ROYAL SOCIETY

OF

TASMANIA

PAPERS & PROCEEDINGS

OF THE

ROYAL SOCIETY

OF TASMANIA

FOR THE YEAR

1913

With 1 Text-Figure, 22 Plates, and 1 Map.

ISSUED 14th FEBRUARY, 1914.

PUBLISHED BY THE SOCIETY,

The Tasmanian Museum, Argyle Street, Hobart,

1914.

Price: Fifteen Shillings.

The responsibility of the statements and opinions in the following papers and discussions rests with the individual authors and speakers; the Society merely places them on record.

Printed at "The Mercury" Office, Macquarie Street, Hobart.

THE ROYAL SOCIETY OF TASMANIA.

The Royal Society of Tasmania was founded on the 14th October, 1843, by His Excellency Sir John Eardley Eardley Wilmot, Lieutenant Governor of Van Diemen's Land, as "The Botanical and Horticultural Society of Van Diemen's Land." The Botanical Gardens in the Queen's Domain, near Hobart, were shortly afterwards placed under its management, and a grant of £400 a year towards their maintenance was made by the Government. In 1844, His Excellency announced to the Society that Her Majesty the Queen had signified her consent to become its patron; and that its designation should thenceforward be "The Royal Society of Van Diemen's Land for Horticulture, Botany, and the Advancement of Science."

In 1848 the Society established the Tasmanian Museum; and in 1849 it commenced the publication of its "Papers and Proceedings."

In 1854 the Legislative Council of Tasmania by "The Royal Society Act" made provision for vesting the property of the Society in trustees, and for other matters connected with the management of its affairs.

In 1855 the name of the Colony was changed to Tasmania, and the Society then became "The Royal Society of Tasmania for Horticulture, Botany and the Advancement of Science."

In 1860 a piece of ground at the corner of Argyle and Macquarie-streets, Hobart, was given by the Crown to the Society as a site for a Museum, and a grant of £3,000 was made for the erection of a building. The Society contributed £1,800 towards the cost, and the new Museum was finished in 1862.

In 1885 the Society gave back to the Crown the Botanical Gardens and the Museum, which, with the collections of the Museum, were vested in a body of trustees, of whom six are chosen from the Society. In consideration of the services it had rendered in the promotion of science, and in the formation and management of the Museum and Gardens, the right was reserved to the Society to have exclusive possession of sufficient and convenient rooms in the Museum, for the safe custody of its Library, and for its meetings, and for all other purposes connected with it.

In 1911 the Parliament of Tasmania, by "The Royal Society Act 1911," created the Society a body corporate by the name of "The Royal Society of Tasmania," with perpetual succession.

The objects of the Society are declared by its Rules to be "the prosecution of the study of Science in its various branches, and more especially the development of a knowledge of the physical character and natural history of Tasmania and the neighbouring States."

His Majesty the King is Patron of the Society; and His Excellency the Governor of Tasmania is President.

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Errata.

Page 33, line 21—for "l" (where it first occurs), read "L."

Page 34. The third equation should read "$-2x + 14y = 600$."

PAPERS

OF THE

ROYAL SOCIETY OF TASMANIA,

1913.

ON THE RELATION BETWEEN THE LOSS OF ENERGY AND THE IONISATION PRODUCED BY CATHODE RAYS.

By J. L. Glasson, B.A., D.Sc.

(Read 14th April, 1913.)

In a previous paper (*Phil. Mag.*, October, 1911) I have shown that the number of ions made by a cathode ray in traversing unit length of air varies inversely as the square of the velocity of the ray. If a be this number we have the relation

$$a = \frac{k}{v^2} \qquad \text{(i)}$$

where k is a constant. W. Wilson has shown (*Proc. Roy. Soc.*, vol. 85, p. 240) that the law represented by equation (i) holds also for the β rays given out by radium. These rays had a velocity as high as $2{\cdot}9 \times 10^{10}$ cm. per second. The cathode rays I used had velocities as low as 3×10^9 cm. per second. So that the law (i) holds over a considerable range of velocities. From data given in my paper, it is easy to calculate the constant k. One cathode ray moving with a speed of $4{\cdot}8 \times 10^9$ cm. per second makes 1·5 pairs of ions per cm. of air at a pressure of 1 m.m. of mercury.

So that for air at atmospheric pressure we find that $a = 1140$ and $k = 2{\cdot}5 \times 10^{22}$.

In a recent paper (*Proc. Roy. Soc.*, April, 1912) Whiddington has shown that when cathode rays pass through matter, the velocity of the rays after traversing a distance x is given by the relation

$$v_0^4 - v_x^4 = ax \tag{ii}$$

and he has given the value of the constant a for the three substances, aluminium, gold, and air.

By a combination of this result with the result of my experiments it is possible to determine the energy lost by the cathode ray for each ion made by it.

The total number of ions made by a cathode ray in going a distance x is given by

$$I = \int_0^x \alpha\, dx \tag{iii}$$

Now $\alpha = \frac{k}{v^2}$, and differentiating (ii) we get

$$dx = -\frac{4v^3}{a}\, dv$$

So that substituting in (iii) and inserting the proper limits the relation becomes

$$I = \int_{v_0}^{v_x} \frac{k}{v^2} \cdot \frac{-4v^3}{a} \cdot dv \qquad -\frac{4k}{a}\int_{v_0}^{v_x} v\,dv \tag{iv}$$

Now if E is the energy of the ray we have

$$dE = mvdv \text{ or } vdv = \frac{dE}{m}$$

So that the relation (iv) becomes

$$I = -\frac{4k}{m}\int_{E_0}^{E_x} dE$$

$$= \frac{4k}{am}(E_0 - E_x)$$

Let us call the amount of energy lost by the ray for each ion produced Q.

Then $$Q = \frac{E_0 - E_x}{I} = \frac{am}{4k} \tag{v}$$

Since the expression for Q does not involve v we see that *the ray loses the same amount of energy per ion made whatever its velocity may be.* This result is one which might almost have been assumed. In fact, Geiger in dealing with the similar problem in the case of α rays has made such an assumption (*Proc. Roy. Soc.*, vol. 83, p. 513). It appears, then, that Whiddington's results (ii) regarding the loss of energy in traversing matter might have been deduced from the law (i) connecting ionisation and velocity, and *vice versa*.

All the constants in (v) are known, so that we can calculate Q.

For air at 760 m.m. pressure Whiddington gives $a = 2\cdot 0 \times 10^{40}$; and $m = 8\cdot 8 \times 10^{-28}$ gms., $k = 2\cdot 5 \times 10^{22}$; therefore $Q = 1\cdot 76 \times 10^{-10}$.

Expressing this in the usual way as a fall of potential in volts by the relation $eV = \frac{1}{2} mv^2 = Q$ we get $V = 1\cdot 1 \times 10^2 = 110$ *volts*. *So that for each pair of ions made the ray experiences a loss of velocity corresponding to a fall through* 110 VOLTS.

We may compare these results with those obtained for the a rays. Geiger has shown (*Proc. Roy. Soc.*, vol. 84, p. 505) that for the rays from Ra. C. the ionisation per cm. of path varies inversely as the velocity of the rays. From his data I have calculated that the energy lost by the ray per ion made is $5\cdot 5 \times 10^{-11}$ ergs. For β rays $Q = 1\cdot 76 \times 10^{-10}$. So that in making a single ion a β ray will lose three times as much energy as an a ray.

There have been many estimates of the energy required to produce an ion, varying from 5 volts up to several hundred volts. Perhaps the most probable value is that given by Townsend, viz., 10 volts. If this value be accepted we see that the proportion of the energy lost by the ray which is actually spent in ionising is fairly small. It seems probable that the bulk of the energy lost by the ray is spent in setting the electrons within the atoms of the gas into vibration insufficient in amplitude to cause their ejection from the atom. This energy of course appears ultimately as heat.

This paragraph is devoted to a consideration of the proportion of the energy of a cathode ray which is spent in ionisation.

Sir J. Thomson has shown (*Phil. Mag.*, April, 1912), that the number of ions made by a cathode ray in traversing unit length of air is given by the expression

$$a = \frac{n\pi e^4}{WT} \qquad \text{(vi)}$$

where n = number of corpuscles in 1 c.c. of air,
W = energy required to ionise an atom,
T = kinetic energy of the moving ray $(= \frac{1}{2} mv^2)$.

By eliminating v from (vi) and (i) we get the relation

$$W = \frac{2n\pi e^4}{km} \qquad \text{(vii)}$$

Thus from (vii) we may calculate W, the energy of an ion, or by combining (vii) with (v) we get the ratio $\frac{Q}{W}$, *i.e.*, the energy lost by the ray to the energy spent in ionisation.

Evidently
$$\frac{Q}{W} = \frac{am^2}{8n\pi e^4} \qquad \text{(viii)}$$

In order to calculate the value of n we refer to a paper by Crowther (*Proc. Roy. Soc.*, vol. 84, p. 226), in which he shows that for the five elements C, Al, Cu, Ag, Pt, which have atomic weights varying from 12 to 195, the number of electrons in the atom is three times the atomic weight to within a few per cent. Assuming that this holds also for the atoms of O and N, we find that the number of electrons per c.c. of air at 760 m.m. is $n = 2{\cdot}3 \times 10^{21}$.
Putting this value in (ix) we get

$$\frac{Q}{W} = 5{\cdot}5 \text{ (approx.)}$$

Thus the energy spent in ionisation is one-fifth of the whole energy spent by the ray.

I am grateful to Professor Kerr Grant, of the University of Adelaide, for valuable suggestions in connection with this paper.

The University of Tasmania,
29th March, 1913.

THE HEIGHT OF BEN LOMOND.

By L. F. Giblin, B.A., E. L. Piesse, B.Sc., and
H. R. Hutchison, Authorised Surveyor.

(Read 14th April, 1913.)

Map

In a paper read before the Society in 1907(1), two of us gave an account of observations made with aneroids on Ben Lomond in 1906 and 1907 with the object of determining the difference of height between Legge Peak(2), the highest summit in the northern part of the Ben Lomond range, and the trigonometrical station at the southern end of the range. The trigonometrical station is stated on the official maps of Tasmania to have a height of 5010 feet; Cradle Mountain is stated to be 5069 feet, and the Ben Lomond station comes next below it, being thus the second highest of the officially recorded summits.

The observations in 1906 made Legge Peak 140 feet higher than the trigonometrical station; and in 1907, 160 feet. From the former, the height of Legge Peak was 5150 feet, from the latter 5170 feet, and the mean of the two results was 5160 feet. If this result were correct Legge Peak was nearly 100 feet higher than Cradle Mountain, and was the highest known summit in Tasmania. But the result had been obtained with aneroids not of the best pattern for this purpose, and not used in the best conditions, and it was desirable that the difference of height should be ascertained by survey. An opportunity to revisit the mountain did not occur until 1911. A survey was then made which in part confirmed the height obtained in 1906 and 1907, but the result was not conclusive, and another survey was accordingly made in 1912, and this placed the height of Legge Peak beyond doubt.

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(1) L. F. Giblin and E. L. Piesse, Note on the Height of Legge Tor (*Proc. Roy. Soc. Tas.* 1906-7, xxxvii.-xl.).

(2) The name Mt. Legge was proposed in the paper just mentioned, but in the title of the paper the name was altered to Legge Tor as this was understood to be the form desired by the Department of Lands and Surveys. In the County chart Cornwall No. 3 the summit has been called Legge Peak.

At Christmas, 1911, a party consisting of Messrs. W. F. D. Butler, J. A. Johnson, A. F. Weber, and two of the writers (L. F. Giblin and E. L. Piesse) spent several days at Ben Lomond. Leaving Hobart by the morning train, the party was met at Avoca station by Mr. C. R. Foster, who made all arrangements for the ascent of the mountain and enabled the party to reach before dark the old Ben Lomond Hotel, 11 miles from Avoca, and about 2400 feet above sea-level. The "Hotel," it should be mentioned, is untenanted, and travellers will be wise to make their own camp. Next morning, Mr. Foster's horses helped the party to the Upper Camping Ground, about 3700 feet, and from there the loads were carried to the plateau. Arrived at the moor, the party went southwards to the Stacks Bluff, on which is the trigonometrical station. There a base rather more than a quarter of a mile long was measured, and with a 5-inch Everest theodolite angles were taken to ascertain the distance and elevation of Legge Peak. Then the party went on to Youl's Lake, where a camp was made. The results of the day's observations were computed, and the height of Legge Peak was found to be 5158 feet.

As the object of the expedition seemed to be attained, the next day, again a fine one, was spent in a visit to Legge Peak instead of in making a check survey. This was attempted on the following day, but the weather had broken and it was impossible to do more than measure a second base on the moor south of the Nile gorge, and move camp to a more sheltered spot, a little flat about 400 feet above the Upper Camping Ground and at the foot of the talus slope from Wilmot Bluff. Three of the party had to return to Hobart next day, but Messrs. Giblin and Piesse remained, and were able to take the required angles at the second base. Satisfied with these, they returned to the flat, and moved camp to the old Hotel, in preparation for an easy stage next day into Avoca.

But when the day's observations were examined that night at the camp fire, it was found that they did not confirm the first day's work at the Stacks Bluff. The observations from the two ends of the Nile gorge base made Legge Peak, from one end of the base, 13 feet lower than the trigonometrical station, and from the other end 6 feet. The apparent agreement of these two results averted suspicion from the instrument, and no other explanation could be imagined. The supply of food was almost exhausted, but there was just enough for another day's stay, so an early start was made with the theodolite next morning, and the site of the previous camp reached by eight o'clock. Then a cloud covered the summit, and did not lift for eight hours. At last, at nearly five o'clock, the fog lifted, and vertical angles were taken from the trigonometrical station to the ends of the Nile base (which, of course, had not been marked on the first day) and again to Legge Peak. The angles to the base agreed closely with the angles taken in the opposite direction from the ends of the base to the trigonometrical station, and the angles to Legge Peak were also nearly the same as those taken on the first day, and so the mystery of the discordant results was still unsolved. However, it was not possible to do any more, and next day the party had to go in to Avoca. It was only after the return to Hobart that an examination of the instrument showed that some parts of it had worked slightly loose, so that it would sometimes give a correct vertical angle and sometimes a quite incorrect one. Its vagaries had not been discovered in the field, because on each test made of it the reading confirmed the previous reading.

It was tempting to disregard the results from the Nile gorge base, and to treat the height, 5158 feet, obtained from the Stacks Bluff base, agreeing so closely with the height given by the aneroids in 1906 and 1907, as correct. However, it was safer to wait for a confirmation, and the result was therefore not published.

At Christmas, 1912, the writers and Messrs. Butler and Weber went again to Ben Lomond. Mr. Foster again made all arrangements for us, and at some inconvenience accompanied us as far as the Upper Camping Ground. This time we decided to avoid the labour of carrying our stores across the moor, and we made our camp at last year's site on the flat below Wilmot Bluff, a position quite convenient for our work. Relying on a little stream (the head of the Ben Lomond Rivulet) which we had found above this flat in 1911, we had no fears for a supply of water; but the supply was much scantier than in the previous year, and this spot, otherwise a very pleasant camp site, might be without water in a dry season. In spite of the heavy rains during December, we found the moor much drier than usual. The beautiful pools which usually are found everywhere over the plateau were for the most part dry, and the bright vegetation which grows in and round them was withered. The blaze of colors which Ben Lomond shows in summer was duller than in other years; the sage bush and the yellow bush had their usual tints, but there was scarcely a flower on the acres which are often covered with the white and red and orange blossoms of the richea.

We first remeasured the base (*TA*) at Stacks Bluff. In 1911 this had been found to be 1554·42 feet and 1554·43 feet in two measurements, each made with a 300-foot $\frac{1}{8}$-inch steel band in the usual way. When remeasured in 1912 with the same band, the length was found to be 1553·0 feet; but owing to a high wind the measurement was probably not as accurate as those made in 1911. We took the length to be 1554 feet.

This base is of course a very short one. But it is to be remembered that our object was not to find the distance of Legge Peak (which was nearly seven miles)—an object for which the base would have been unsuitable, as any error of measurement would be exaggerated twenty times, and in addition there would be an error in calculation resulting from the smallness of the angle at Mt. Legge—but to determine a difference of height which was only about one-tenth of the length of the base. An error of a foot, then, in the measured length would give an error of only a little more than an inch in the difference of height, and from this point of view the base was long enough.

Mr. Hutchison then measured the horizontal and vertical angles from the ends of the base to Legge Peak, and to the ends of a new base *CD* which another member of the party had marked meanwhile near last year's base at the Nile gorge. Owing to a high wind and other circumstances the angles are not quite complete, but even apart from the angles taken at the second base, they give two determinations of the height of Mt. Legge, and with these angles they give an ample check.

On the following day we measured the new base at the Nile gorge (1366·5 feet), and Mr. Hutchison took the necessary angles there. We also laid out two other bases, *CB*, *BE*, and used these to determine the heights of the two summits of Ragged Mountain, an outlier to the north-west of Ben Lomond.

The instrument used was a 5-inch Troughton and Simms transit theodolite reading on each circle by two verniers to 20″. The angle obtained at each setting is given below.

The degree of accuracy of the angles appears from the triangles *ACD*, *CDT*, in each of which all three angles were measured. The sum of the measured angles of the triangle *ACD* is 180° 0′ 17″, and the sum of the measured angles of the triangle *CDT* is 179° 59′ 53″. For the vertical angles, a test of accuracy is given by the angles between *A* and *C* and between *A* and *D*, which were measured in both directions. After applying the usual correction for curvature and refraction, the difference between the angles *A* to *C* and *C* to *A* is 51″, and the difference between the angles *A* to *D* and *D* to *A* is 3″. A test of the accuracy of the angles and measurements of length combined is obtained by calculating the distance from the trigonometrical station to Legge Peak, first from the Stacks Bluff base and the angles observed there, and second from the Nile gorge base and the angles observed at it. The results are 35,280 feet and 35,260 feet, whence it appears that the lengths required for determining the difference of height are known with sufficient accuracy.

From the abstract given below of the calculations, it will be seen that the height of Legge Peak was determined in four ways calculated in pairs from independent observations at the two bases. The results are:

HEIGHT OF LEGGE PEAK.

How Obtained.	*Calculated Height.*
Direct from *T*	5160·0
From *A*	5160·6
From *D*	5160·6
From *C*	5158·3

These results and the result (5158) feet obtained in 1911 justify the adoption of 5160 feet as the height of Legge Peak, which accordingly is the highest known summit in Tasmania, a satisfactory conclusion to the investigations of the height of Ben Lomond commenced by Col. W. V. Legge in 1906. The agreement between the results by aneroid and by the theodolite is remarkably close, and could not be expected to occur again in similar conditions.

The claims of Barn Bluff to be higher than its neighbor, Cradle Mountain, have still to be tested by survey.

Barn Bluff may prove to be higher than Cradle Mountain, but no one, so far as we know, has suggested that it is likely to be as much as 90 feet higher, and there is little probability that Legge Peak will be displaced from its position at the head of Tasmanian summits.

The results of the calculations for *N* (the western summit) and *S* (the eastern summit) of Ragged Mountain are also given below. The height of the northern summit is about 4440 feet, and of the southern about 4490 feet. The mountain has thus a respectable place in the list of Tasmanian summits, although perhaps not quite as high a one as its prominent appearance from Launceston and elsewhere would suggest.(3)

The map published with this paper is based on a rough survey made by Colonel Legge. We are indebted to Mr. A. F. Weber for preparing it for reproduction. The aneroid heights shown on the map depend for the most part on single unchecked observations. The topographical features of the map are shown on the county chart of Cornwall (No. 3), issued by the Department of Lands and Surveys, which has also been drawn from Colonel Legge's survey. Most of the names given on our map are not, however, shown on the official chart.(4)

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(3) Ragged Mountain can be seen on a clear day from Mt. Wellington. Legge Peak is also in view, between Ragged Mountain and the southern summit, but it is not conspicuous enough to be distinguished as a separate summit in the general high area at the north of Ben Lomond.

(4) Colonel Legge has sent us the following explanation of names on the Ben Lomond plateau given by him in the rough survey he made in the years 1906-9 :—

"As I regarded the Ben Lomond plateau as the most remarkable physiographical feature in the State, it seemed fitting that the majority of the names should have some historical significance : accordingly—

1. The lake-source of the Nile, its gorge, the 'cirque' in the escarpment, and the isolated fell adjoining the river's descent through the latter, were named after explorers connected with discoveries at the sources of the parent river in Africa.
2. Dominant and commanding features of the great escarpment, as also important surface characteristics of the plateau : after governors, officials, surveyors, &c. of the State.
3. Other features on the plateau : after fellow-explorers and assistants in the survey.
4. The remarkable eroded-down valley, dissecting the plateau, at the upper entrance of the Speke Gorge : after our good Queen.
5. The lofty cliff buttress as seen from the Break-o'-Day Valley, often standing up alone against the cloud in the 'amphitheatre,' after the lonely and mysterious 'Sentinel of Egypt'—the 'Sphinx.'"

