further could be known, for as none of the littoral beds subsequent to the deep-sea deposits of chalk yielded a trace of its continuance, the genus was naturally conceived to be extinct. Being extinct it should according to all rule geological never have reappeared, but as if to warn us that a law whose sanction depends on future experience is but a law on sufferance, the fish after a term of oblivion measured by the deposition of the Cretaceous and Tertiary beds in all their enormous thickness, variety of conditions, and time consumption, is found lingering in two small rivers at the furthest remove from its original habitats. We are here reminded strongly of a case extremely and very interestingly analogous to that of Ceratodus. In the oolite and chalk rocks everywhere a genus of shells, Trigonia, occurs in specific and individual abundance, so much so, indeed, as to give to certain beds a name and character. But beyond the limits of the mesozoic strata Trigonia never appears in the older known parts of the world. It was therefore much to the surprise of geologists that Trigonias were in the course of research found still living in tropical seas, notably in those of Australia. In this case, indeed, the gap has been largely bridged, and the wonder diminished, by subsequent discoveries of Trigonias in the Pliocene and Miocene beds of Australia. And so it may happen with Ceratodus, for living in the interval of time it must have been, for living it is now, to declare emphatically the imperfection of the geological record. Living in the interval of space it most probably has been, for it has been discovered in the secondary rocks of Asia as well as Europe. But curiosity is not satisfied with the bare inevitable, or the bare probable, we want to know where and how it has maintained its geological existence; has it always been the companion of marsupial life as it was in the beginning, and is now at its end? Have the marsupial and the fish always lived together in Australia, as would seem to be suggested by the prevalence of oolitic characters in the Australian fauna, or have they perforce, terminated on our shores their slow retrocession before the adverse influences which have rendered each step in succession baneful to them? These are questions for the geologist to answer: the first of them for the Queensland geologist especially. For that answer I fear we must wait till the due distinction is made amongst us between geology and mining survey, and our geological staff is employed on its proper work. Meanwhile though the rocks are silent their modern detritus has given some response to the question. Remains of Ceradotus have appeared in the post-pliocene drifts of the Darling Downs, and we now know that the fish inhabited the waters of Queensland before the present systems of its watersheds were established : that is, before changes, whether of surface levels or climate, had laid dry the area now traversed by the Condamine, and drained the swamps and lakes left for a time upon its basin. Protected by its aquatic surroundings from the full force of the new influences to which most of the land animals of the period succumbed, the Ceratodus saw them perish, but its survival was in those only of the present waters to which it had access, and which remained suitable to it: it was lost to those now running south, and to those which form the southern head of the Fitzroy; it remained in, or entered those only of the Mary and Burnett. To account for its presence in these rivers, we must suppose one of two things: either while still living in the Condamine area under the old arrangements of surface, its range was extended to that drained by the rivers mentioned by some of the known or unknown modes of distribution, or there ensued from some geological agency a solution of the continuity of the water area accupied by its then wider habitat. The question must remain open until the geologist has determined the date of the upheaval of the Bunya Range, so called, or of the filling up of its passes by basaltic overflows. The fact originating the question is that the Ceratodus, that is the living one, C. Fosteri, once existed in the Condamine: the proof of this must now be offered. Some years ago a tooth of Ceratodus, obtained from the Darling Downs, was submitted to the late Mr. Krefft. It was apparently so different to the teeth of the living species that Mr. Krefft regarded it as new and gave it the name of C. Palmeri, but, as I am assured, published no description of it; a notice of it, however, accompanied by a cast, was communicated to *Nature*, Feb. 12, 1874, p. 292. During the last year the collectors employed by the Trustees of the Queensland Museum obtained several other examples from the Chinchilla conglomerate in which they are associated with remains of crocodiles, turtles, &c. These are the specimens before the society and among them is the type of Mr. Krefft's C. Palmeri. It will be remembered that the Mesozoic teeth are in every character extremely variable, and the recent acquisitions fully maintain the family peculiarity, no two are alike in detail: but just as among the diversities presented by the fossil polymorphus we discern a general resemblance sufficient for their collection in one specific form, so in the examples before us we can perceive an approximate similarity in their leading features which enables us to avoid the error of considering them all of different species and leads us to regard them as not only one, but one with the living C. Fosteri. They consist of four pterygopalatine plates and five mandibulary: of the pterygopalatine of the upper jaw, one of the left side is pretty complete, retaining the greater part of its pterygoid element and the basal portion of the process for articulation with the frontal cartilage, the utmost difference it presents from the recent bone is the more forward position of that process, which rises opposite the second anterior tooth instead of opposite the interval between the second and third: the contour of the inner edge of the dental is a continuous curve, as in the recent fish. The surface of the plate in this specimen is nearly smooth, but in the very young one accompanying it the surface is even more pitted than its living exemplar. The two largest of the mandibulary plates must have belonged to fish of considerable size, that is, about four feet long, their plates are rather more elongated than in the living fish, and consequently, less curved on the inner edge. In the best preserved the symphysial and angular elements are retained in much completeness. It is useless to dwell on the minute differences they show amongst themselves, and when compared with the recent specimen. Suffice it to say that after due consideration of the value to be given to the dissimilarities, we must arrive at the conclusion that one and all belonged to ancestors of the present species, C. Fosteri.

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