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ABSTRACT OF OBSERVATIONS.

T, a spot on the rock within the "stockade" at the trigonometrical station on the southern summit. We did not see any mark of the original station, and its position is somewhat uncertain.

A, the top of a flag at the eastern end of the Stacks Bluff base.

B, *C*, *D*, *E*, tops of flags at the ends of the bases south of the Nile Gorge.

L, the base of the cairn erected in 1907 on Mt. Legge.

N, *S*, the highest points visible from *B*, *C*, *E*, of the western and eastern summits of Ragged Mountain.

Lengths of Bases.

(Reduced to the horizontal.)

TA	Measured in 1911, 1554·42, 1554·43 feet.
	Measured in 1912, 1553·0 feet.
	Length adopted, 1554 feet.
CD	1366·5 feet.
BC	1369 feet.
BE	1204 feet.

HORIZONTAL ANGLES OBSERVED.

Each entry in the columns "Face Right," "Face Left," is the mean of the vernier-readings at one setting.

	Face Right.			Face Left.			Mean.			Corrected Angle. (1)		
	°	′	″	°	′	″	°	′	″	°	′	″
LTA	75	12	40	75	12	20	75	12	35			
						40						
CTD	5	31	30	5	30	45	5	31	07			
			20			55						
CAD	5	21	50	5	21	40	5	21	45			
DAL	16	27	15	16	27	20	16	27	17			
LAT	102	19	10	102	19	45	102	19	27			
LCD	71	37	05	71	37	20	71	36	55			
		36	40		36	35						
LCA	144	20	40	144	21	10	144	20	45			
		20	15		20	55						
LCT	150	34	00	150	34	10	150	34	00			
		33	40		34	10						
CDL	104	59	25	104	58	55	104	59	00			
		58	50		58	50						
CDA	101	54	10	101	54	50	101	54	42	101	54	32
		54	55		54	55						
CDT	95	31	25	95	31	45	95	31	41	95	31	45
		32	00		31	35						

(1) Corrected to make sum of observed angles of triangle 180°.

VERTICAL ANGLES.

Each entry in the columns "Face Right," "Face Left," is the mean of the vernier-readings at one setting.

Angle.	Face Right.	Face Left.	Mean.	Correction. (2)	Corrected Angle.
	° ′ ″	° ′ ″	° ′ ″	′ ″	° ′ ″
T (+ 4·5) to *L*	+ 0 10 40	+ 0 12 50	+ 0 11 42	+ 2 29	+ 0 14 11
	35	45			
	35	45			
T (+ 4·5) to *A*	— 0 50 30	— 0 47 25	— 0 48 57	+ 0 06	— 0 48 51
A (— 1·0) to *L*	+ 0 12 55	+ 0 15 30	+ 0 14 10	+ 2 29	+ 0 16 39
	40	35			
A (— 1·0) to *D*	— 1 41 20	— 1 38 55	— 1 40 07	+ 0 59	— 1 39 06
A to *D*					— 1 39 20 (3)
A (— 1·0) to *D*	— 1 33 10	— 1 34 50	— 1 34 00	+ 1 01	— 1 32 59
A to *D*					— 1 33 13 (4)
C (— 1·2) to *L*	+ 1 21 40	+ 1 25 10	+ 1 23 50	+ 1 35	+ 1 25 25
	22 45	25			
	22 30	30			
C (— 1·2) to *D*	— 0 45 05	— 0 42 15	— 0 43 40	+ 0 06	— 0 43 34
C (— 1·2) to *T* (+ 6)	+ 1 37 20	+ 1 39 20	+ 1 38 31	+ 1 00	+ 1 39 31
	25	40 00			
C (— 1·2) to *A*	+ 1 30 30	+ 1 32 25	+ 1 31 38	+ 1 01	+ 1 32 39
	40	33 00			
C to *A*					+ 1 32 22 (4)
D (— 1·2) to *L*	+ 1 27 30	+ 1 30 00	+ 1 28 40	+ 1 33	+ 1 30 13
	10	00			
D (— 1·2) to *T* (+ 6)	+ 1 43 35	+ 1 46 00	+ 1 44 56	+ 0 59	+ 1 45 55
	40	30			
D (— 1·2) to *A*	+ 1 37 30	+ 1 40 00	+ 1 38 41	+ 0 59	+ 1 39 40
	15	00			
D to *A*					+ 1 39 23 (3)

(2) Correction for curvature and refraction, + 4·25″ per 1000 feet. This correction is obtained by taking the coefficient of refraction to be ·070 (see Close's Text Book of Topographical and Geographical Surveying, p. 29).

(3) *A* to *D*, 1° 39′ 20″; *D* to *A*, 1° 39′ 23″; mean, 1° 39′ 21″.

(4) *A* to *C*, 1° 33′ 13″; *C* to *A*, 1° 32′ 22″; mean, 1° 32′ 47″.

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CALCULATION OF HEIGHTS.

Point.	How obtained.	Calculated Height.	Height Adopted.
		feet.	feet.
T	Trigonometrical Survey of Tasmania	...	5010
A	Direct from *T*	4992·4	4992·4
D	Direct from *T*	4587·4	4588·1
	From *A*	4588·8	
C	Direct from *T*	4607·6	4606·8
	From *A*	4606·2	
	From *D*	4606·6	
L	Direct from *T*	5160·0	5160
	From *A*	5160·6	
	From *D*	5160·6	
	From *C*	5158·2	
N	From *C*	4439	4440
	From *B*	4444	
	From *E*	4442	
S	From *C*	4491	4490
	From *B*	4492	
	From *E*	4491	

LIST OF PAPERS, &c., RELATING TO THE PHYSICAL GEOGRAPHY AND GEOLOGY OF BEN LOMOND.

1845.

P. E. De Strzelecki. Physical Description of New South Wales and Van Diemen's Land. (London: Longmans, Brown, Green and Longmans, 1845. 8vo.)

Count Strzelecki gives the following in his table of heights (p. 44):—

"Mount Ben Lomond, culminant point, 5002,
, N.W. point, 4354,
, South Bluff, 4500."

There is nothing, however, to show where his "culminant point" was. His "South Bluff" may have been Sphinx Bluff (4580 feet), but it is a name more suitable for the Stacks Bluff (5010). If South Bluff was the Stacks Bluff, Strzelecki's table shows that he observed a higher summit elsewhere on the mountain. Many of his heights in other parts of Tasmania were inaccurate, although he seems to have made the most of his apparatus. The instruments used were Gay Lussac's syphon mountain barometers and Wollaston's boiling point apparatus (p. 40). Count Strzelecki describes the scenery of Ben Lomond. Of the plateau he says (p. 67): "The scene is here one of unbroken solitude, silence, and desolation."

1892.

A. Montgomery (Geological Surveyor). Report on the Ben Lomond District. (*In* Report of the Secretary of Mines (Tasmania) for 1891-2, pp. 25-40. Journal and Papers of Parliament. 1892. Vol. XXVI., No. 79.)

Geological section from Avoca to Ben Lomond.

1901.

George A. Waller (Assistant Government Geologist). Report on the Tin-mining District of Ben Lomond. (*Issued with* Report of the Secretary of Mines (Tasmania) for 1901-2, pp. 1-41. Government Printer, Hobart, 1908. 8vo.)

Geological sketch-map of the district. Ideal section from Ben Lomond Butts to Mt. Rex.

1907.

Colonel W. V. Legge. An Investigation into the Physiography of the Ben Lomond Plateau, Tasmania. (*In* Report of the Eleventh Meeting of the Australasian Association for the Advancement of Science, Adelaide, 1907, pp. 521-5.)

Colonel W. V. Legge. Note on the Ben Lomond Plateau, and the Discovery of High Land at the North End. (*In* Proceedings of the Royal Society of Tasmania, 1906-7, pp. xxxiv.-xxxvi.)

L. F. Giblin and E. L. Piesse. Note on the Height of Legge Tor. (*In* Proceedings of the Royal Society of Tasmania, 1906-7, pp. xxxvii.-xl.)

THE THEORY OF THE QUOTA IN PROPORTIONAL REPRESENTATION—II.*

By E. L. Piesse, B.Sc., LL.B.

(Read 19th May, 1913.)

* For Part I., see *Papers and Proceedings of the Royal Society of Tasmania*, 1912, pp. 49-77.

List Systems.

54. In §§ 22-25, I discussed, with the aid of the method of least squares, the problem of partitioning a given number of seats among three parties in proportion to their strengths. I had not then seen any mathematical discussions of this problem; but I have since obtained a copy of a paper published in 1910 by M. A. Sainte-Laguë, Professeur de Mathématiques spéciales au Lycée de Douai (and now of Besançon), in which he gives a discussion of the problem for any number of parties by the same method.[20] The volume in which this paper is published is not accessible to many students in this part of the world, and I have therefore made a summary of M. Sainte-Laguë's results.

I use the notation of § 25 of my own paper, as corrected in the erratum slip.

55. Each elector, says M. Sainte-Laguë, has the right to be represented by a fraction of a deputy given by $m/v = 1/Q$. If he belongs to the party A, he is represented by the fraction x/p of a deputy; whence the error in representation for him is seen to be $x/p - m/v$. For the electors of the various parties, there are errors $e_1, e_2, e_3, \ldots e_S$. The various methods diverge from one another in the ways in which they endeavour to make these errors as small as possible.

56. To arrive at the best rule, M. Sainte-Laguë applies the method of least squares.

For each elector of party A the error in representation is—

$$\frac{x}{p} - \frac{m}{v}.$$

The sum of the squares of the errors for the p electors of this party is—

$$p\left(\frac{x}{p} - \frac{m}{v}\right)^2$$

and the sum of the squares of the errors for all v electors is—

$$\sigma = \Sigma p\left(\frac{x}{p} - \frac{m}{v}\right)^2$$

([20]) *La représentation proportionnelle et la méthode des moindres carrés*, Annales Scientifiques de l'Ecole Normale Supérieure, 3e. série, tome 27, December, 1910, pp. 530-542. M. Sainte-Laguë has given a more popular account of his results in the Revue Générale des Sciences pures et appliqueés of 30th October, 1910, pp. 846–852; and the "rule of least squares" is stated in a communication made to the Academy of Sciences of Paris on 8th August, 1910.

whence it can be shown that—

$$\sigma = \Sigma \frac{x^2}{p} - \frac{m^2}{v}$$

The quantity to be made a minimum is, then, $\Sigma\ (x^2/p)$. M. Sainte-Laguë suggests a geometrical solution similar to the method used by me for three parties, but gives the following practical solution for any number of parties. The identity—

$$x^2 = 1 + 3 + 5 + \ldots + (2x - 3) + (2x - 1)$$

shows that the sum to be made a minimum is the sum of the x first numbers of (1), the y first numbers of (2), &c.; x, y, z being chosen so that the m smallest numbers are selected:—

$$\frac{1}{p},\ \frac{3}{p},\ \frac{5}{p}\ \ldots. \qquad (1)$$

$$\frac{1}{q},\ \frac{3}{q},\ \frac{5}{q}\ \ldots. \qquad (2)$$

$$\frac{1}{r},\ \frac{3}{r},\ \frac{5}{r}\ \ldots. \qquad (3)$$

As the same result would be obtained by inverting all these numbers and choosing the m largest we have the following rule:—

Rule of least squares: Divide p, q, r ... by the odd integers 1, 3, 5 ..., and in the various series of quotients so obtained select the largest, until m have been obtained. Party A receives as many members as the number of quotients taken from its series; and so with the other parties.

57. Next, consider only positive errors (*i.e.*, errors for electors who are over-represented). If the error for each elector of party A is positive, this party has at least $X + 1$ seats ($X + 1$ being the whole number next greater than X_0). According as the seats obtained are $X + 1$, $X + 2$, ..., the error for each elector of A is—

$$\frac{X+1}{p} - \frac{m}{v},\quad \frac{X+2}{p} - \frac{m}{v}\ \ldots.$$

and so for the other parties; and the remaining seats have to be allotted so that these errors may be as small as possible. If the parties have obtained X, Y, Z ... seats, and there are l seats left, these seats will be distributed according to the l smallest of these numbers, or according to the l largest of the numbers—

$$\frac{p}{X+1}, \frac{p}{X+2} \ldots, \frac{q}{Y+1}, \frac{q}{Y+2} \ldots, \frac{r}{Z+1} \ldots$$

If we notice that the numbers—

$$\frac{p}{1}, \frac{p}{2}, \frac{p}{3} \ldots \frac{p}{X}, \frac{q}{1}, \frac{q}{2} \ldots \frac{q}{Y}, \frac{r}{1} \ldots \frac{r}{Z}, \ldots,$$

each greater than those that follow in the same series, may be considered as corresponding to the seats already allotted, we are led to the *rule of D'Hondt*, of which the statement is the same as the rule of least squares, with the substitution of the consecutive integers 1, 2, 3, 4 .. as divisors in place of the odd integers 1, 2, 3, ...

58. If we consider only negative errors (*i.e.*, errors for electors who are under-represented), and limit ourselves to cases in which the parties have at least X, Y, Z ... members, negative errors will occur for such of the lists as do not get any more seats, and we have therefore to choose for the allotment of the remaining seats the smallest of the numbers

$$\frac{X}{p} - \frac{m}{v}, \quad \frac{Y}{q} - \frac{m}{v}, \ldots$$

Now if—

$$p = X.Q + r_p, \quad q = Y.Q + r_q, \ldots,$$

we have—

$$\frac{X}{p} - \frac{m}{v} = \frac{1}{Q} - \frac{r_p}{pQ} - \frac{m}{v} = \frac{-r_p}{pQ}, \text{ \&c.}$$

We must choose then the smallest of the numbers $-r_p/pQ$ &c., or the largest of the numbers r_p/p, &c., for the remaining seats. This is the *rule of the largest fractions*. This method, M. Sainte-Laguë points out, is not to be confused with the *rule of the largest remainders*, in which the remaining seats are allotted according to the largest of the remainders r_p, r_q . . .

59. Finally, the *rule of Equer* results from making as small as possible the difference between the largest positive error and the largest negative error.

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60. M. Sainte-Laguë then passes to methods which are based on the consideration, not of the error for each elector, but of the error for each member; a less valid basis, as he considers, for the apportionment of seats. A member should represent $v/m = Q$ electors; if he has been elected by party A he represents p/x, whence the error for him is $p/x - v/m$.

Applying the method of least squares to these errors, M. Sainte-Laguë finds that if each party secures at least one member, the seats are to be allotted by using divisors whose approximate values are 3, 5, 7, 9, 11, 13, 15 ..., one seat having been allotted to the largest party before applying the rule.

If, in place of considering the error for each member, we consider the error for each party $(x - pm/v)$, the method of least squares leads us to the *rule of the largest remainders*, also known as the *Swiss rule*.

Finally, M. Sainte-Laguë applies several tests to compare the *rule of least squares* with the *rule of D'Hondt*, and concludes that the former rule leads to fairer results than the rule of D'Hondt.

61. For the assistance of those who may wish to become acquainted with the views of French and Belgian writers on the principal rules proposed in recent years for partitioning seats among parties district by district, I have compiled the following list of references to the various rules. These are the principal rules; but there are many others, and these may be found in the reports of MM. Benoist and Groussier.

Système des moyennes, or *rule of Dietz*, adopted in the *Projet de loi portant modification aux lois organiques sur l'élection des Députés*, passed by the French Chamber of Deputies in July, 1912. (Each party gets, in the first place, as many seats as it has whole quotas of votes, the quota being the number of votes in the district divided by the number of seats. If there is a seat unallotted, the number of votes for each list is divided by one more than the number of seats already allotted, and the seat is given to the list which gives the largest quotient, and so for any other unallotted seats.) Groussier, p. 27 et sqq. Lachapelle, pp. 114-6.

D'Hondt rule (système du diviseur électoral). Benoist, pp. 19, 43 et sqq. Flandin, pp. 11 et sqq. Goblet d'Alviella, pp. 5-8. Lachapelle, pp. 94-98, 107-117, 208-217. La Chesnais Ch. VII. and App. I. Macquart, pp. 548-551. Moch, *passim*. Sainte Laguë, p. 534 et sqq. (see § 57 above). Van den Heuvel.

Hagenbach-Bischoff rule or *système Genevois* (used in the Canton of Geneva and in the town of Basel) (the Droop quota $v/(m + 1) + 1$ is used as divisor; if any seats remain unallotted, $v/(m + 2) + 1$ is used as divisor; if any still remain $v/(m + 3) + 1$ is the divisor; and so on). Macquart, pp. 551-4. Lachapelle, pp. 117-9.

System of the electoral quota (quotient électoral), unallotted seats going to the largest parties. (The quota is the number of votes in the district divided by the number of seats). Groussier, p. 28 et sqq. This system was used in the Neuchâtel electoral law of 1894, article 64 (Benoist, p. 126.)

System of the electoral quota (quotient électoral), unallotted seats going to the parties with largest remainders. Groussier, p. 28 et sqq. Macquart, 546-9. Sainte-Laguë, pp. 537-8 (see § 60 above). Lachapelle, pp. 103-107. Moch, §§ 5-13.

System of the electoral quota (quotient électoral), unallotted seats going to the parties for which the ratio of the remainder to the strength of the party is largest (méthode des plus fortes fractions). Sainte-Laguë, p. 535 (see § 58 above).

System of M. Maurice Equer (in which seats are partitioned so that the difference between the greatest and least of the quantities x/p—see § 55—may be as small as possible). Equer. Groussier, p. 33 et sqq. Sainte-Laguë, p. 535 (see § 59 above).

Methode des moindres carrés (see § 56 above). Sainte-Laguë, p. 531 et sqq.

Van de Walle's system (system of the electoral quota; remainders added together in a group of districts and remaining seats allotted by applying D'Hondt rule to the totals of the remainders). Lachapelle, pp. 221-230. Van de Walle, pp. 1-30. Goblet d'Alviella, pp. 13-15. Van den Heuvel.

General discussions of the problem will be found in—

Groussier, pp. 22-51.
Sainte-Laguë, pp. 529-542.
Macquart, pp. 545-554.

The works referred to above by authors' names are as follows:—

Benoist, Charles (Député). *Rapport fait au nom de la commission du suffrage universel chargée d'examiner diverses propositions de loi tendant à établir la représentation proportionnelle.* Chambre des Députés, Annexe au procès-verbal de la séance du 7 Avril, 1905. (Chamber of Deputies, No. 2376 of 1905.)

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Equer, Maurice. *Arithmétique et représentation proportionnelle.* Supplément à la Grande Revue de 25 Juin, 1910.

Flandin, Etienne (Député). *Rapport fait au nom de la commission du suffrage universel chargée d'examiner les propositions de loi: 1° de M. Dansette; 2° de M. Louis Martin et plusieurs de ses collègues; 3° de M. Massabuau; 4° de M. Etienne Flandin (Yonne), tendant à l'établissement du scrutin de liste avec représentation proportionnelle dans les élections à la Chambre des Députés.* Chambre des Députés, Annexe au procès-verbal de la séance du 22 Mars, 1907. (Chamber of Deputies, No. 883 of 1907.)

Goblet d'Alviella, M. le Comte Félix. *Quelques considérations sur la représentation proportionnelle.* Extrait de la Revue de Belgique. (Bruxelles: Société anonyme M. Weissenbruch, Imprimeur du Roi, 1910.)

Groussier, Arthur (Député). *Rapport fait du nom de la commission du suffrage universel chargée d'examiner le projet de loi et diverses propositions de loi portant modification aux lois organiques sur l'élection des députés et tendant à établir le scrutin de liste avec représentation proportionnelle.* Chambre des Députés, Annexe au procès-verbal de la 1re séance du 16 Mars, 1911. (Chamber of Deputies, No. 826 of 1911.)

Lachapelle, Georges (Secrétaire général du Comité républicain de la R.P.). *La représentation proportionnelle en France et en Belgique.* (Paris: Félix Alcan, 1911.)

La Chesnais, P.-G. *La représentation proportionnelle et les partis politiques.* (Paris: Georges Bellais, 1904.)

Macquart, Emile (Secrétaire général de la Ligue pour la Représentation proportionnelle). *Examen critique des divers procédés de répartition proportionnelle en matière électorale.* Revue Scientifique, 5e série, tome iv., 28 Octobre, 1905, pp. 545-554.

Moch, Gaston. *La représentation vraiment proportionnelle.* Collection de la Grande Revue. (Paris: Edouard Cornély et Cie, 1910.)

Sainte-Laguë, A. (Professeur au Lycée de Douai). *La représentation proportionnelle et la méthode des moindres carrés.* Annales scientifiques de l'Ecole Normale Supérieure, 3e. série, tome 27, December, 1910, pp. 530-542.

Van den Heuvel, Jules. *Le mécanisme de la représentation proportionnelle.* Extrait de la Revue Générale, février, 1911. (Bruxelles: Goemaere. 1911.)

Van de Walle, Victor. *La Représentation proportionnelle intégralement appliquée aux élections législatives: Proposition de loi (avant-projet).* (Bruxelles: Imprimerie du Progrès—V. Feron, 1910.)

List Systems—The Method of the Uniform Quota.

62. Finally, it remains to point out that the problem of apportioning seats among parties arises from fixing before the election the number of seats for each constituency. The problem can be avoided, and a partition of seats among parties as exact as the size of the legislature allows can be secured, if the number of seats in the legislature is fixed, but the number of seats for each constituency is determined after the polling by the number of votes polled in it. On this idea is based the system of *le nombre unique*, or the *uniform quota*—a system supported by the late Professor Henri Poincaré and other French mathematicians as the only exact method of proportional representation. [20a]

63. Hare proposed to use for the quota the number obtained by dividing the total of the votes throughout the country by the number of members in the House of Commons. He also proposed that the whole country should be one constituency; a proposal which, with other notions contained in his works, is usually thought to have kept back for a generation the progress of proportional representation in England. The same quota is used in the system of *le nombre unique*; but the country is divided into districts, as in other systems of proportional representation, and these may be equal or unequal, as may be convenient. The system assumes that the same parties will contest the election in many districts or throughout the country; it would break down if there were many isolated candidatures, but these are not to be expected when the party system has become established.

The votes for all the candidates of each party throughout the country are totalled, and then the total number of votes for all parties is obtained. This total is divided by the number of members to be elected, and the result is *le nombre unique*, or the uniform quota.

The total number of votes for each party is then divided by the quota. The quotient so obtained is the share of representation of the party. If the sum of the quotients

(20a) See note (20), § 73.

is not equal to the number of members to be elected, the remaining seats can go to the parties with the largest remainders, or otherwise as may be thought fit; it matters little how the remaining seats are dealt with if the House is at all large. The proportion of seats to voters in each party can thus be made as exact as the number of members will allow.

Next, the number of votes for each party in each district is divided by the quota, and members equal in number to the quotient so obtained are selected from the candidates of the party in that district. The total number of seats allotted to a party in the various districts will be less than the total number of seats to which it is entitled, for in some or all of the districts there will be remainders. The unallotted seats are then given to the districts with the largest remainders. Each party's share of representation in each district has now been ascertained. It only remains to choose the members for the party in each district from the candidates of the party in the district; the candidates to be chosen will be those of the party who are highest on the poll.[20b]

64. As an example, let us apply the system of the uniform quota to the Tasmanian General Election of 23rd January, 1913. The first choices (with the single transferable vote) obtained by the parties were as follow:—

General Election, Tasmania, 23rd January, 1913.—Votes for the Parties.

District.	Liberal.	Labor.	Independent.	Grand Total.
Bass	6839	6932	—	13,771
Darwin	6174	6441	—	12,615
Denison	7717	7132	—	14,849
Franklin	8566	6677	—	15,243
Wilmot	6861	4451	977	12,289
All	36,157	31,633	977	68,767

[20b] On the system of *le nombre unique*, see—

Le Système du Nombre Unique, a pamphlet of 8 pages published by the Comité Républicain de la R.P., 23 Rue Pasquier, Paris.
Lachapelle (see § 61), pp. 89-102, 230-5, 258-9.
Groussier (see § 61), pp. 103-4, 191-3.

I assume that these numbers represent the relative strengths of the parties. With a party-list system, as each elector would have several votes, the numbers would be multiples of these (subject to a slight disarrangement of the votes in Wilmot); but these numbers will serve for the illustration.

We first divide the total number of votes polled, 68,767, by the number of members to be elected, 30; the result is the quota, 2292.

The total of the votes for each party is then divided by 2292; the results are, Liberal, 15·78; Labour, 13·79; Independent, 0·43. The members to be allotted to the parties are therefore Liberal, 16; Labour, 14; Independent, 0 (which, it may be noticed, was the result given by the single transferable vote).

Next divide the totals of the votes for the parties in the various districts by the quota. The results are:—

General Election, Tasmania, 23rd January, 1913.—*Share of Representation in each District according to the Method of the Uniform Quota.*

District.	Liberal.	Labor.	Independent.	Grand Total.
Bass	2·98	3·02	—	6·00
Darwin...........	2·70	2·81	—	5·51
Denison	3·37	3·11	—	6·48
Franklin	3·74	2·91	—	6·65
Wilmot	2·99	1·94	0·43	5·36
All...........	15·78	13·79	0·43	30

Allotting seats first to whole quotas, the Liberals would get two seats in Bass, Darwin and Wilmot, and three in Denison and Franklin, total 12; and the remaining four seats would go to the districts in which there are the greatest remainders, namely Bass, Darwin, Franklin, and Wilmot. Similarly the Labour Party would get, from whole quotas, three seats in Bass and Denison, two in Darwin and Franklin, and one in Wilmot, total 11; and the remaining three seats would go to Darwin, Franklin, and Wilmot. The result of the election would therefore be:—

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General Election, Tasmania, 23rd January, 1913.—Result according to the Method of the Uniform Quota.

District.	Liberal	Labor.	Independent.	Grand Total.
Bass	3	3	—	6
Darwin	3	3	—	6
Denison	3	3	—	6
Franklin	4	3	—	7
Wilmot............	3	2	0	5
All...........	16	14	0	30

As between the parties the result would be the same as with the single transferable vote; but in Franklin (in which 15,243 votes were polled) there would have been seven members instead of six, of whom the Liberals would have had four, and in Wilmot (in which only 12,289 votes were polled) there would have been only five members instead of six, and there would thus have been a greater approach to electoral equality between electors in these two districts than with the same number of members for each district.

It would remain only to choose the members from the candidates of each party in each district. For each party the candidates highest on the poll would be chosen: these, of course, would not necessarily be the same if each elector had several votes as when he had only one vote.

65. From this illustration two of the principal advantages of the method of the uniform quota can be seen: first, districts in which political interest is more active may get more members than districts in which, although the number of electors enrolled is the same, fewer voters go to the poll; second, it is no longer necessary to alter boundaries as the distribution of population changes, for the method (so far as the size of the House allows) will give proportional representation to the districts in spite of differences in their electoral populations. The method, then, gives proportional representation as between parties throughout the country; proportional representation as between parties in each district; and proportional representation as between districts of varying sizes.

Multiple Transferable Vote Systems.

66. In these systems a voter gives equal votes to a number of candidates less than the number of members to be elected, and marks other candidates in an order of preference. The name "multiple transferable vote" describes such systems; but they might also be called "limited vote systems with preferential voting."

67. To appreciate the relation of the multiple transferable vote to other systems used in many-membered constituencies, the following arrangement of these systems in order of development will be useful:—

(*a*) The single non-transferable vote. This is used in Japan.([21]).

(*b*) The single transferable vote.

(*c*) The limited vote, in which an elector gives equal votes to a number of candidates less than the number of members to be returned. The limited vote was used in England from 1867 to 1885 in thirteen three-member constituencies and one four-member constituency.([22])

(*d*) The limited vote with preferential voting, or the multiple transferable vote.

(*e*) The block vote, or *scrutin de liste*, in which an elector votes for as many candidates as are to be elected. This is the system used for the Federal Senate. The block vote (with the modification that the elector might vote for fewer than the number to be elected) was used in Tasmania for the House of Assembly from 1856 to 1870 in one five-member constituency and one three-member constituency, and from 1885 to 1896 in eight two-member constituencies.

Of these, the single transferable vote gives approximately proportional representation (§§ 6-21); the single untransferable vote and the limited vote give representation to minorities, but not in proportion to their strengths; while the multiple transferable vote, with suitable rules, gives, as is shown below, the same approximation to proportional representation as the single transferable vote.

([21]) See J. H. Humphreys, *Proportional Representation* (London, 1911) pp. 283-9.

([22]) Benoist (see § 61) collects other instances of the use of the limited vote (p. 13).

68. As an example of the multiple transferable vote, let us take a contest in a six-member district between two parties each nominating six candidates, in which each voter has three first choices, and second, third and fourth choices; and let us suppose that there is neither cross-voting between the parties nor short-voting within a party.

The first stage of the scrutiny will be to count the first choices obtained by each candidate. The total of these for all candidates will be three times the number of voters. The quota will be one-sixth (if the Hare quota is used) or one-seventh (if the Droop quota is used) of the total number of first choices; *i.e.*, three-sixths (Hare) or three-sevenths (Droop) of the number of voters. Some candidates will have surpluses above the quota, and there must be rules for transferring these; when all surpluses have been transferred, there may be one or more seats unfilled, and there must be rules for excluding the candidates lowest on the poll and distributing their votes.

Various sets of rules have been proposed. To illustrate the importance of the differences between the rules, let us take an extreme case based upon the following ballot-papers (*A*, *B*, *C*, *D*, *E*, *F* being supposed to be the candidates of one party)—

1	*A*	1	*D*
1	*B*	1	*E*
1	*C*	1	*F*
2	*D*	2	*A*
3	*E*	3	*B*
4	*F*	4	*C*

Let us suppose that A, B, C are the candidates of one section, and D, E, F the candidates of another section, of the same party; the supporters of the first section give a first choice to each of A, B, C, and their subsequent choices to the candidates of the second section (as in the first ballot-paper); the supporters of the second section give their first choices to D, E, F, and their subsequent choices to A, B, C (as in the second ballot-paper).

Let us further suppose that this party has two-thirds of all the voters, and is therefore entitled to four out of the six members; and that on making up the totals of the first choices, A, B, C are found to have each just a quota (either Hare or Droop); that all but three of the candidates of the other party have been excluded; and that D, E, F each have fewer votes than the three remaining candidates of the other party. There will, then, be just a quota of papers marked like the first ballot-paper; and the other ballot-papers for the party will be marked like the second ballot-paper.

A, B, C having just a quota each, there are no votes to be transferred from them, and D, E, F get no benefit from the second, third, and fourth choices given to them on the quota of papers on which A, B, C have first choices. D, E, F being lowest on the poll, one of them has to be excluded; let it be D. Suppose that the rules provide (23) that the votes of an excluded candidate are to be divided among the candidates having second or next available choices on the papers on which the excluded candidate has a first choice. On D's papers, the second, third, and fourth choices have been given only to candidates who are already returned. Consequently there is no candidate available to receive D's votes; and all of his votes are lost. One of E, F, say E, is now lowest on the poll; his votes cannot be transferred and are also lost; finally the votes of the third candidate F are lost. We are left, then, with three elected candidates of the party we have been considering and three candidates of the other party. The other party, numbering only one-third of the voters, and so entitled only to two members, thus gets three.

The failure to obtain proportional representation has arisen in this case because there were no candidates to

(23) The rules of the "Launceston Voting System" for pre-elections contained in *The Tasmanian Workers' Political League Election Manual* (Tasmanian News Printing Works, Hobart, 1912) have this provision.

whom (with the rules supposed) the votes of the excluded candidate could be transferred. With the single transferable vote (and no cross-voting or short-voting), an excluded candidate's votes can always be transferred if there is another candidate of the same party unelected, but in the cases just considered, although *E*, *F* are still unelected, the rules do not permit of *D*'s votes going to them.

69. The following table shows the representation which the Launceston Voting System may give to a party having 60 per cent. of the voters in a two-party contest in a six-member district. In the cases in which disproportional representation is shown to be possible, it should be remembered that the assumptions necessary for these cases are not likely to be realised very frequently.

Multiple Transferable Vote according to the Launceston Voting System in a Six-Member District—Possible Representation of a Party having 60% of the Voters, and so entitled to Four Members.

Number of First Choices allowed to each Elector.	Members Returned.
4	The party must get four members.
	If three members are returned each with just a quota, the party may fail to return a fourth (see §68); total 3.
3	If two members are returned each with just a quota, the party may return only one more; total 3.
	If one member is returned with just a quota, the party will get three others; total 4.
2	The party must get four members.

70. Disproportional representation through a division of a party into two sections (as in the cases just considered) can be avoided if the rules provide that on the distribution of a surplus or of the votes of an excluded candidate the votes shall go to the other candidates having first

choices on the same papers if there are no candidates available with second or subsequent choices.(24)

In the case supposed in § 68, neither *A*, *B*, or *C* are available, and *D*'s votes would be divided between *E* and *F*.

If *E* and *F* were still lowest on the poll, one of them would be excluded, and his votes (including those he had obtained from *D*) would go to *F*, who would have all the first choices given to *D*, *E*, and himself. Thus no votes would be lost, and the party, if the total of the first choices polled for *D*, *E*, *F* entitled it to another seat, would get the seat.

Let us suppose, then, that we have rules which provide for the transfer of a vote so long as there is an unexcluded candidate, whether with a first choice or a subsequent choice, marked on the same paper.(25) With such rules no votes are lost by a party, and it will be found that the argument in regard to the single transferable vote contained in §§ 6-21 is applicable. Either the Hare quota or the Droop quota will give representation approximately proportional, and the Droop quota will be preferable to the Hare quota.

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(24) There is an objection to such a rule, however, at all events in pre-elections. One of the reasons for preferring the multiple transferable vote to the single transferable vote in an election such as the pre-election of the candidates of a party is that with the single vote a section as small as the quota (one-seventh), and possibly out of sympathy with the rest of the party, may return a candidate who will stand for the party as a whole; whereas with the multiple vote, the quota (if there are three first choices) is three-sevenths, and the rules are intended to prevent the return of any candidate with less than a quota of supporters. If *D*, *E*, *F* are the candidates of a small section, and if *D*'s votes go to *E*, and *E*'s to *F*, *F* has as many votes as if each voter of the section had given him three first choices, and so a section as small as one-seventh is enabled to return a candidate.

(25) A set of rules providing for all possible cases would be rather complicated. The scrutiny, too, would be difficult. Mr. J. H. Humphreys (*Minutes of Evidence taken before the Royal Commission on Systems of Election*, Stationery Office, London, 1910, Cd. 5352, at p. 40) has pointed out that counting of votes is more laborious when there are several votes on a paper than when there is only one. "Whenever the ballot-paper (as in the Belgian system and with the single transferable vote) represents but one vote only, the process of counting consists of sorting papers according to the votes given, and then in counting the heaps of papers so formed. Whenever there is more than one vote recorded upon a ballot-paper it becomes necessary to extract the particulars of each vote upon recording sheets." With the multiple transferable vote and fractional transfers, fractional values add a further complication. These difficulties are avoided in the Launceston Voting System of the Labour Party in Tasmania, in which no choice can have a fractional value.

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Single Transferable Vote Systems.

71. The argument in §§ 6-21 has been restated more fully and clearly by Mr. F. W. Barford, of Melbourne, in a paper *A Study in Proportional Representation* read at the meeting of the Australasian Association for the Advancement of Science held in Melbourne in January, 1913.

Close Contests.

72. In a note to § 4, I collected some information as to the frequency of close contests. Students interested in this aspect of representation will find further information in the following papers in the Journal of the Royal Statistical Society:—

John Biddulph Martin: *Electoral Statistics: A Review of the Working of our Representative System from* 1832 *to* 1881, *in view of Prospective Changes therein.* Journal of the Royal Statistical Society, March, 1884 (XLVII., 75-115).

J. A. Baines: *Parliamentary Representation in England, illustrated by the Elections of* 1892 *and* 1895. Journal of the Royal Statistical Society, March, 1896 (LIX., 38-118). Table D shows the distribution of seats according to the majority per cent. in 1892 and 1895; Table G the percentage of the majority in each constituency at these elections.

F. Y. Edgeworth: *Miscellaneous Applications of the Calculus of Probabilities.* Journal of the Royal Statistical Society, September, 1898 (LXI., 534-544).

Sir Richard Biddulph Martin: *The Electoral "Swing of the Pendulum."* Journal of the Royal Statistical Society, December, 1906 (LXIX., 655-707).

Single-Member Constituencies.

73. It is well known that single-member constituencies usually fail to give proportional representation to parties, and sometimes put a minority in power.([26]). But it is commonly said that this defect will be remedied if the

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([26]) The case against the single-member system is stated by J. H. Humphreys (*Proportional Representation* (London, 1911), Ch. v.); and by Professor J. R. Commons, in his *Proportional Representation* (2nd edition, New York, 1907) at pp. 36-85, his illustrations being taken mainly from elections in the United States.

constituencies are approximately equal in electoral population and if members are elected by a system of preferential voting ensuring that the candidate returned has received votes from a majority of the electors (as in the elections for the Legislative Council in Tasmania). The following paragraphs will show that equality of constituencies and an absolute majority system are insufficient to secure even that the majority in the country shall have a majority in the House, to say nothing of a majority proportional to its strength.(26a)

(26a) Mr. L. F. Giblin, M.H.A., has pointed out to me that it is possible even with proportional representation for the minority in the country to win a majority of seats. With proportional representation the total representation of each party depends to some extent (though to a much less extent than with single-member districts) on the distribution of the strengths of the parties among the districts. If members are allotted to parties district by district, the representation, although proportional as nearly as possible in each district, may become disproportional for the country as a whole. The only sure way to secure exactly proportional representation is to allot seats in proportion to votes throughout the country, as in the method of the uniform quota. Mr. Giblin writes:—

"It should be noted that proportional voting with the single transferable vote may result in putting a minority in power, and, when the number of constituencies is small, the chance is not a remote one. In Tasmania under the present system, in which the Droop quota is used, assume that the quotas are the same in each division. Let party A return 16 members and party B 14 members. There being 35 quotas in the five districts, the 14 members for party B will represent a majority in the country if B's votes are more than $17\frac{1}{2}$ quotas, i.e., if the sum of its remainders is more than $3\frac{1}{2}$ quotas. If B's votes are more than $17\frac{1}{2}$ quotas, A's are less than $17\frac{1}{2}$, and the sum of its remainders is less than $1\frac{1}{2}$. That is party A (the minority in the country) will get a majority in Parliament if the votes not absorbed as quotas are divided between the parties A and B in less than the ratio 3 : 7. In practice, the parties are fairly equally divided and no party is likely to be represented in any division by less than two members out of six. Within the range thus indicated, it may be assumed approximately that any remainder from 0 to one quota is equally likely to occur. On these conditions, the chance of a majority of 16 members being returned by a minority of voters may be stated roughly as 1 in 14. That is to say, in every 14 elections in which the result was 16 to 14, there would be on an average one in which the minority of the voters returned the majority in Parliament. This, however, is but a small matter compared to the case in which 15 members are returned on each side, when the odds are more than 2 to 1 that one party is entitled to an additional member. If the number of members was altered to 7 in each district, making 35 members in all, this high probability of disproportional representation would be removed, but the chance of a majority of 18 to 17 being returned by a minority of voters would, under the same assumptions as above, be nearly 1 in 4. It should be noted that this possibility of disproportional representation, though not negligible, is small compared to the possibilities with single-member districts, and that it is equally present in the different List systems, excepting only the List system with the Uniform Quota, by which proportional representation is made certain under all circumstances so far as the number of members will allow."

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74. The following is an investigation of the conditions in which the larger of two nearly equal parties may get only a minority of seats in a country divided into single-member constituencies. It is assumed that in each district there are only two parties each with one candidate, or that if there are more than two candidates a system of preferential voting is used to secure that the candidate returned has received votes from an absolute majority of the voters; and that the constituencies are equal in the number of voters.

Let S be the party which has less than half of the votes polled throughout the country, and let L be the party which has more than half; and let the strengths of S, L throughout the country be $(50 - a)$ % and $(50 + a)$ %. Let there be 100 constituencies and v voters in each.

Consider the constituencies in each of which S has a majority, and consequently wins the seat; let there be x of these, and let the average strength of S in them be $(50 + s)$%. Consider also the constituencies in which L has a majority; let there be y of these, and let the average strength of l in them be $(50 + l)$ %.

Then, considering the total number of votes obtained by S, we have:

$$x . \frac{50 + s}{100} . v + y . \frac{50 - l}{100} . v = \frac{50 - a}{100} . 100v,$$

or

$$\frac{50 + s}{100} . x + \frac{50 - l}{100} . y = 50 - a \qquad (1)$$

Similarly, from L's votes we get—

$$\frac{50 - s}{100} . x + \frac{50 + l}{100} . y = 50 + a \qquad (2)$$

Also—

$$x + y = 100. \qquad (3)$$

Subtracting (1) from (2), we get—

$$ly - sx = 100a \qquad (4)$$

The condition for equal representation of the larger and smaller parties $(x = y = 50)$ is

$$l - s = 2a. \qquad (5)$$

As an example, let the average strength of S in the districts in which it is in a majority be 51 %, and let the average strength of L in the districts in which it is in a majority be 57 %, and let the average strengths of the two parties throughout the country be 47 %, 53 %. The values of s, l, a are then $s = 1$, $l = 7$, $a = 3$, and $l - s = 2a$.

Then we have

$$\frac{51}{100} . x + \frac{43}{100} . y = 47$$

and

$$\frac{49}{100} . x + \frac{57}{100} . y = 53$$

whence $$2x - 14 y = 600.$$

Also $$x + y = 100.$$

From these equations we find $x = y = 50$; *i.e.*, the representation of the parties is equal, and there is a deadlock in the House, in spite of the 6 % majority which L has over S in the country.

If $l - s > 2a$, we can see from (4) that $x > 50$, *i.e.*, the smaller party gets a majority of the seats.

Thus, if the average strength of S in the districts in which it has a majority is 51 %, and the average strength of L in the districts in which it has a majority is just over 57 %, S, the smaller party, will get more seats than L, the larger party, and so the smaller party will have a majority over the larger in the House, although the larger has a majority of over 6 % above the smaller in the country.

75. J. R. Commons [27] gives the following illustration of a distribution of votes which would give the smaller party the majority of seats. A country is divided into 40 districts, and in each of these 5500 electors vote. In 25 districts the smaller party obtains 2800 votes, and the larger 2700 votes; in 15 districts, the smaller party obtains 2000 votes and the larger 3000 votes. The votes polled are, then:

Smaller Party.

2800 in 25 districts	70,000
2000 in 15 districts	30,000
	100,000

Larger Party.

2700 in 25 districts	67,500
3500 in 15 districts	52,500
	120,000

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(27) *Proportional Representation*, 2nd edition (New York, 1911), pp. 48-49.

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The smaller party thus obtains 25 seats with only 100,000 votes, while the larger party with 120,000 votes obtains only 15 seats.

76. Professor Edgeworth ([28]) has shown that in the general elections of 1886, 1892, and 1895 in Great Britain the ratios, (number of Unionist supporters) ÷ (number of Unionists and number of Gladstonians) in the various constituencies, were distributed about an average in accordance with the normal law of error. Such a distribution will give a majority to the larger party in the House which will be a greater percentage of the House than the strength of the larger party in the country is of the total number of electors, as appears from a comparison of the actual result of these elections with the percentages of representation calculated from the curve of error representing the distribution.

The Right Hon. J. Parker Smith, in his evidence before the British Royal Commission on Systems of Election ([29]), gives reasons why the majority is usually exaggerated if single-member constituencies are used. He mentions a calculation by Major Macmahon, who has shown that if in a two-party contest the voters are in the ratio of A to B, then the members elected may be expected to be at least in the ratio of A^3 to B^3. Thus if the strengths of the parties are 55 % to 45 % ($A : B = 11 : 9$), the members may be expected to be in the ratio of 11^3 to 9^3, or nearly 2 to 1; *i.e.*, a party with 5 % more than half the electors may be expected to get nearly two-thirds of the members.

77. Statistics of elections in single-member constituencies in which the conditions of § 74—approximate equality between the constituencies in number of votes, and either only two candidates or else preferential voting—are fulfilled, are scarce. It is one of the disadvantages of single-member constituencies, especially in new countries, that redistribution is required much more frequently than with grouped districts, and the sizes of the constituencies are usually by no means equal when a few years have elapsed since the last redistribution. Also, the proportion of electors who vote varies largely from one constituency to another. In Australia at the

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([28]) *Miscellaneous Applications of the Calculus of Probabilities*, Journal of the Royal Statistical Society, September, 1898 (LXI., 534-544).

([29]) *Minutes of Evidence taken before the Royal Commission on Systems of Election* (Stationery Office, London, 1910, Cd. 5352), Question 1253, p. 81.

House of Representatives election in 1910 [30] the numbers of electors enrolled in the constituencies in each State varied up to about 15 % from the mean for the State. The number of voters varied even more: leaving out a few very large and a few very small constituencies, the numbers of voters varied up to about 20 % or 25 % from the mean for the State. These numbers, however, were much more nearly equal than is usually the case with single-member districts, and this election is consequently more suitable as an illustration of the arguments in §§ 73-76 than any other of which I have statistics.

In New South Wales, at this election, there were contests between one Liberal candidate and one Labour candidate (or between two such candidates and a third who obtained so few votes that he need not be taken into account) in 24 constituencies. In these the Labour candidates polled 245,000 votes and the Liberal candidates 203,000; and consequently the Labour party, in proportion to its strength, was entitled to 13 seats and the Liberal party to 11. The seats won by the parties were Labour 17, Liberal 7.

In Queensland, there were contests between one Labour candidate and one Liberal candidate in each of the nine constituencies. The Labour candidates polled 89,000 votes and the Liberal candidates 76,000; the members to which the parties were entitled were consequently 5 to 4. The seats won by the parties were Labour 7, Liberal 2.

In Victoria, there were contests between one Labour candidate and one Liberal candidate in 19 constituencies. The Labour candidates polled 216,000, and the Liberal candidates 192,000: the members to which the parties were entitled were consequently 10 and 9; and these were the numbers of seats actually won by the parties.

The results in New South Wales and Queensland, then, confirm the predictions referred to in § 76, that single-member constituencies will usually exaggerate the majority obtained by the larger party In Victoria the election gave exactly proportional representation in the 19 constituencies considered. But it is to be noted on the one hand that a loss by Liberal candidates in Victoria of only 800 votes, spread over four constituencies in which their majorities were very small, would have given the Labour party 14 members and reduced the Liberal mem-

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[30] See *Elections. 1910. Statistics relating to the Senate Election; the Gen ral Election for the House of Representatives* (&c.). (Papers of the Parliament of the Commonwealth of Australia. No. 1 of 1910).

bers to 5; and on the other hand that a gain of only 700 votes in a constituency in which the Labour majority was small would have given the Liberal party 10 seats and the Labour party only 9—that is, a party having only 47 per cent. of the voters would have had a majority of the seats.

Remark as to the Conclusions of this Paper.

78. In discussing the various methods of proportional representation noticed in this paper, with the exception of the method of the uniform quota, I have considered the result that may be expected to occur in a single district. But in estimating the probability that an election throughout the country will give proportional or disproportional representation, it must be remembered that under- or over-representation in some districts is likely to be balanced by over- or under-representation in others, unless the system used has been deliberately constructed (as was the D'Hondt) with the object of favouring one party (the larger party in that case); and consequently that the result of an election in many districts is more likely to be in proportion to the strengths of the parties than an election in one district.(31) This qualification, however, does not apply to the argument against the single-member system, in which the country has been considered as a whole

(31) But see § 73, note (26a), by Mr. L. F. Giblin.

NOTES ON HYMENOPHYLLUM PELTATUM (POIR) DESV

By L. Rodway

(Read 19th May, 1913.)

Prof. Ewart has recently pointed out (*Proc. R. S. Vict.* Oct., 1911) that the fern which has been familiar to us as *H. Wilsoni*, Hook, or *H. unilaterale*, Willd, will be more correctly named if we call it *H. peltatum*, Desv.

This little fern is very widely dispersed in Tasmania. It and *H. tunbridgense*, L., are the only two members of the genus with serrated leaves which are natives of Tasmania. The two used to be confounded, but the great difference of the indusia permits of immediate recognition. In *H. tunbridgense* the indusia are semicircular with a straight serrate terminal margin. In *H. peltatum* the indusium is oblong, with an entire margin. *H. peltatum* varies in size. In the commonest condition in which it is found the leaf does not exceed 5 c.m. in length, the pinnæ about 1 c.m., giving the plant much the appearance of *H. tunbridgense*, except that the pinnules almost all grow on the upper margin of the pinnæ. When the plant grows under more favourable conditions it acquires a much taller habit. The leaf may be as long as 17 c.m., though the breadth does not increase. The pinnules are erect, but when at all wilted they recurve, giving the leaf a characteristic appearance.

BIBLIOGRAPHY OF PROPORTIONAL REPRESENTATION IN TASMANIA.

By E. L. Piesse, B.Sc., LL.B.

(Read 12th May, 1913.)

INTRODUCTION.

Proportional representation was introduced in Tasmania by the Electoral Act of 1896, in which a form of the Hare system was used for two of the electorates of the House of Assembly.

The causes which led to the adoption of the Hare system were thus stated by the late Mr. Justice Andrew Inglis Clark in the following paragraphs, contributed by him to the report by Messrs. J. G. Davies and R. M. Johnston on the elections for the Senate and House of Representatives in Tasmania in 1901 (1):—

The Clark-Hare system of voting was introduced into the electoral law of Tasmania in consequence of the frequent fail-

(1) See Bibliography No. 16.

ure of the ordinary system of voting to secure a proportionate representation of the preponderating opinions of the electors on political questions either in single or plural electorates. Under the first Electoral Act, which provided for the election of the members of a bicameral Legislature, the city of Hobart, by the "block vote," elected five representatives to the House of Assembly as one electorate, and the city of Launceston elected three representatives to the same branch of the Legislature in the same manner.

Under that system it was discovered that a majority of the electors, in each of the two electorates, could elect all the representatives, and leave a very large minority totally unrepresented in the Legislature. To remedy this evil those two electorates were divided into eight single electorates. But under this system it was discovered that when three or more candidates presented themselves for election, it very frequently happened that the successful candidate was elected by a minority of the total number of votes recorded. The same thing sometimes occurred in the rural electorates, which were all single electorates, but the number of candidates in the rural electorates did not often exceed two. It was also discovered that the division of the cities of Hobart and Launceston into eight single electorates reduced the area of each electorate, and the number of voters to such small dimensions that the agents and canvassers of the several candidates could easily interview every resident elector and ascertain very closely the number of purchasable or otherwise controllable votes.

After the representation of the cities of Hobart and Launceston was increased to six and four members, those electorates were divided into five electorates, each of which returned two members. At the same time, two rural electorates, each returning two members, were created. Under this plan it was discovered that the majority of electors in the total number of the electorates which returned two members frequently secured a much larger representation in Parliament than that to which it was proportionately entitled, and thereby gave a preponderance of voting power in the Legislature to a political party which had secured only a minority of the total number of votes recorded at a general election. In several instances neither of the successful candidates in a double electorate was elected by a majority of votes. The lastmentioned result was frequently produced by a large number of the electors voting for only one candidate out of the five or six who were in the field.

With a view of avoiding these serious defects, the cities of Hobart and Launceston were converted into two electorates under the Clark-Hare system, which enables every section of political opinion which can command the requisite quota of votes to secure a number of representatives proportionate to its numerical strength. It also utilises every vote recorded if the elector chooses to exercise the whole of his power to indicate his preferences. If any vote is not used to help in the election of a representative, it is because the voter has chosen

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to indicate his preferences for a less number of candidates than the number of representatives to be elected in the electorate in which he votes.(2)

(2) The following table shows the constitution of the House of Assembly from 1856:—

The House of Assembly from 1856.

Period.	Districts returning One Member.	Districts returning Two or more Members.	Total Number of Members.	Reference.	Remarks.
1856-1870	22	Hobart, 5 members Launceston, 3 members	30	Electoral Act, 1856 (19 Vict. No. 24), Section 4 Electoral Act, 1857 (21 Vict. No. 32), Schedule	The mode of voting in the multi-member districts was by striking out names so as to leave a number less than or equal to the number to be elected
1870-1885	32	...	32	Electoral Act, No. 4, 1870 (34 Vict. No. 12), Sections 2, 4, 7, 8	Hobart and Launceston were divided into single-member districts, and two more members given to the North-West Coast
1885-1893	20	8 two-member districts	36	Electoral Act, No. 7, 1885 (49 Vict. No. 12), Schedule 1 Electoral Act, 1890 (54 Vict. No. 13), Schedule 2	One more member was given to Hobart and one to Launceston, and Hobart was divided into three districts and Launceston into two, each returning two members. The country districts were redistributed, and East Devon, Kingborough, and Wellington were made two-member districts. In the two-member districts the voting was by striking out names so as to leave one name or two
1893-1896	21	8 two-member districts	37	Electoral Act Amendment Act, 1893 (57 Vict. No. 8), Section 3	A member was given to the West Coast
1896-1898	27	Hobart 6 members Launceston, 4 members	37	Electoral Act, 1896 (60 Vict. No. 49), Schedule 2	Hobart and Launceston were each made one district. The two-member districts in the country were divided into single-member districts
1898-1901	28	Hobart, 6 members Launceston, 4 members	38	Electoral Act Amendment Act, 1898 (62 Vict. No. 68), Section 3	A second member was given to the West Coast
1901-1907	35	...	35	Electoral Act, 1901 (1 Ed. VII. No. 57), Section 6	
1907	...	5 six-member districts	30	Electoral Act, 1907 (7 Ed VII. No. 6), Section 13	

The Electoral Bill of 1896 was brought in by Mr. Clark, then Attorney-General in Sir Edward Braddon's Ministry. The Bill applied Hare's method to two electorates—Hobart (6 members) and Launceston (4 members), leaving the rest of the country in single-member electorates. The rules for transferring surpluses originally proposed (Appendix 1 below) were those of Hare, but in answer to critics who thought that these rules left too much to chance, Mr. Clark proposed the modifications from which the rules of the Act have come to be known as the Hare-Clark system, and by which the most important part of the element of chance was removed. (Appendix 2.)

The element of chance in the transfer of surpluses had been noticed by Miss Fawcett in 1872 (Henry Fawcett and Millicent Garrett Fawcett, *Essays and Lectures*, London, 1872, pp. 336-368), by H. R. Droop in 1881 (*On Methods of Electing Representatives*, Journal of the Statistical Society, XLIV., June 1881, pp. 141-196, at p. 182), by Sir John Lubbock in 1890 (*Representation*, London, 1890) and others; and had been discussed by Mr. Clark himself as long ago as 1874, in a paper in *The Quadrilateral*. [3] Sir John Lubbock pointed out that the element of chance might be reduced if rules such as those afterwards employed by Mr. Clark were used; but he did not think it necessary to use such rules. Mr. Clark's contribution to the rules, although anticipated by Sir John Lubbock, was original, so far as I can learn, and these rules are still commonly known as the Hare-Clark rules. Mr. Clark's principal claim to be remembered in connection with the Hare system is not, however, derived from these arithmetical details, but from his having been the means of using the Hare system for the first time in a Parliamentary election in a British country.

The Electoral Act of 1896 contained a provision that it should remain in force only until 31st December, 1897, but it was afterwards extended, and it remained the electoral law of Tasmania until repealed by the Electoral Act of 1901. The elections held under it were: for the State House of Assembly: Hobart (6 members) and Launceston (4 members), 20th January, 1897 (see Bibliography, Nos. 3, 4, 6, and Hobart *Mercury*, 21st January, 1897; Hobart (6 members) and Launceston (4 members), 9th March, 1900 (see *Mercury*, 10th and 12th March, 1900); for the Commonwealth House of Representatives (5 members) and Senate (6 members), the whole of Tasmania being one con-

(3) See bibliography No. 1.

stituency for each House, 29th March, 1901 (see Bibliography Nos. 16, 17, and *Mercury*, 30th March, 1st April, 5th April, 1901).

The quota used in the Act of 1896 was the quota originally used by Hare, although the quota now usually admitted to be the correct quota—the Droop quota—had been proposed as early as 1872, and had been used in New Zealand in the Representation Bill of 1889 and by Sir John Lubbock in 1890.

The Hare system came under discussion again in 1899, when the Electoral Bill of that year (Bibliography No. 7) was before the House of Assembly. Mr. Clark meanwhile had become a justice of the Supreme Court of Tasmania, and the Bill was brought in by Mr. D. C. Urquhart. It was proposed to apply the Hare system to the whole of Tasmania, which was to be divided into seven districts returning from four to seven members each, and new and more elaborate rules for dealing with surpluses (see Appendix 3) were to be used. There was little discussion now of arithmetical details, and the debates were mainly of the political effects and difficulties of the system. The supporters of the system urged that it provided representation for minorities. It is noticeable to one familiar with present-day discussions that there was little mention of the proportional representation of parties; but this was scarcely to be expected, for there were then no definite parties as we have now. The opponents of the system argued that it was not understood; that electors did not want it; and, in particular, that the country districts (other than the West Coast) were against it; that there were no principles or parties to be represented; and that large districts were difficult to canvass. The bill was withdrawn by the Government, and the Electoral Act of 1896 (in which, as previously mentioned, the Hare system was used only in Hobart and Launceston) was continued until 1901.

In 1901 Sir Elliott Lewis introduced an Electoral Bill [4] in which the Hare system (with the rules of the Act of 1896) was to be used for the whole of Tasmania. The Hare system was opposed on much the same grounds as in 1899, and the Government gave way, and reverted to the single-member system throughout Tasmania.

The electoral law was again under consideration in 1906. It was desired that Commonwealth and State should use joint electoral rolls, and the most convenient

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(4) See Bibliography No. 15.

way to arrange for this was to adopt the five divisions for the House of Representatives as districts for the House of Assembly. The House of Assembly had hitherto had 35 members, but it was thought that 30 would now be sufficient. Mr. J. W. Evans, for these and other reasons, brought in an Electoral Bill, in which Tasmania was divided into five districts, each returning six members, to be elected under the rules of the Electoral Act of 1896. This Bill was withdrawn, and another was introduced, which became law next year as the Electoral Act of 1907. In this Act, new rules for transferring surplus votes and the votes of excluded candidates were used, and the Droop quota was introduced in place of the Hare quota used in the Act of 1896. These rules embody what is called the fractional method of transfer; they are based on a device published by Mr. J. B. Gregory, of Melbourne, in 1890 (5), and used independently by Miss A. M. Martin, of Adelaide (6). The rules are the same as those proposed in the Proportional Representation Bills, 1902, 1905, and 1906 of South Australia, and are similar to the rules in the Parliamentary Elections Bill, 1900, of Victoria, and to the rules in the Commonwealth Electoral Bill introduced in the Senate on 24th January, 1902.(6a) Their form is understood to be due to Professor E. J. Nanson and Mr. John Mackey, of Melbourne. The name "Hare-Clark" is sometimes used of these rules, but this is a misnomer. The frame of the rules is entirely different from Mr. Clark's; his provisions for dealing with surpluses are merged in a neater method, in which all chance disappears; the Hare quota of the Act of 1896 is abandoned, and, moreover, the rules are based on proposals made by Mr. Gregory some years before Mr. Clark's Bill was under discussion.

Under the Act of 1907 the following General Elections for the House of Assembly have been held:—30th April, 1909 (see Bibliography No. 26); 30th April, 1912 (see Bibliography No. 30; and 23rd January, 1913 (an official report on which is now in preparation; see also Bibliography Nos. 35, 36, 37).

In 1912 the Tasmanian Workers' Political League adopted in the "Launceston Voting System" for pre-elec-

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(5) See Bibliography No. 4, p. 16.

(6) See Bibliography No. 5, p 19, and also *Effective Voting the Basis of Good Municipal Government: An Exposition of the Principles and Practice of Proportional Representation.* Issued by the Proportional Representation Committee of Ontario, Toronto, 1898, pp. 23-24.

(6a) A clear explanation of the rules is contained in a memorandum circulated with the draft Bill.

tions ([7]), a further modification of the original Hare system. Instead of a single transferable vote, the Launceston Voting System gives several votes (but a less number than the number of members to be elected), and there is provision for transferring surplus votes and the votes of lowest candidates. The idea of using several votes is borrowed from the Brandt system, due to Mr. P. J. Brandt, of Melbourne, used by the Labour Party in Victoria for its pre-elections; but in the Brandt system there is no quota or surplus, and the votes of lowest candidates are transferred until only the number required to be elected remain. The object of having several votes in place of only one is to make the quota larger, and so ensure that the elected candidate shall have received support from a considerable body of the voters: also, the provision for several votes prevents the struggle for the first choice which has been found to be an undesirable feature of the single transferable vote. The rules of the Launceston Voting System are printed in Appendix 5.

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This is an unsigned article, but I am informed by Mr. William Burn, of Hobart, the only survivor of the four members of "The Quadrilateral," that the author was Andrew Inglis Clark.

The leading features of the system; the probable effects of adopting it. Reference to the objection to Hare's method of dealing with a surplus, and suggestion that of the candidates not yet elected the one who has the greatest number of first choices shall be entitled to as many votes from papers on which he is marked second as he requires for election.

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2. Tasmania: "The Electoral Act, 1896" (60 Vict. No. 49).

For an account of this Act, see the Introduction. The speech of Mr. Attorney-General Clark in moving

([7]) See Bibliography No. 34.

the second reading of the Bill (1896, No. 3) is reported in the Hobart "Mercury" of 13th August. The debate on the amendment to Clause 115, substituting the Clark method of dealing with surpluses for Hare's method proposed in the Bill when introduced is reported in the "Mercury" of 20th August. The rules originally proposed and Mr. Clark's rules in the form finally adopted in the Act are printed in Appendices 1 and 2.

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Discussion of the modifications of Hare's proposals adopted in the Electoral Act of 1896—the country not one constituency but divided into districts, the elector to give preferences to at least three candidates, the provisions for transfer of surpluses. Account of the election in Hobart in 1897, and copy of R. M. Johnston's analysis of the voting (see 3).

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Appendix 1.

The Electoral Bill, 1896.

(As introduced into the House of Assembly.)

Bibliography No. 2.

Clause 115. In every case in which more than one candidate is to be elected for any district, the returning officer shall deal with the ballot-papers as follows:—

1. He shall first arrange the ballot-papers by placing in a separate parcel all those which have the figure 1 set opposite to the name of the same candidate, and in so doing he shall reject all ballot-papers which have not the official signatures or stamps on the back thereof, or which have anything written or marked thereon by which the voter can be identified, and all ballot-papers on which no number has been placed by the voter to indicate the candidate for whom he wishes to vote, and all ballot-papers on which the same number has been placed against more names than one; but he shall not reject any ballot-paper whereon the number of candidates marked in the order of the voter's preference is fewer than, or in excess of, the number of members to be elected.

2. He shall then proceed to ascertain the "quota" of votes necessary for the election of a candidate by dividing the aggregate number of all the ballot-papers contained in all the parcels by the number of members to be elected, and the result disregarding any fractional remainder shall be the "quota."

3. He shall then proceed to count the number of ballot-papers in each parcel, and every candidate who has a number of first votes equal to or greater than the quota shall be declared elected, and every ballot-paper which has been once counted in the quota for a candidate who is declared elected shall be set aside as of no further use.

   All the ballot-papers in each parcel which are in excess of the quota shall be set aside to be counted for other candidates as hereinafter provided, and on all such ballot-papers so set aside the name of any candidate for whom the requisite number of ballot-papers has already been counted shall be deemed to be cancelled, and the returning officer shall then severally transfer such ballot-papers to the candidates indicated thereon respectively as the next in the order of the voter's preference, and the votes thus transferred shall be deemed to have been given for the candidates to whom they shall be transferred as herein directed, and shall be deemed to be first votes.

   This process shall be repeated until no candidate has more than a quota of first votes, or votes deemed first; and in every case in which the name of only one candidate, or the names of a less number of candidates than the number of members to be elected, have

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been marked on any ballot-paper with a figure set opposite thereto as hereinbefore directed, and the candidate or candidates whose names have been so marked thereon have received the required quota of votes exclusive of such ballot-paper, then the names of the other candidates shall be deemed to have been numbered on such ballot-paper in the order in which they are printed thereon, and shall be so numbered by the returning officer for the purpose of being thereafter used by him in the next or any subsequent counting of votes for which they may be available.

4. If, after all the ballot-papers have been counted and respectively assigned to the several candidates as hereinbefore directed, it is found that no candidate, or an insufficient number of candidates, has obtained the quota of votes necessary for his or their election, then and in such case the candidate who has obtained the lowest number of votes shall be excluded from the poll, and all the ballot-papers previously counted for such candidate shall be deemed to have been unused and to have his name cancelled thereon, and they shall be respectively transferred to and counted for the other candidates who have not received the requisite quota of votes and who are indicated on such ballot-papers respectively as the next in the order of the voter's preference.

5. The same process of excluding the candidate lowest on the poll and transferring to other candidates the ballot-papers previously counted for the excluded candidate shall be repeated as often as may be necessary until the requisite number of candidates have received the necessary quota of votes, or until the number of candidates has been reduced to the number of members to be elected.

6. If at any time after the first counting of the ballot-papers it becomes necessary to exclude the lowest candidate from the poll as hereinbefore directed, and it shall be found that two or more candidates have the same number of votes and occupy together the lowest position on the poll, then and in every such case whichever one of such candidates was found to have received the least number of votes upon the first counting of the ballot-papers shall be deemed to be the lowest on the poll; and if at any time it becomes necessary to exclude from the poll one or more of any number of candidates who have received the same number of votes upon the first counting of the ballot-papers, the returning officer shall decide which one or more of such candidates shall be excluded from the poll.

7. When, by successive applications of the directions hereinbefore contained, the number of candidates is reduced to the number of members to be elected the candidates constituting such reduced number shall be declared elected.

APPENDIX 2.

The Electoral Act, 1896.

Bibliography No. 2.

Clause 102. Every election under this Act shall be conducted in the manner following:—

* * * * * * *

3. In every case in which more than one candidate is to be elected for any district, each elector shall have one vote only, but may vote in the alternative for as many candidates as he pleases, provided he votes for not less than one-half of the number of members to be elected; and his vote shall be deemed to be given in the first place for the candidate opposite whose name upon the ballot-paper is placed the figure 1; but in the event of its not being required to be used for the return of such candidate, it may be transferred to the other candidates in succession, in the order of priority indicated by the figures set opposite their respective names; and the elector shall insert opposite to the names of the candidates for whom he wishes to vote, the figures 1, 2, 3, and so on, in the order of his preference. He shall not strike out from the ballot-paper the name of any candidate.

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Ascertaining the Poll.

Clause 115. In every case in which more than one candidate is to be elected for any district, the returning officer shall deal with the ballot-papers as follows:—

I. He shall first arrange the ballot-papers by placing in a separate parcel all those which have the figure 1 set opposite to the name of the same candidate, and in so doing he shall reject all ballot-papers which have not the official signatures or stamps on the back thereof, or which have anything written or marked thereon by which the voter can be identified, and all ballot-papers on which no number has been placed by the voter to indicate the candidate for whom he wishes to vote, and all ballot-papers on which the same number has been placed against more names than one; and all ballot-papers whereon the number of candidates marked in the order of the voters' preference is fewer than one-half the number of members to be elected.

II. He shall then proceed to ascertain the "quota" of votes necessary for the election of a candidate by dividing the aggregate number of all the ballot-papers contained in all the parcels by the number of members to be elected, and the result, disregarding any fractional remainder, shall be the "quota."

III. He shall then proceed to count the number of ballot-papers in each parcel, and every candidate who has a number of first votes equal to or greater than the quota shall be declared elected, and every ballot-paper which has been once counted in the quota for a candidate who is declared elected shall not be counted for any other candidate.

IV. As many ballot-papers in each parcel as are in excess of the quota shall be set aside in the manner hereinafter directed to be counted for other candidates as hereinafter provided, and on all such ballot-papers so set aside the name of any candidate for whom the requisite number of ballot-papers has already been counted shall be deemed to be cancelled, and the returning officer shall then severally transfer such ballot-papers to the candidates indicated thereon respectively as the next in the order of the voter's preference, and the votes thus transferred shall be deemed to have been given for the candidates to whom they shall be transferred as herein directed, and shall be deemed to be first votes.

V. The ballot-papers which are set aside from any parcel after the first count of votes as hereinbefore directed shall be selected from that parcel in such manner that they shall include as nearly as practicable in respect of each candidate the same proportion of ballot-papers having the figure 2 set opposite to his name as the number of such ballot-papers included in the whole parcel bears to the total number of ballot-papers in the whole parcel: and if any doubt or dispute shall arise as to the number of ballot-papers which should be included in respect of any candidate among the ballot-papers set aside from any parcel, the decision of the returning officer shall be final.

VI. If in any case the number of ballot-papers transferred to another candidate as the second in the order of preference indicated thereon shall exceed the number required to give the quota of votes to that candidate, the excess to be transferred to other candidates shall be selected from the total number of the ballot-papers previously transferred as aforesaid in such manner that the excess shall include as nearly as practicable in the case of each candidate the same proportion of ballot-papers having the figure 3 set opposite to his name as the number of such ballot-papers included in the total number of ballot-papers previously transferred as aforesaid bears to such total number: and if any doubt or dispute shall arise as to the number of ballot-papers which should be included in such excess in respect of any candidate, the decision of the returning officer shall be final.

This process shall be repeated until no candidate has more than a quota of first votes, or votes deemed first.

VII. If, after all the ballot-papers have been counted and respectively assigned to the several candidates as hereinbefore directed, it is found that no candidate, or an insufficient number of candidates, has obtained the quota of votes necessary for his or their election, then and in such case the candidate who has obtained the lowest number of votes shall be excluded from the poll, and all the ballot-papers previously counted for such candidate shall be deemed to have been unused and to have his name cancelled thereon, and they shall be respectively transferred to and counted for the other candidates who have not received the requisite quota of votes and who are indicated on such ballot-papers respectively as the next in the order of the voter's preference.

VIII. The same process of excluding the candidate lowest on the poll and transferring to other candidates the ballot-papers previously counted for the excluded candidate shall be repeated as often as may be necessary until the requisite number of candidates have received the necessary quota of votes, or until the number of candidates has been reduced to the number of members to be elected.

IX. If at any time after the first counting of the ballot-papers it becomes necessary to exclude the lowest candidate from the poll as hereinbefore directed, and it shall be found that two or more candidates have the same number of votes and occupy together the lowest position on the poll, then and in every such case whichever one of such candidates was found to have received the least number of votes upon the first counting of the ballot-papers shall be deemed to be the lowest on the poll; and if at any time it becomes necessary to exclude from the poll one or more of any number of candidates who have received the same number of votes upon the first counting of the ballot-papers, the returning officer shall decide which one or more of such candidates shall be excluded from the poll.

X. When, by successive applications of the directions hereinbefore contained, the number of candidates is reduced to the number of members to be elected, the candidates constituting such reduced number shall be declared elected.

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Appendix 3.

The Electoral Bill, 1899.

Bibliography No. 7.

Clause 127. In the case of every electoral district in which more than one candidate is to be elected, and in which there is more than one polling-place, the deputy returning officer of each polling-place shall, as soon as practicable after the close of the poll, and in the presence of such of the scrutineers as choose to be present, open the ballot-boxes and deal with the ballot-papers as follows:—

I. He shall first arrange the ballot-papers by placing in a separate receptacle or parcel all those which have

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the figure 1 set opposite to the same candidate, and in so doing he shall, upon the proper recording-sheet, mark the preferences 1, 2, 3, respectively by a 1 in the proper column under the name of the candidates for whom these preference votes are declared in each ballot-paper, as in Appendix A. At the same time he shall reject all ballot-papers which have not the official signatures or stamps on the back thereof, or which have anything written or marked thereon by which the voter can be identified, and all ballot-papers on which no number has been placed by the voter to indicate the candidate for whom he wishes to vote, and all ballot-papers on which the same number has been placed against more names than one, and all ballot-papers whereon the number of candidates marked in the order of the voter's preference is less than three of the number of members to be elected:

II. He shall then proceed to ascertain the aggregate number of No. 1, 2, and 3 preferences for each candidate, as indicated upon recording-sheet:

III. Ballot-papers which have been rejected as invalid shall not be counted as votes:

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V. The deputy returning officer shall then separately make up the ballot-papers of the various candidates respectively, recording on the inner wrapper of each candidate's ballot-papers the aggregate number of preferences 1, 2, and 3. He shall then securely bind in One parcel the several candidates' separate parcels of ballot-papers, sealed with his own seal and the seal of such scrutineers as desire to affix their seals, and shall transmit to the returning officer of the district such parcel so sealed as aforeaid, and shall also transmit at the same time to the returning officer of the district in separate parcels securely fastened—

(*a*) The unused and spoiled ballot-papers;

(*b*) The certified copies of rolls supplied to the said deputy returning officer on which the fact of any person having received a ballot-paper has been noted; and

(*c*) An account, in which such deputy returning officer shall charge himself with the number of ballot-papers originally delivered to him, the number thereof delivered and used by voters, and the number not so delivered or left unused, and the number set aside for separate custody (which account is hereinafter referred to as the ballot-paper account).

Every such ballot-paper account shall be verified as well by the signatures of the said deputy returning officer and the poll clerk (if any), also by the signatures of such of the scrutineers as shall be present and shall consent to sign the same:

VI. If at any time after the first counting of the votes it becomes necessary to exclude the lowest candidate from the poll as hereinafter directed, and it shall be found that two or more candidates have the same number of votes and occupy together the lowest position on the poll, then and in every such case whichever one of such candidates was found to have received the least number of first preference votes shall be deemed to be the lowest on the poll; and if at any time it becomes necessary to exclude from the poll one or more of any number of candidates who have received the same number of votes upon the first counting of the ballot-papers, the returning officer shall decide which one or more of such candidates shall be excluded from the poll.

VII. When, by successive applications of the directions hereinafter contained, the number of candidates is reduced to the number of members to be elected, the candidates constituting such reduced number shall be declared elected.

Clause 128. In the case of any electoral district for which more than one candidate is to be elected, and there is more than one polling-place, the Returning Officer General, as soon as he shall have received the full reports of the deputy returning officers (to be transmitted to him as hereinbefore directed) showing the total number of preference votes, 1, 2, and 3 respectively, polled in every district polling-place at such election in respect of each candidate shall proceed as follows:—

I. He shall first compute and ascertain the total number of first preference votes polled at such election, and shall divide such total number by the number of members to be returned for such district, rejecting any fractional remainder which may appear after such division, and the number of the said quotient found by such division shall be the quota or number of votes entitling the candidates respectively for whom such quota shall be given to be returned at the said election as members to serve in Parliament:

II. He shall then proceed to compute the number of 1st, 2nd, and 3rd preference votes recorded in favour of each candidate, and every candidate who has a number of first preference votes equal to, or greater than, the quota shall be declared elected.

III. As many first preference votes for any one candidate as are in excess of the quota shall, in the manner hereinafter directed, be counted for other candidates who have not received a quota as hereinafter provided, and the Returning Officer General shall then severally transfer such excess first preference votes to such candidates, and the votes thus transferred shall be deemed to have been given for the candidate to whom they shall be transferred as hereinafter directed, and shall be deemed to be first votes. All excess votes transferred as directed by this subsection are hereinafter referred to as transfer excess votes of the first order:

IV. The first preference excess votes set aside for transfer to candidates who have not yet been excluded shall be distributed in a proportion to be determined by reference to the total number of second preferences of such candidates: that is to say, the number of votes to be transferred to a candidate shall bear as nearly as practicable the same proportion to the surplus for distribution as the said candidate's second preferences on the whole election bear to the second preferences on the whole election of all the candidates who are not yet excluded; and, if any doubt or dispute shall arise as to the number of transfer votes which should be included in respect of any candidate, the decision of the Returning Officer General shall be final:

V. If in any case the number of excess votes transferred to a candidate shall exceed the number required to give the quota of votes to that candidate, the excess shall be transferred to other candidates, and shall be distributed in a proportion to be determined by a reference to the total number of the third preferences of such candidates; that is to say, the number of votes to be transferred to a candidate shall bear as nearly as practicable the same proportion to the surplus for distribution as the said candidate's third preferences on the whole election bear to the third preferences on the whole election of all the candidates who are not yet excluded; and, if any doubt or dispute shall arise as to the number of transferred votes which should be included in respect of any candidate, the decision of the returning officer shall be final. All excess votes transferred as directed by this subsection are hereinafter referred to as transfer excess votes of the second order:

This process shall be repeated, if necessary, until no candidate has more than a quota of first votes, or votes deemed first.

VI. If, after all the votes have been respectively assigned to the several candidates as hereinbefore directed, it is found that no candidate, or an insufficient number of candidates, has obtained the quota of votes necessary for his or their election, then, and in every such case the candidate who has obtained the lowest number of votes, shall be excluded from the poll, and all the votes previously counted for such candidate shall be transferred to the remaining candidates who have not yet been excluded, and shall be distributed among them in the manner hereinbefore provided for the distribution of transfer excess votes of the first order (Subsections III. and IV.):

VII. If in any case the number of any lowest candidate's votes transferred to another, as directed in the previous subsection, shall exceed the number required to give the quota of votes to that candidate, the excess shall be deemed to be a transfer excess of the second order, and shall be transferred and distributed among the remaining candidates not yet returned in the manner hereinbefore provided for the distribution of transfer excess votes of the second order (Subsection v.):

VIII. The same process of excluding the candidate lowest on the poll at each stage, and transferring to other candidates the unused or the transfer votes of the first and second order, shall be repeated as often as may be necessary until the requisite number of candidates have secured the quota of votes, or until the number of candidates has been reduced to the number of members to be elected.

Clause 130. In the case of every electoral district in which more than one candidate is to be elected, and in which there is only one polling-place, the returning officer himself shall supervise all the operations and processes involved in dealing with ballot-papers, and in balloting for the various candidates, as hereinbefore provided in the case of districts where there is more than one polling-place, and shall himself supervise all the processes involved in counting the votes and ascertaining the final results of the election, as hereinafter provided—

I. He shall, as soon as practicable after the close of the poll, and in the presence of such of the scrutineers as choose to be present, open the ballot-boxes and deal with the ballot-papers as in the following subsections:—

II. He shall arrange the ballot-papers by placing in a separate receptacle or parcel all those which have the figure 1 set opposite to the same candidate, and in so doing he shall, upon the proper recording sheet mark the preference 1 by a mark 1 in the proper column under the name of the candidate for whom the No. 1 preference vote is declared in each ballot-paper. At the same time he shall reject all such defective ballot-papers as are described in Subsection One of Section One hundred and twenty-eight:

III. He shall then compute and ascertain the total number of first preference votes polled at such election, and shall determine the quota entitling each candidate to be returned at the said election as a member to serve in Parliament, in the same manner as hereinbefore provided in Section One hundred and twenty-nine, Subsection One; and every candidate who has a number of first preference votes equal to or greater than the quota shall be declared elected, and shall as such be excluded from the subsequent operations of the poll:

IV. He shall then in proper order proceed to deal with the transfer and distribution of transfer excess votes of the first and second order, and with the unused votes of candidates who as the next lowest in turn are excluded from the poll, in the same manner as hereinbefore provided (Section One hundred and twenty-nine, Subsections Three to Eight) for districts in which more than One candidate is to be elected, and where there is more than One polling-place, but with the following modifications:—

In the case of transfer excess votes of the first and second order, as hereinbefore described, and in the cases of the transfer votes of the next in turn lowest excluded candidate, their distribution at each successive count or stage shall include as nearly as practicable in respect of each of the other candidates not yet returned or excluded the same proportion of the particular number of total transfer votes as the aggregate number of all second preferences, or, if not available because of exclusion, the next in order preference available, polled by the particular candidates whose votes are being so transferred.

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Appendix 4.

The Electoral Act, 1907.

Mode of Voting.

Clause 119. At every election votes shall be recorded in manner following:— Bibliography No. 18.

I. No name shall be struck out from any ballot-paper:

II. In every case in which only One member is to be elected for any district the voter shall mark his ballot-paper in the manner following:—

(*a*) He shall place the number 1 within, or substantially within, the square opposite the name of the candidate for whom he votes as his first preference;

(*b*) He shall also (where there are more than Two candidates) give contingent votes for at least Two of the remaining candidates, by placing within, or substantially within, the squares respectively opposite their names the numbers 2 and 3, so as to indicate the order of his preference;

(*c*) He may, in addition, indicate the order of his preference for as many more of the other candidates (if any) as he pleases, by placing within, or substantially within, the squares respectively opposite their names other numbers next in numerical order after those already used by him:

III. In every case in which more than One candidate is to be elected for any district the voter shall mark his vote upon the voting-paper in the manner following:—

(*a*) He shall place within, or substantially within, the squares respectively opposite the names of Three candidates the numbers 1, 2, and 3, so as to indicate the order of his preference;

(*b*) He may, in addition, indicate the order of his preference for as many more candidates as he pleases, by placing within, or substantially within, the squares respectively opposite their names other numbers next in numerical order after those already used by him.

Rules for the Scrutiny.
(Schedule 4.)

In this schedule, unless the contrary intention appears—

"Returning officer" means the returning officer for the district:

"Quota" means the number of votes sufficient to elect a candidate:

"Surplus" means the number of votes which a candidate has obtained, at any stage of the scrutiny, over and above the quota:

"First choice recorded for a candidate" means a voting-paper on which the number 1 is placed in a square opposite the name:

"Second choice recorded for a candidate" means a voting-paper on which the number 2 is placed in the square opposite his name:

"Transfer value" means that portion of a vote which is unused by—

(*a*) An elected candidate who has obtained a surplus;

(*b*) A candidate excluded on account of his being lowest on the poll, and which is therefore transferred to the candidate next in the order of the voter's preference. The transfer value of all votes is either 1 or some fraction of 1.

Method of Counting Votes where One Member only has to be returned for a District.

1. The number of first choices recorded for each candidate shall be counted, and all informal ballot-papers shall be rejected.

2. The candidate obtaining an absolute majority of votes shall be elected.

An absolute majority of votes means a number greater than One-half of the whole number of ballot-papers other than exhausted and informal ballot-papers. The casting vote of the returning officer shall be included in reckoning an absolute majority of votes.

3. If no candidate has an absolute majority of votes, the candidate who has the fewest votes shall be excluded, and each ballot-paper counted to him shall (unless exhausted) be counted to the unexcluded candidate next in the order of the voter's preference.

4. If no candidate then has an absolute majority of votes, the process of excluding the candidate who has the fewest votes and counting each of his ballot-papers (unless exhausted)

to the unexcluded candidate next in the order of the voter's preference, shall be repeated until one candidate has an absolute majority of votes.

5. Every ballot-paper, not rejected as informal, shall be counted in every count until it becomes exhausted, when it shall be rejected in all further counts. When a candidate is excluded, any ballot-paper counted to him shall be deemed to be exhausted if there is not indicated upon it a consecutive preference for one unexcluded candidate.

6. If on any count Two or more candidates have an equal number of votes and One of them has to be excluded, the returning officer shall decide which is to be excluded, and if in the final count two candidates have an equal number of votes, the returning officer shall decide by his casting vote which shall be elected, but otherwise no returning officer shall vote at any election.

Method of Counting Votes where more than One Member has to be Returned for a District.

1. The number of first choices recorded for each candidate shall be counted, and all informal voting-papers shall be rejected.

2. The aggregate number of such first choices shall be divided by one more than the number of candidates required to be elected, and the quotient increased by one, disregarding any remainder, shall be the quota, and (except as hereinafter provided in Rule 10) no candidate shall be elected until he obtains a number of votes equal to or greater than the quota.

3. Any candidate who has, upon the first choices being counted, a number of such votes equal to or greater than the quota shall be declared elected.

4. Where the number of such votes obtained by any candidate is equal to the quota, the whole of the voting-papers on which a first choice is recorded for such elected candidate shall be set aside as finally dealt with.

5. Where the number of such votes obtained by any candidate is in excess of the quota, the proportion of votes in excess of the quota shall be transferred to the other candidates not yet declared elected, next in the order of the voters' respective preferences, in the following manner:—

- I. All the voting-papers on which a first choice is recorded for the elected candidate shall be re-examined, and the number of second choices, or (in the case provided for in Rule 12) third or next consecutive choices, recorded for each unelected candidate thereon shall be counted:
- II. The surplus of the elected candidate shall be divided by the total number of votes obtained by him on the counting of the first choices, and the resulting fraction shall be the transfer value:
- III. The number of second or other choices, ascertained in paragraph I. to be recorded for each unelected candidate, shall be multiplied by the transfer value:
- IV. The resulting number, disregarding any fractional remainder, shall be credited to each unelected candidate, and added to the number of votes obtained by him on the counting of the first choices.

6.—(*a*) Where, on the counting of the first choices or on any transfer, more than one candidate has a surplus, the largest surplus shall be first dealt with. If then more than one candidate has a surplus, the then largest surplus shall be dealt with, and so on: Provided that, if one candidate has obtained a surplus at a count or transfer previous to that at which another candidate obtains a surplus, the surplus of the former shall be first dealt with.

(*b*) Where two or more surpluses are equal, the surplus of the candidate who was the highest on the poll at the count or transfer at which they last had an unequal number of votes shall be first dealt with; and if they have had an equal number of votes at all preceding counts or transfers, the returning officer shall decide which candidate's surplus shall be first dealt with.

7.—(*a*) Where the number of votes obtained by a candidate is raised up to or above the quota by a transfer as aforesaid, he shall thereupon be declared elected. And in such a case, notwithstanding the fact that he may have reached the quota, such transfer shall be completed, and all the votes to which he is entitled therefrom shall be transferred to him, but no votes of any other candidate shall be transferred to him.

(*b*) Where the number of votes obtained by a candidate is raised up to, but not above, the quota by a transfer as aforesaid, the whole of the voting-papers on which such votes are recorded shall be set aside as finally dealt with.

(*c*) Where the number of votes obtained by a candidate is raised above the quota by a transfer as aforesaid, his surplus shall be transferred to the candidates next in the order of the voters' respective preferences, in the following manner:—

I. The voting-papers on which are recorded the votes obtained by the elected candidate in the last transfer shall be re-examined, and the number of third, or (in the case provided for in Rule 12) next consecutive choices recorded for each unelected candidate thereon counted:

II. The surplus of the elected candidate shall be divided by the total number of voting-papers mentioned in paragraph I., and the resulting fraction shall be the transfer value:

III. The number of second (or other) choices, ascertained in paragraph 1 to be recorded for each unelected candidate, shall be multiplied by the lastmentioned transfer value:

IV. The resulting number, disregarding any fractional remainder, shall be credited to each unelected candidate, and added to the number of votes previously obtained by him.

8.—(*a*) Where, after the first choices have been counted and all surpluses (if any) have been transferred as hereinbefore directed, no candidate, or less than the number of candidates required to be elected, has or have obtained the quota, the candidate who is lowest on the poll shall be excluded, and all the votes obtained by him shall be transferred to the candidates next in the order of the voters' respective preferences, in the same manner as is directed in Rule 5.

(*b*) The votes obtained by such excluded candidate as first choices shall first be transferred, the transfer value of each vote in this case being 1.

(*c*) The other votes of such excluded candidate shall then be dealt with in the order of the transfers in which, and at the transfer value at which, he obtained them.

(*d*) Each of the transfers which takes place under the two previous clauses of this rule shall be deemed for all purposes to be a separate transfer.

9.—(*a*) Where the number of votes obtained by a candidate is raised up to or above the quota by any such transfer as aforesaid, he shall thereupon be declared elected. And in such case, notwithstanding the fact that he may have reached the quota, such transfer shall be completed, and all the votes to which he is entitled therefrom shall be transferred to him, but no other votes shall be transferred to him.

(*b*) Where the number of votes obtained by a candidate is raised up to, but not above, the quota by any such transfer as aforesaid, the whole of the voting-papers on which such votes are recorded shall be set aside as finally dealt with.

(*c*) Where the number of votes obtained by a candidate is raised above the quota by any such transfer as aforesaid, his surplus shall be transferred to the candidates next in the order of the voters' respective preferences in the same manner as is directed in Rule 7, Clause (*c*): Provided that such surplus shall not be dealt with until all the votes of the excluded candidate have been transferred.

(*d*) Where any surplus exists it shall be dealt with before any other candidate is excluded.

10. The same process of excluding the candidate lowest on the poll and transferring to other candidates his votes shall be repeated until all the candidates, except the number required to be elected, have been excluded, and the unexcluded candidates, who have not already been so declared, shall then be declared elected.

11. Where at any time it becomes necessary to exclude a candidate, and two or more candidates have the same number of votes and are lowest on the poll, then whichever of such candidates was lowest on the poll at the last count or transfer at which they had an unequal number of votes shall be first excluded, and if such candidates have had an equal number of votes at all preceding counts or transfers the returning officer shall decide which candidate shall be first excluded.

12. In determining what candidate is next in the order of the voter's preference, any candidates who have been declared elected or who have been excluded shall not be considered, and the order of the voter's preference shall be determined as if the names of such candidates had not been on the voting-paper.

13. Where on any transfer it is found that on any voting-paper there is no candidate opposite whose name a number is placed, other than those who have been already either declared elected or excluded, such voting-paper shall be set aside as exhausted.

R.S. TAS.

APPENDIX 5.

Bibliography No. 34.

Rules for Conducting Pre-election Ballots, according to the Launceston Voting System (based upon the Multiple Transferable Vote).

Section 4.—Mode of Voting.

(*a*) Where three or four candiates are to be elected the voter places within the squares opposite the names of the two candidates whose return he chiefly desires, the number 1; and in addition indicates the order of his preference for the remaining candidates by placing within the squares opposite their names the numbers 2, 3, 4, and so on.

(*b*) Where five or six candidates are to be elected the voter places within the squares opposite the names of the three candidates whose return he chiefly desires, the number 1; and in addition indicates the order of his preference for the remaining candidates by placing within the squares opposite their names the numbers 2, 3, 4, and so on.

(*c*) Where seven or eight candidates are to be elected the voter places within the squares opposite the names of the four candidates whose return he chiefly desires, the number 1; and in addition indicates the order of his preference for the remaining candidates by placing within the squares opposite their names the numbers 2, 3, 4, and so on.

(*d*) Voters must vote or show a preference for at least six candidates, otherwise their voting-papers will be informal. In the event of less than six candidates offering, a vote or preference must be must be shown for each candidate.

Section 5.—Definitions.

In the following section, unless the contrary intention appears—

"Returning officer" means the returning officer for the district.

"Quota" means the number of votes sufficient to elect a candidate.

"Surplus" means the number of votes which a candidate has obtained at any stage of the scrutiny, over and above the quota.

"First choice for a candidate" means the number 1 placed in the square opposite his name.

"Second choice for a candidate" means the number 2 placed in the square opposite his name.

"Next available candidate" on any paper means the candidate not yet elected or excluded (and not already marked by the returning officer) to whom the next consecutive choice is to be credited.

"Transfer value" means that portion of a vote which is unused by—

(*a*) An elected candidate who has obtained a surplus; or

(*b*) A candidate excluded on account of his being lowest on the poll, and which is therefore transferred to the candidate next in the order of the voter's preference. The transfer value of all votes is either 1 or some fraction of 1.

Section 6.—Method of Counting Votes.

1. The ballot-papers shall first be examined and all informal papers rejected.

2. Wherever during the process of the count the rules provide for a transfer of surplus votes from one candidate to other candidates, all the voting-papers concerned in the said transfer shall be shuffled before the transfer is commenced.

3. The number of first choices for each candidate shall be counted, and on each paper a mark shall be made opposite the name of each candidate who receives one of such choices. Each candidate shall be credited with one vote for each such choice given to him.

4. The aggregate number of such first choices shall be divided by one more than the number of candidates required to be elected, and the quotient increased by one, disregarding any remainder, shall be the quota, and (except as hereinafter provided in Rule 9) no candidate shall be elected until he obtains a number of votes equal to or greater than the quota.

5. Any candidate who has, upon the first choices being counted, a number of such votes equal to or greater than the quota shall be declared elected.

6. Where the number of such votes obtained by any candidate is in excess of the quota, the surplus shall be transferred to the next available candidate in the following manner:—

(i) All the voting-papers on which a first choice is recorded for the elected candidate shall be re-examined and the number of second, or next consecutive, choices, recorded therein for each unelected candidate shall be counted.

(ii) The surplus of the elected candidate shall be divided by the total number of votes obtained by him on the counting of the first choices, and the resulting fraction shall be the transfer value.

(iii) The number of second, or next available choices, ascertained in paragraph (1) to be recorded for each unelected candidate shall be multiplied by the transfer value, and the resulting number, ignoring fractions, shall be the share of the surplus to which that candidate is entitled, if required.

(iv) For each unelected candidate the returning officer shall select at random from the papers on which a second, or other choice has been found for that candidate under paragraph (1) a number of papers equal to the number calculated as his share of the surplus under paragraph (iii).

(v) If on crediting a candidate with a number of votes equal to the number calculated as his share under paragraph (iii) the candidate would not have a number of votes in excess of the quota, the returning officer shall place a mark opposite his name on each of the papers selected under paragraph (iv), and one vote shall be credited to him for each such paper.

(vi) But if on crediting a candidate with a number of votes equal to the number calculated as his share under paragraph (iii) the candidate would have a number of votes in excess of the quota, the returning officer shall select at random from the papers selected under paragraph (iv) a number of papers sufficient to give the candidate a quota, and no more. On each of the papers thus selected the returning officer shall place a mark opposite the name of the candidate, and one vote shall be credited to him for each such paper. On each of the remainder of the papers of such candidate selected under paragraph (iv) the returning officer shall place a mark opposite the name of the next available candidate, and shall credit one vote to such next available candidate, provided that as soon as a candidate reaches the quota he shall be declared elected and no more votes shall be credited to him.

7. Where on the counting of the first choices more than one candidate has a surplus, the largest surplus shall be dealt with first. If then more than one candidate has a surplus, the then largest surplus shall be dealt with, and so on.

8.—(*a*) Where, after the first choices have been counted and all surpluses (if any) have been transferred as hereinbefore directed, less than the number of candidates required to be elected have obtained the quota, the candidate who is lowest on the poll shall be excluded, and all the votes obtained by him shall be transferred to the next available candidates on the ballot-papers from which he has obtained his votes—that is, the papers on which his name has been marked by the returning officer.

(*b*) The returning officer shall in all cases make a mark on the ballot-paper opposite the name of the candidate to whom he transfers a vote.

(*c*) Whenever, during the transfer of an excluded candidate's votes another candidate reaches the quota, he shall be immediately declared elected, and the remainder of the excluded candidate's votes shall be transferred to the next available candidate on the remainder of the excluded candidate's papers.

9. The same process of excluding the candidate lowest on the poll and transferring to other candidates his votes shall be repeated until all the candidates, except the number required to be elected, have been excluded, and the unexcluded candidates, who have not already been so declared, shall then be declared elected.

10. Where at any time it becomes necessary to exclude a candidate, and two or more candidates have the same number of votes and are lowest on the poll, then whichever of such candidates was lowest on the poll at the last count or transfer at which they had an unequal number of votes shall be first excluded, and if such candidates have had an equal number of votes at all preceding counts or transfers the returning officer shall decide which candidate shall be first excluded.

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11. In determining which candidate is next in the order of the voter's preference, any candidates who have been declared elected, or who have been excluded, shall not be considered, and the order of the voter's preference shall be determined as if the names of such candidates had not been on the voting-paper.

NOTE.—If, during the process of the count, the returning officer uses pencils of different colours in marking the names on the ballot-papers, it will be found to greatly facilitate counting operations. For instance, a candidate credited with primary votes (first choices) could be marked with blue pencil; a candidate credited with transferred surplus votes could have a red mark made opposite or across his name; whilst a candidate credited with transferred votes from an excluded candidate could have a green mark or two red marks made across his name.

A RECTIFICATION IN THE CARTOGRAPHY OF NORTH-EAST TASMANIA.

By Colonel W. V. Legge, F.R.G.S.

(Read 14th April, 1913.)

Plates I. and II.

The so-called Saddleback is one of the tor-mountains eminently characteristic of the N.E. plateau of Tasmania, which is the main divide for the river system in that part of the State. Like its adjacent neighbour, Ben Nevis, it rises from the southern edge of the plateau, though its spurs running in that direction descend to the foot of the upland and join with the ranges flanking the north bank of the South Esk. The mountain takes the form of a short ridge with an axis lying about south-west—north-east, its structure being like that of the other plateau-mountains, diabase. The eastern face is precipitous, and towers over the Ringarooma-Mathinna track, which passes it at an elevation of about 2,200 feet, and not far from the base.

The crestline, though jagged and rough, has an undulating aspect from distant, eastern points of view, and is continuous with a spur which runs up from the foothills in the valley of the South Esk, rising with a fairly regular slope to a prominence, south of the summit, from which there is a slightly ascending dip up to the top, which takes the form of a flattish dome with rather an abrupt northern descent to the plateau.

The writer has sketched the aspect of the tor from various eastern points, from none of which has it any appearance of a saddlebacked mountain; nor could such a hump-backed ridge take that form from any direction.

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The aspect-sketch of the eastern tors of the plateau given with this note was taken from an altitude of about 2,700 feet on the northern side of the summit of Mt. Nicholas, from which one of the most beautiful and comprehensive panoramic views of forest and mountain in all Tasmania awaits any mountaineer or tourist, who chooses to spend a day at St. Mary's. Saddleback is here seen next to the mountain Ben Nevis on the extreme left, with Mts. Victoria and Albert (the true Saddleback) foreshortened on the right. The remarkable table-like level of the plateau is noticeable in the sketch; but to view this to perfection it must be seen on a frosty winter's evening before sunset from the summit of the Blue Tier at Poimena, when it stands out as level as the top of a wall from Mt. Victoria to Mt. Barrow.

It may be remarked in passing that the existence of this great orographical feature seems to be quite unknown to the general public, notwithstanding that it is, in conjunction with Ben Lomond (itself a loftier but smaller plateau), the main regulator of the climatic conditions in N.E. Tasmania. The reason for this lies in its concealment from view both north and south by the broken nature of the country, and on the fact that the true topographical features of the State have not yet been shown on our maps, on which the chief mountains are all shown as isolated heights, standing, as it were, on the sea-level.

To return: We find that Mt. Albert, twin mountain with Mt. Victoria, when seen from the Lottah district and the George River Valley (Pyengana), from some points of which latter it is hidden from Mt. Victoria, is called almost universally Mt. "Saddleback" by the country people. In point of fact, if a titan-hand had done his best to cut a mountain into that shape he could not have succeeded better. An aspect-sketch is given of Mt. Albert to show its claim to a local name of that sort. It is taken from a position in the valley where its sister mountain, Victoria, cannot be seen. The impression in the writer's mind when first seeing the mountain from this position may be expressed: "Why, that must be Mt. Saddleback; but surely it cannot be, as that mountain rises above Mathinna a long way to the westward from here!" Thus, it appears likely that the misnomer, "Saddleback," is the result of a cartographical error in the Survey Office, based, perhaps, on the information of an official who was unacquainted with the true aspect of the mountain near Mathinna now called by that name.

The position, therefore, as regards the correct orography of that part of Tasmania is that a new name is now required for the so-called Saddleback, this appellation being left as a "vernacular" in the George River district, as the title "Albert" pertaining to it as the mountain adjoining Victoria cannot be interfered with.

It is therefore suggested and recommended that a Scotch title (Tasmania being looked on as the Scotland of the South) be given, and that there be another "Ben" added to Ben Lomond and Ben Nevis, which are closely associated with the mountain in question. Ben Nevis in Scotland is the western termination of the great Grampian Range, which contains to the eastward other "Bens," prominent among them being Ben Avon. It therefore seems appropriate that the Tasmanian mountain standing to the eastward of our Ben Nevis should be given that good old Scotch name. It is hoped that this title will be acceptable to the Department of Lands and Surveys.

Note added by the Author 13th May, 1913.—The name Ben Avon elicited some opinion at the meeting as to the advisability of further duplication of Scotch names in Tasmanian geography. The adoption of British names for this purpose in Tasmania and other Australian States has, however, been largely the rule under "Crown Government" from early days of colonisation; and may be taken as a happy indication of our loyalty to the Mother country. Nevertheless in the present instance the title "Ben Esk" might be more appropriate and would equally harmonise with the nomenclature desired by the author for the three mountains in question, which are so prominently associated in our North-eastern orographical system.

LIST OF NATIVE WORDS OF THE OYSTER BAY TRIBE, VAN DIEMEN'S LAND.

By J. W. Beattie

(Read 10th June, 1913.)

The following list of Native Words was found among papers originally in the possession of Rev. William Bedford, D.D., who succeeded Rev. Robert Knopwood as Principal Chaplain of Van Diemen's Land in 1823.

Mr. Bedford took a deep interest in the "Native Question," and was an active member of the Aboriginal Committee, an advisory body appointed by Colonel Arthur to assist the Executive in effectually dealing with the very difficult Native problems of the time.

The list and notes have been copied by myself, and are an exact reproduction of the original in spelling and composition.

I have not been able, yet, to discover who the writer "H.W.M." was.

List of Native Words, with Note by "H.W.M."

Buc-ga-na	What do you call this or that thing.
Ba-mi-en-da	Emmu.
Cran-wan-wa	to step.
Cham-not-ca	Sheep.
Dre-na-kena, or Lee-naa	Kangeroo.
Dig-e-na-Man-a-Waa	the Minister, Rev. Mr. Bedford.
En-cli-be-na	good or palatable.
Governor-Waa	His Honor the Governor.

Le-gun-tha-Waa	Kangeroo dog.
Le-gun-tha	Common dog.
Lim-pu-ga	Shoping.
Lag-wee	Walking.
Lo-ru-me-na	scratching.
Lee-na, or Ly-en-na	Water.
Lod-the	tree's.
Lu-gu-na	leg's.
Log-Wan-na	Wife.
La-ge-na	salt.
Le-bta-la, tha-gen-na, or Wag-ge-na	Hobert Town.
Lun-na	House.
Me-a-nen-qua	Will you live with me
Me-yalla-cas-an-a-rea	talking.
My-yen-na	you.
Mier-men-na	smooking.
Min-Man-a-wee-bob-ar-ree	fighting.
My-ett-ta	five.
My-he-na	Body.
Mad-tha	privates.
Mun-na	Mouth.
Mi-gun-na	Nose.
Min-gra-nith-ka	bad, or disagreable.
Mi-hilk-a-la-ma	silence.
Ma-va-den-na	boat.
Mou-thig-na	Eyes.
Nu-ge-na	stealing.
Nu-ga-lantha	Possum.
Olumptha	Head.
Oyster bay Waa	Oyster bay.
Penin-na	Laughter.
Po-co-la	Bullocks.
Po-co-na	smoke.
Pa-matt-ta	potatoes.
Par-a-pel-a	Cook.
Pae-a-nu-bra, or Per-ni-per-na	the Sun.
Pig-e-na, or Wig-e-na	Hair.
Pa-gen-gun-ya	Horse.
Par-a-wee	I want.
Pud-ca	fish.
Rung-we	to run, or make haste
Re-gun-na	Oysters.
Re-nea	hand.
Tta-van-ya	Cloathing.
Ta-gar-a-ga	Crying.
Ta-Wal-a-wee	Eating.

Ta-ken-a-pee	to give me.
Talla-Walla-Wa	Come heare.
Tag-wee	go there.
Te-bet-e-men-e-ana	go gather berry's.
Tid-qua	Sugar.
Ti-er-id-ka	Ship.
Tra-ban-na	Blankett.
Vestra	Star.
Weig-tha	Moon.
Wag-grun-na	teeth.
Wood-tha	Bird.
Wan-a-pack-a-la-lea	Work, or Labour.
Fa-cu-na, or pho-ca-nah	Rain.
Pe-e-bid-ca	Thunder.

Native words spoke quick with a guttural sound.

Some of the Oldest asked the boy's Bill and Jack to enquire about Thunder. I told them it was the Voice of God, who made the Sun and Moon and stars and every other thing good Around them that His Name was Jesus Christ and that he could see them and knew all they did, they all listened very Attentively And one Old man or one of the Oldest of them surprised Me by Asking if he would soon Come again. I could perceive Most of them Could understand, and Often told the boy's the Names of things I Asked them.

H. W. M. 1824.

NOTES ON THE LIST OF NATIVE WORDS OF THE OYSTER BAY TRIBE, PRESENTED BY MR. J. W. BEATTIE. (1)

By Hermann B. Ritz, M.A.

(Read 8th Sept., 1913.)

This list bears the colophon "H.W.M., 1824," which may mean that it was drawn up by Sergeant Montgomery, of the 51st Foot (King's Own Light Infantry), stationed in Tasmania in 1824. There certainly was such a person here at that time, and the list itself shows that it was written by a man who conscientiously paid strict attention to details, and recorded them faithfully, as far as his literary attainments enabled him to do so. The punctilious respect for persons in authority is shown by the way the recorder mentions "the Minister, Rev. Mr. Bedford," and "His Honor the Governor," both of whom entered upon their duties in 1824, the former as Incumbent of St. David's, and the latter as Lieutenant-Governor.

In taking down the native words, H.W.M. evidently took great pains, getting the Aboriginals to pronounce them in syllables, and carefully, and on the whole very successfully, separating these by hyphens.

At first sight, these words seem quite different from those recorded in the lists previously published; but on closer inspection they are found to be quite in harmony with them; indeed, more than half of them are practically identical with them.

In my paper, "The Speech of the Tasmanian Aborigines," read before the Royal Society of Tasmania, on the 14th June, 1909, (2) I explained my theory on the etymology of the Tasmanian vocabulary, and the present list decidedly confirms my conclusions, as will be seen when we examine each word of H.W.M.'s list in detail. I may fairly claim to have shown in my previous papers on this subject, that by my theory every Tasmanian word and phrase that has been published, can be rationally explained to be in strict accordance with the known primitiveness of the life and manners of the Tasmanian Aboriginals, and the present list strongly confirms the soundness of my theory. It will be

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(1) See pages 79-81.

(2) These *Papers and Proceedings*, 1909, pp. 44-81.

convenient to readers of the present paper, to have a brief statement of the principal point of my theory, as regards the etymology of Tasmanian words.

They are:—

(a) The Aboriginal's mind worked on the same lines as those followed by a very young child. The first object to be distinguished is one that moves while the objects surrounding it are at rest. The speech-sounds, or rather, the consonants, most naturally expressing motion are the continuants, viz., l, m, n, r, ng. The sibilants are not found in the Tasmanian speech, and the vowels are too indistinct to serve as characteristics.

(b) Next, the modifications of motion would be observed; if motion came *before* rest, it would be expressed by the group b, p, w, m; if motion came *after* rest, it would be expressed by the group g, k, w, r, ng; while rest itself would be expressed by the group d, t, l, n.

(c) The members of each group are readily interchangeable, practically at the discretion of the individual speaker, though, of course, some forms may have become conventionally fixed.

(d) The vowels are interchangeable, within certain limits.

(e) Each syllable begins normally with a consonant; where a vowel is found as initial, it is most likely the remains of a syllable originally beginning with w.

(f) In a group of syllables, any interior letter is liable to be slurred, and eventually elided, if the syllable to which it belongs does not bear the phrase-accent.

In my discussion of the details of Mr. Beattie's list,

(a) The spelling will be uniform, chiefly on the lines followed by H. Ling Roth, in Appendix F. of his "The Aborigines of Tasmania."

(b) The statements will as a rule be positive, though they are necessarily based on conjecture. Still, the harmony of the facts with my theory is so consistent, that there is no justification for excessive diffidence on my part. Hence, my statements may fairly be considered as valid pending disproof based on facts and logic.

(c) The following abbreviations will be used:—

(1) "H.W.M.," for the original recorder of the present list.

(2) "H.L.R," for H. Ling Roth: "The Aborigines of Tasmania.

(3) "H.B.R.," for Hermann B. Ritz: "The Speech of the Tasmanian Aborigines" (3).

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(3) These *Papers and Proceedings*, 1909, pp. 44-81.

Mr. Beattie's List.

(The words actually on the list are printed in *italics*, and are transcribed exactly as they appear in the original list. They are marked with consecutive numbers for reference.)

1. *Buc-ga-na* = *What do you call this or that thing.*

This is "pugana," meaning "big thing," *i.e.*, "the thing that engrosses the attention for the moment."

2. *Ba-mi-en-da* = *Emmu.*

The spelling of "Emu" seems to show that the orthoëpy of the initial vowel has changed since 1824.

H.L.R. gives "punamunta" for "emu." This is an abbreviation of "pugana-munta," where "pugana" means "big" Now "palla" also means "big" (H B.R.), and it is often shortened to "pa." Hence "pa-munta" means the same as "punamunta," and is the standardized form of "ba-mi-en-da."

3. *Cran-wan-wa* = *to step,*

This is "krana" (a shortened "krakana"), meaning "to stand," + "pena," meaning "moving forward," + "pe," meaning "to act" (H.B.R.). The whole of it means:—"The action of (alternately) standing and moving forward."

4. *Cham-not-ca* = *Sheep.*

This is "kana," to speak, + "muna," mouth, + "itya," diminutive suffix. Hence:—"The thing that speaks with a little mouth," the voice of a sheep being "little" in comparison with its bulk.

5. *Dre-na-kena* = *Kangeroo.*

This is "ta(g)-rena-kana," meaning:—"walk-quick-noise." Thus:—"The thing that walks quickly and noisily."

6. *Lee-naa* = *Kangeroo.*

H.L.R. gives "lena" for "brush-kangaroo." It is "the swift thing."

7. *Dig-e-na Man-a-Waa* = *the Minister, Rev. Mr. Bedford.*

This is "tigana-muna-pa(lla)," that is "heart, mouth, big" (H.L.R.). Thus:—"He that speaks with great sympathy"; literally:—"He that has a big heart in his mouth." This would certainly be an excellent designation of Dr. Bedford, whose sympathy with the unfortunate Aborigines was very deep, and who had, moreover, just arrived, and would realize their misery more keenly than many of those who had become accustomed to this state of affairs.

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8. *En-cli-be-na = good or palatable.*

This is "an" (for "wan" (v. No. 3) or "pena") meaning "the moving or pointing thing," i.e., "the hand," + "ka," "the chin or jaw," + "lipa," "moving with a purpose" (H.B.R.), + "na," the common suffix for nouns. Hence:—"The thing which the hand moves to the jaw or mouth," because it is "good to eat."

9. *Governor-Waa = His Honor the Governor.*

The English origin of "Governor" is obvious. "Waa" is a form of "palla," meaning "big," or "important." This form of "palla" occurs also in Nos. 7, 10, 41, and probably in No. 61 (q. v.).

10. *Le-gun-tha-Waa = Kangeroo dog.*

11. *Le-gun-tha = Common dog.*

No. 10 is simply No. 11 with the addition of "Waa," "big." The common part "leguntha" is "lagan(a)-ta(gana)," i.e., "swiftfoot." "Lagana" and "tagana" are really identical, as "l" and "t" are interchangeable. The meaning is "moving away" (H.B.R.). If the motion is emphasized, the "l" is used; the use of the "t" indicates that the "thud" of the footfall is in the speaker's mind. Most of the names of animals given in the existing lists mean simply "the moving thing," and appear in one form or another of the combination "liquid + guttural" (H.B.R.).

12. *Lim-pu-ga = Shoping.*

"Shoping" is clearly an error for "shipping," for "lina" means "water," and "puga(ta)" means "to float" (H.L.R.). The word thus means:—"the thing that floats on the water." "Puga(ta)" is "pa-ka-ta," where "pa" is "motion before rest," "ka" is motion after rest," and "ta" is "rest." The whole phrase "pugata" describes very well, in a primitive way, "the thing that moves up and down, but does not move from the spot," that is, "a boat riding at anchor." "Puga," of course, also describes the "bobbing" motion. Hence "lin-pu-ga" is "the thing that moves up and down on the water." When the recorder pointed out some ships, the native would first notice the water ("lina"), and only on further prompting would he notice the things that moved up and down ("puga").

13. *Lag-wee = Walking.*

This is "laga-pe," "foot-action."

14. *Lo-ru-me-na = scratching.*

This is "lori" (finger) (H.L.R.) + "mena" (for "pena") (lance). "Lori" itself is "lag-ri," "the movable foot." H.L.R. gives "riena" for "hand" and also for "finger"; it means simply "the most agile members of the body," from "rene" "quick." "Lorimena" means "making a lance of the finger," which describes the operation of "scratching" very aptly. H.L.R. gives "larre" for scratch.

15. *Lee-na = Water.*

This is simply "lina," "the movable substance."

H.L.R. gives "lina" for "water" (v. No. 6).

16. *Ly-en-na = Water.*

H.L.R. gives "liena" for "water." The points of difference between "lina" and "lienna" are, that the latter has a diphthong, "ie," instead of a simple vowel, "i," and it has the suffix "na" (v. No. 8). This diphthong often indicates "not straight," the vocal flexion describing the local one; *e.g.*, ' rianna riacunna" (H.L.R.), "dance," means "varied motion + varied voice" ("kanna); "mina" or "pena," "stick" or "leg"; "miena," "knee" (H.L.R.), and "piena," "leech" (H.L.R.).

17. *Lod-the = tree's.*

The apostrophe as part of the sign of the English plural is usual in this list. *Lod-the* is simply "lotta," "Eucalyptus tree" (H.L.R.). The only sign of the plural in the Tasmanian speech is the reduplication of a word. "Lotta" is a contraction of "ligata," *i.e.*, "laga" ("foot") + "ta" (stationary). To the Aboriginal, a tree was a living thing, and its trunk was its foot, which was fixed to the spot.

18. *Lu-gu-na = leg's.*

This is the same as "lagana" (v. No. 11).

19. *Log-Wan-na = Wife.*

H.L.R. gives "lowanna" and "lowa," for "woman."

This is "lag-pen-na," "the nimble-footed" servant, who had to do all the work incidental to camp life.

20. *La-ge-na = salt.*

H.L.R. gives "legana" for "water." This is "lagana," "foot" in another aspect, the water "resting on the ground and moving at times." It is doubtful whether the Aboriginals used salt as seasoning. In the case of the present word, it is probable that when the native tasted the salt presented to him for nomenclature, he meant to say that it had the same taste as the sea-water, and therefore said "lagana," which the recorder took down as the native word for "salt." In the existing lists, quite a number of such natural misapprehensions can be traced. (H.B.R.)

21. *Le-bta-la = Hobart Town.*

This is "li-pa-tal-a," or, in full, "lina-palla-tagala"; that is, "water-big-walk," meaning "(the goal of) a long journey by water." With the primitive boats of the Aboriginals, it would be a long journey from Oyster Bay to Hobart.

22. *tha-gen-na = Hobart Town.*

This is simply "tagana," *i.e*, "a journey."

23. *Wag-ge-na = Hobart Town.*

This is "Pa(lla)-kan-a," meaning "the big talk," *i.e.*, the place where there is much noise, in contrast to the bush. "The big smoke" for "London" or any other large city, would be an analogous expression.

24. *Lun-na = House.*

H.L.R. gives "lenna" for "house." As the shelters of the Aboriginals consisted merely of some pieces of bark or wood brought to the spot, they were "movable" things, and "lenna" would express this idea (v. No. 6).

25. *Me-a-nen-qua = Will you live with me.*

This is "mena-nina-ka," *i.e.*, "I-you-talk," meaning "we keep company together." It is evident that if two people intended to talk to each other, they must remain near each other; especially as the Aboriginal "talk" largely depended on gestures.

26. *Me-yalla-cas-an-a-rea = talking.*

The "s" is clearly out of place in a word consisting of purely Tasmanian elements; it is therefore probably an error. If we read it as "n," we get "mialla-kan-ana-ria," which would mean "varied motion (v. No 16)-voice-hand-fingers," graphically expressing "speech aided and illustrated by gestures"

27. *My-yen-na = you.*

The common Tasmanian word for "you" is "nina," *i.e.*, "that thing," "the other person." The explanation of the word here given is suggested by "My-he-na = Body" (v. No. 31). The word is, in each of these cases, "miena," that is, "a thing that is or can be bent." H.L.R gives "miack" for "corpse," that is, "mien-k," the thing that was capable of being bent, but is so no longer, for "k" is the sign of "rejection" (H.B.R.). It is probable that H.W.M. pointed at a native and told him "This is you," and the native promptly said "This is my body"; whereat H.W.M. wrote: "miena = you" (v. No. 20).

28. *Mier-men-na = smooking.*

This is "mia-mina," *i.e.*, "bent-stick" and refers to the tobacco-pipe, to which H.W.M. may have pointed when telling the native that he was "smooking" (v. No. 20)

29. *Min-Man-a-wee-bob-ar-ree = fighting.*

This is "*mina-mina-pe-pa(lla)-pa(lla)-an(a)-ria*," that is, "stick-stick-active-big-big-hand-fingers," meaning "Stick is active against stick in a very great effort made with hands and fingers."

30. *My-ett-ta = five.*

This is "miatta," a variant of "matta," *i.e.*, "lump," meaning a "lump formed by bending the fingers"; compare the English "bunch of fives."

31. *My-he-na = Body.*

See No. 27. The emphatic "h" is characteristic of H.W.M.

32. *Mad-tha = privates.*

This is "matta" (v. No. 30).

33. *Mun-na = Mouth.*

H.L.R. gives "muna" for "lips" (v. No. 20).

34. *Mi-gun-na = Nose.*

H.L.R. gives "meuna" for "bird's bill." The standardized form of these words is "pe-kan-na," *i.e.*, "pointed (upper) jaw." The use of "beak" for "nose" is found in many languages.

35. *Min-gra-nith-ka = bad, or disagreable.*

This is "mina-karana or kanana-ka," *i.e.*, "I or my—mouth—(H.L.R.) rejects," because it is "disagreeable or bad" to my taste.

36. *Mi-hilk-a-la-ma = silence.*

This is "mial-kala or kana-pe," *i.e.*, "Sit down, or stop-talk-do, or make," meaning "make the talk take a rest."

37. *Ma-va-den-na = boat.*

This is quite unlike any Tasmanian word for "boat." If it were "pa-pata-na," *i.e.*, "big stamp," it might mean "boot"; the bare foot would make a "little" stamp. It is probable that "boat" is a mistake for "boot."

38. *Mou-thig-na = Eyes.*

H.L.R. gives "mongtena" for "eye." This suggests that the word is "mun-tigana" or "mun tena" (in contracted form), and means "mouth-heart" (v. No. 7), that is "a mouth-like opening that expresses feelings." "Mou-thig-na" may be an error for "Mon-thig-na."

39. *Nu-ge-na = stealing.*

This is probably a variant of "lugana," *i.e.*, "quick, nimble."

40. *Nu-ga-lantha = Possum.*

H.L.R. gives "neulaugta" for "opossum." This is "nuga or luga-lagata" (v. No. 17), meaning "nimble" on the "tree," which is characteristic of the opossum.

41. *Olumptha = Head.*

H.L.R. gives "ulumpta" for "head." This is one of the few words that have a vowel as initial. The rule of the consonantal initial is so generally observed, that it is reasonable to assume that in the case of the exceptions an initial consonant has been lost. Here, the original form may be "Wa-len-matta" or "Pa(lla)-len-matta," that is, "the big moving round-thing." (Compare the English idiom "pumpkin.") The characteristic point would be the "moving" or "movableness," and therefore "len" would be strongly accented, with the result that the first and third words would be slurred, and become "Wa" and "mta." The "w" would impress its character on the following vowel and make it "u"; thus "u-len-mta," and, by further assimilation and contraction, "ulumta."

42. *Oyster bay Waa = Oyster bay.*

"Oyster Bay" is obviously English. "Waa" is "Palla," "big" (v. No. 9). The locality is even now called "Big" Oyster Bay.

43. *Penin-na = Laughter.*

H.L.R. gives "peninna" for "laugh."

44. *Po-co-la = Bullocks.*

This confirms H.B.R.'s contention that this is a Tasmanian word, and not, as Jorgensen and his followers asserted, a variant of the English "bullock." It is "puga-la(ga)," that is, "the big thing (with) feet." The English plural forms given in this list, as in the others found in H.L.R., have no equivalents in Tasmanian speech. The Aboriginals had no abstract ideas, and the only way in which they could express plurality was by enumerating the individuals, that is, by repeating the name given to an individual. A striking instance is the word given for "ten," viz., "karde-karde," *i.e.*, "kata-kata," that is "five-five" (fingers). See H.B.R. See also No. 17.

45. *Po-eo-na = smoke.*

This is a misprint for "po-ee-na," *i.e.*, "poina," meaning "long" (pena) + "not straight" (oi diphthong, v. No. 16). The word means therefore "a curling column" (of smoke). (Compare No. 28.)

46. *Pa-matt-ta=potatoes.*

Fenton, in his History of Tasmania, quotes from Robinson's journal:—' Parmatter—potatoes" (p. 96). There is no native word for "potatoes" in H.L.R. The word is "pa(lla)-matta," *i.e.*, "big-round thing."

47. *Par-a-pel-a = Cook.*

This is "palla palla," *i.e.*, "very big (man)," referring either to the stature of a particular cook, or else to the cook's great importance for the comfort of the community.

48. *Pae-a-nu-bra = the Sun.*

This is a misprint for "palla-nubra," *i.e.*, "big eye" (H.L.R.).

49. *Per-ni-per-na = the Sun.*

H.L.R. gives "perenna" for "lance." Hence this word is "perenna-perenna," *i.e.*, "many lances" or "many beams" (of light), as seen when the sun shines through foliage or crevices in the wall of the "lenna."

50. *Pig-e-na = Hair.*

51. *Wig-e-na = Hair.*

These words are practically the same. H.L.R. gives the variant "poinghana" for "hair matted with ochre" (so as to form "sticks"). See H.B.R.

52. *Pa-gen-gun-ya = Horse.*

This is "Pa(lla)-kan-kan-ka," *i.e.*, "big-voice-voice-voice," meaning "the thing that repeats the same sound loudly"; this is a very natural description of a horse's "whinnying."

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53. *Par-a-wee = I want.*

H.L.R. gives "parrawe" for "to abstain," also for "to throw away." "I want," therefore, means here "I lack," and not "I desire." Norman gives "parra(r)wa(r)" for "go away." H.L.R. gives "pagra" for "woe's me," and "pakara" for "to fling." This last meaning explains the word: it is "pa-ka-ra," *i.e.*, propulsion + violent expiration + motion (of the missile). "Away" therefore covers all these meanings, and the final "wee," *i.e.*, "pe," is simply an emphatic repetition of the initial "pa." "Parawee," *i.e.*, "pa-ka-ra-pe," thus means "the thing that is away" (from me, to my sorrow).

54. *Pud-ka = fish.*

H.L.R. gives "pugale" and "pugra" for "to swim," where "le" and "ra" simply mean "motion." The word is therefore "pug-ra," *i.e.*, "the big thing that swims." As the "Native words spoke quick with a guttural sound' (H.W.M.), the native word might be written phonetically as "pudka" or "pukka" or "pugra," indifferently.

55. *Rung-wee = to run, or make haste.*

H.L.R. gives "rene" for "to run"; "rung" is a regular variant of "rene" (H.B.R.); "pe" is sign of emphasis (v. No. 53).

56. *Re-gun-na = Oyster.*

H.L.R. gives "lugana" for "oyster"; "reguna" is a regular variant of this. H.L.R. gives also "regana" for "basket" (used in gathering oysters) (v. No. 20). It is the same as "lagana," "foot," and means "alive, but resting on the spot" (v. Nos. 11 and 17.)

57. *Re-nea = hand.*

H.L.R. gives "riena" for "hand." It is a variant of "renea," and means "the moving member *par excellence*."

58. *Tta-van-ya = Cloathing.*

The doubling of the initial letter is clearly otiose; and the "v" is simply an error for "w." The standardized form of the word would be "tawanna," *i.e.*, "tagana." Norman gives "tuernar" (*i.e.*, "tugena") and "tuernarnar" (*i.e.*, tu(g)enana") for "clothing"; it means "moving off," *i.e.*, "the things that can be taken off" (v. No. 11).

59. *Ta-gar-a-ga = Crying.*

This represents another aspect of "tagana" or "tagara," viz., "the thing that falls down." H.L.R. gives "tagarena" for "tear," and "tagara-mena" for "to weep." The final "ga" is simply "ka," "voice." "Tagaraga" means therefore "weeping and wailing."

60. *Ta-Wal-a-wee* *Eating.*

This is "tagala" (or "tagana") + "pe," *i.e.*, "to go down-make," meaning "to put down" (food).

61. *Ta-ken-a-pee* = *to give me.*

This also is "tagana-pe," *i.e.*, "to lay down" ("for me to take"). This alludes to the practice, commonly observed among primitive races, of laying on the ground such things as are to be given to another individual, instead of passing them from hand to hand.

62. *Talla-Walla-Wa* = *Come heare.*

This is "ta(g)ala pallawa," *i.e.*, "walk (to the) big man," the "big man" (H.L.R.) being the "warrior" (Sergeant Montgomery).

63. *Tag-wee* = *go there.*

This is "taga-pe," *i.e.*, "move (your) foot." Compare Nos. 11 and 13.

64. *Te-bet-e-men-e-ana* = *go gather berry's.*

H.L.R. gives "telbete lebea" for "to eat heartily," also "lepina" for "neck"; "tel" is "tagala" (v. No. 62), "to go down"; "te" is "to stop." Thus "telbete lebea" is a form of "tagala-pe-te-lepina," meaning "to make go down to stop in the neck," *i.e.*, "to eat till you are full up to the neck." This accounts for the part "tebete." "Men-e-ana" is "me-ni-na," *i.e.*, "I-you-there." The whole phrase is therefore "(let) me and you (go) there to eat"; "there" meaning "a berry-bearing bush" (pointed out to the native).

65. *Tid-qua*=*Sugar.*

This is "teka" or "taga(na)," + "pa" or "wa," sign of emphasis; that is, "a thing to eat eagerly"; in standard form "tak-pa."

66. *Ti-er-id-ka* = *Ship.*

This is "tia-ri-taka," *i.e.*, "a heap or mass—swift-move"; meaning "a bulky thing that moves swiftly." As an alternative, "ri" may be taken in its meaning of "hand" or "arm" (v. No. 57). The phrase would then mean "a bulky thing with a hand (*i.e.*, an oar) (to enable it) to move." However, this would rather refer to a boat than to a "ship."

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67. *Tra-ban-na = Blankett.*

H.L.R. gives "teri" for "basket"; if "banna" is a contraction of "palla-na," the phrase means "a big basket," that is, "a wrapper" in which men lie as if in a "basket."

68. *Vestra = Star.*

The "s" is foreign to Tasmanian speech; "v" is also foreign, but it may be written for "w" (v. No. 58), and could then stand for "p." If H.W.M. pointed ("pe") to a "star," saying at the same time "star," the native would most naturally say "pe-stara," adding the usual final vowel, and laying stress on "pe," which word he knew, and slurring over "stara," which had no meaning to him; thus H.W.M. would get "we-st(a)ra," and write "vestra."

69. *Weig-tha = Moon.*

H.L.R. gives "wiggetena," "weetah," "weena," for "Moon." Our word, standardized, is "wig-ta," evidently a variant of those given by H.L.R.

70. *Wag-grun-na = teeth.*

This is "pag" (or "pug")-"rene-na"; H.L.R. gives the form "wughrinna" for "tooth." This would refer to the round or rather cylindrical things moving (with the lower jaw).

71. *Wood-tha = Bird.*

This is a variant of "mutta," which H.L.R. quotes as meaning "pigeon." "Mutta" is a contraction of "pugata," meaning "a round or plump thing." Perhaps the "mutton-bird" (sooty petrel), the export of which is the staple industry of the Tasmanian half-casts settled on the islands of Bass Straits, was originally the "mutta-bird," *i.e.*, the "plump" or "fat" bird; the description would be very apt.

72. *Wan-a-pack-a-la-lea = Work, or Labour.*

This is "P (lla)-na pakala lia." "Palla" or "pa lawa" is "man"; "pakala" is "bullock"; "li-a" is "moving." The phrase would then mean "to move (like) a human bullock." Regular work was distasteful to the Tasmanian aboriginal man, and he would naturally speak of it as fit only for inferior beings.

73. *Fa-cu-na = Rain.*

74. *pho-ca-nah = Rain.*

These words are clearly identical. H.L.R. gives "pokana" and "pogana" for "rain." This is "the round thing (*i.e.*, "drop") that makes a noise," viz., "pug(a)-kana."

75. *Pee-bid-ka* = *Thunder.*

H.L.R. gives the variant "poimettya" for "thunder." It is "pe(na)-matta-ka," *i.e.*, "lance-big mass-noise," and means "a (fiery) lance (followed by) a big mass (falling with) a noise."

In the final note, H.W.M. mentions the rapid, guttural diction of the Aboriginals, which H.L.R. also mentions. His explanation of thunder shows that he was eager to do missionary service. He was probably in error when he took that old native to refer to the Second Advent; as thunder is rarely heard in Southern Tasmania, and the memory of primitive people is short, that native probably meant to ask simply whether there would be more thunder soon, evidently considering H.W.M. to be able to tell him what was going on in the sky.

In conclusion, I submit that I have now established the genuineness of Mr. Beattie's record, and considerably augmented the force of the arguments I have urged in support of my theory on the nature of the language of the Aborigines of Tasmania.

NOTES ON THE SECTION AT ONE TREE POINT, NEAR HOBART. Plates iii. to ix.

By Fritz Noetling, M.A., Ph.D.

(Read July 14, 1913.)

1. Introductory Remarks.

More than thirty years ago Mr. R. M. Johnston, in a paper (1) read before this Society, pointed out the great geological interest of a section exposed on the western side of Brown's River-road, near One Tree Point. On the whole Mr. Johnston's observations hold good up to the present day, though some details have to be altered. Mr. Johnston has shown that we have here a volcanic rock of the Basalt-group overlying sedimentary rocks, which contain an abundance of plant remains. The most important of these Mr. Johnston sent to the late Baron von Mueller, who was able to identify them with species well-known from the auriferous drifts of Victoria. In itself this would be a most important fact, but the flora, according to the Baron's determination, is of such an extraordinary nature, that it would be almost unique, if his determinations could be accepted as correct.

Many years later Messrs. McLeod and White examined the Basalt, and came to the conclusion that it is a basalt in which Fayalite, the red variety of Olivine, has replaced the Augite and Olivine (2).

I have frequently studied this section, remarkable in more than one way, and I have come to the conclusion that it allows for an interpretation quite different from that given by Mr. Johnston. The main point on which I differ from him is of tectonical nature. Mr. Johnston thinks that the southern portion of the section has been thrown up, but a careful examination has convinced me that it is not the southern portion that has moved, but the northern one; further, there is not an up-throw of the

(1) Notes showing that the Estuary of the Derwent was occupied by a fresh water lake during the Tertiary Period. These *Papers and Proceedings*, 1881, p. 74.

(2) Notes on a Fayalite Basalt from One Tree Point.—These *Papers and Proceedings*, 1898-1899, page 77.

southern, but a down-throw of the northern portion. The ends of the leaf beds are turned upwards near the fault, and this admits of only one explanation, viz., that this part moved downwards in relation to the southern one. If this view be admitted, the interpretation of the section takes a different aspect at once, when we replace the down-thrown portion to its original level. I further noticed that the leaf beds of the northern portion are considerably thicker than those of the southern one. Therefore we must assume that, if the portions on either side of the fault originally formed one continuous layer, a considerable part of the leaf beds must have disappeared in the southern (remaining) portion. This observation holds good, whether the southern portion is thrown up as Mr. R. M. Johnston thinks, or whether the northern portion has slid down, as I opine.

The origin of the curious Breccia seems to me still somewhat doubtful. Mr. Johnston thinks it represents old landslips which fell in the "lake." There are, however, many objections to such a view, which I will set forth later on.

This section is perhaps the best illustration of the more modern geological history of Tasmania, and the sequence of strata, as well as its tectonical features, afford a wonderful mass of information regarding the latest phases of the geological evolution of Tasmania. I think it will, therefore, be advisable to describe first the section as it now stands, then to discuss its different members, and, lastly, to deduce those conclusions which seem to afford an explanation of the facts observed.

2. The Leaf Bed Series.

Though not exposed at One Tree Point, it is pretty certain that the lowest member of the whole series is a yellowish sandstone, but so far the contact of Sandstone and Breccia has not been observed (3). It may be that the latter rests immediately on the Sandstone, or that some beds of different, more argillaceous nature, intervene between the two. On the whole this is of little importance as far as the questions here discussed are concerned, if we always bear in mind that the Breccia does not form the base of the series.

(3) A little further towards Hobart a sandstone of yellowish colour appears from underneath the Breccia. There is no doubt that this sandstone belongs to the Leaf Bed series, of which it most probably forms the basal member. This question requires, however, further confirmation.

Mr. R. M. Johnston has already noticed that the leaf bed series as a whole, wherever they occur, are not found higher than about 40 feet above the present sea level, and from this peculiar deposition he concludes that, excepting for the south-easterly dip, the leaf bed series is practically in the same position as it was when it was deposited. He further assumes that the strata in question are of lacustrine origin, and in his first paper he draws a vivid picture of the "lake" filling up the Derwent estuary. Assuming that Mr. Johnston's hypothesis be correct, it requires—

(a) That the valley of the Derwent existed almost in its present shape previous to the deposition of the leaf bed series.

(b) That the strata deposited in this lake gradually thin out towards the hill ranges on either side.

The first proposition assumes that the deep canyon of the Derwent was completed to about the present day level in Pre-Eocene times (4). In other words, that the greatest portion of the Derwent valley is geologically of very old age (5). This is a very fascinating theory, but it mainly depends on the age of the leaf bed series. There is every reason to believe that the Tertiary strata of Australia are much younger than Eocene; in fact, it is more than probable that they are not older than Miocene. Naturally this would greatly reduce the age of the valley in which the lake was whose waters deposited the leaf beds. This is a question which cannot be decided for the present, and we have to leave it an open one, but I do not think that the Derwent valley dates back as far as the Upper Cretaceous period. As regards the second proposition, we should expect that the leaf bed series gradually gets thinner towards the shore line of the old lake, which naturally must be somewhere along the Mount Nelson ridge, for instance, on the western side. Though I observed the leaf bed series on the lower part of the new road to Mount Nelson, I have not been able to ascertain whether they comply with this requirement of the lake hypothesis or not. If anything can be said from the rather unsatisfactory outcrops it is this, that the thickness of the leaf beds is not reduced towards the hillside.

On the other hand, Mr. R. M. Johnston's own sections,

(4) For the sake of argument I accept the view that the Leaf Beds are of Eocene age, though according to more modern researches this view is no longer tenable.

(5) Accepting the present view of the Eocene age of the Leaf Beds and the hypothesis as to their origin, the Derwent Valley, at least that portion above the present sea-level, would be of Cretaceous age.

particularly his Fig. 2, the section opposite Sandy Bay Point, offer a most serious objection to his own hypothesis; leastways they are capable of quite a different interpretation. As shown by him in Figure 2, the leaf beds abutting against the Palæozoic rocks are bent upwards. Now, such an effect will never be produced during sedimentation; only a subsequent downward movement of the strata can produce such an effect. Mr. R. M. Johnston's Figure 2 plainly suggests the existence of a trough fault; that is to say, that the leaf beds were deposited at a much higher level than they are now, and that subsequently the whole mass moved downwards along two great faults, one of which is running approximately parallel to the Mount Nelson range, and that during this downward movement it was broken, the different pieces acquiring the southern tilt. Of course, if it can be proved that the leaf bed series are preserved in a trough fault, the "lake" hypothesis, notwithstanding its seductiveness, has to be abandoned. Before we decide we will have to make further investigations, and I refrain from expressing my opinion one way or other; for the purposes of this paper I accept Mr. Johnston's lake hypothesis, because the main results will not be affected by it. Should, however, future investigations prove that the leaf bed series rest now inside a trough fault, many of the seemingly incongruous features would easily explain themselves.

Mr. R. M. Johnston has already noticed that the leaf bed series have a very uniform dip towards south, and are traversed by a series of faults, which run apparently nearly parallel in north-west, south-eastern direction. These faults have produced a feature known as step faults; that is to say, while one end of the mass of rock remained stationary, the other moved downwards. In the leaf bed series apparently the southern end of the mass between two faults moved downwards, while the northern end remained stationary. I may point out that this is a feature frequently observed in strata preserved in trough faults; for instance, in the coal basins of Giridih, in Bengal.

3. Description of the Section at One Tree Point.

The sequence of the strata as seen in the above section is as follows (see Plate iv.):—

(a) Northern part.

(5) Vesicular Basalt, about 18 feet.

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(4) Leaf beds.

(b) Altered, 4 to 6 feet.

(a) Normal, about 90 feet.

(3) Breccia, about 12 feet.

(2) Leaf beds, normal, about 40 feet.

(1) Breccia, about 80 feet.

(b) Southern part.

iv. Humus, about 4 to 5 feet.

iii. Basalt.

(b) Normal.

(a) Vesicular.

ii. Leaf beds.

(a) Altered, about 4 to 5 feet.

(b) Normal, about 40 to 42 feet.

(c) Arenaceous, about 18 feet.

i. Breccia, about 130 feet.

The sequence of strata as given above shows that the two parts of the section north and south of the fault are somewhat different. The differences are slight only, and may not be material, yet they have to be noted.

The most important is the appearance of a Breccia bed in the lower portion of the leaf beds; where it reaches the surface it has a thickness of about 18 feet, but it very rapidly becomes thinner in the direction of the dip, and has probably died out completely before reaching the level of the road. This conclusively proves that though the deposition of the leaf beds was continuous, it was locally interrupted by layers of Breccia. In other words, the agencies which produced the Breccia continued to some extent during the deposition of the leaf beds, though on the whole it would appear that the Breccia is older than the leaf beds.

The leaf beds are overlaid by a fairly thick layer of vesicular Basalt, which is, however, of small horizontal extension, and rests unquestionably on altered leaf beds. The southern portion is somewhat obscured; the altered leaf beds form a conspicuous yellow band, which extends from underneath the Basalt up to the fault; above this are about five feet of leaf beds, which appear as if they had been worked up, and seemingly dip in northern direction; these are followed by a bed of humus appearing as a conspicuous dark band.

The remarkable feature is that the humus does not overlap the Basalt, but abuts against it, and the same applies to the worked up leaf beds. I shall have to deal with this feature presently. The southern portion appears to be more regular. Under a thick layer of Basalt which rapidly thins out in northern direction follows a layer of vesicular Basalt, which rests on altered leaf beds, of conspicuous yellow colour, of about 3 to 4 feet in thickness; below these are the normal leaf beds which get rather arenaceous towards the base, resting on Breccia of great thickness.

These leaf beds are again observed at sea level, about 40 to 50 feet below the main section, overlaid by massive Basalt, which is divided by a vesicular band (6).

4. Description of the Strata Observed.

A. *The Breccia.* (Pl. v. and vi.)

Mr. R. M. Johnston has given a most accurate description of this very rock, whose peculiar features he well noticed. It is "a motley assortment of coarse and huge angular blocks principally of the fossiliferous mudstone." This feature is exceedingly well shown in Plate vi.

Though without doubt the blocks of mudstone form far the majority, there occur many boulders of Diabase frequently of large dimensions (See Plate v.). These boulders are always well rounded, and thus sharply contrast with the angular blocks of mudstone. The boulders are imbedded in an argillaceous, somewhat gritty matrix.

At the northern portion a mudstone boulder of fairly large size is deeply pressed into the underlying leaf beds. (See Plate vi.). The dark lines of stratification seen in the white leaf beds closely follow the contour of the boulder, and this proves conclusively that it must have pressed into the leaf beds while these were still in a plastic state.

I have been greatly puzzled as to the origin of this Breccia. It unquestionably closely resembles a moraine produced by the action of glaciers, and I think that under other circumstances nobody would hesitate to consider it of glacial origin. On the other hand, no scratched boulders have so far been found, and I cannot quite imagine how a glacier could have passed over beds which were unquestionably in a soft and pliable state (7)

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(6) To judge from Mr. Johnston's figures the Breccia could be observed at sea-level in 1881. During my visits the Breccia was not visible, being covered under a layer of debris.

(7) Unless they were frozen hard.

without disturbing them further than pressing a boulder into the top layer. Mr. R. M. Johnston thinks that the Breccia represents the debris of landslips that fell into the "lake." This is a very fascinating theory, and looks very convincing at first, but on closer inspection there are many objections to it. To begin with, there are certain reasons against the lake hypothesis, but I will let that pass (8). The main objection to the landslip theory is the composition of the Breccia; how is it possible that in a debris produced by a landslip well rounded boulders are mixed with angular blocks? In all the landslips I have seen in the Himalayas the debris consisted of sharp angular fragments, which were, moreover, never imbedded in a matrix as seen at One Tree Point. Further, if the landslip fell into the water one should assume that the action of the waves started at once the process of sifting. Instead of preserving its present appearance, where blocks of all sizes are irregularly mixed up, the heavier blocks would have eventually settled towards the bottom, leaving the lighter ones near the top. In fact, I cannot imagine how an entirely unstratified mass remained as such in the water for any length of time. And, again, if the mass of debris fell from above, how is it that only one solitary block has been observed to be pressed into the underlying strata, which were, as it must be kept in mind, in a pliable state when the Breccia was deposited? If such a mass of debris, as shown in Pl. vi., fell on the top of a soft mud one should imagine that numbers of the hard boulders became imbedded in it. But though some large boulders were within an inch or so from the top layer of the leaf beds, they were not pressed into it, as is well seen in Plate vi. The whole appearance of the leaf beds and Breccia proves that the deposition of the latter on the top of the former must have been a quiet, rather than a violent, process. Further, the Breccia layer in the middle of the leaf beds in the northern portion becomes thicker towards north; that is to say, towards a direction where there were no cliffs from which the debris could have fallen, though I would not lay too much stress on this. Taking everything into consideration, this "landslip" hypothesis affords, therefore, such a lot of difficulties, that it is no longer tenable.

For the present I am unable to replace it by any other theory, and the origin of the Breccia is still a problem. If we could conclusively prove that it were a

(8) See above page.

moraine, many of the present difficulties would disappear. One of the chief arguments against the moraine hypothesis is the present position of the leaf bed series, but were the view that the leaf bed series rest in a trough fault, that is to say, are now in a lower position than they were originally, correct, one of the chief objections against the glacial origin of the Breccia would disappear.

B. *The Leaf Beds.*

The leaf beds represent a series of finely laminated clay of whitish colour, which towards its base on the southern section becomes somewhat arenaceous. When exposed to the air the leaf beds soon crumble away, and this unfortunately renders the preservation of the fossil remains most difficult (9).

Mr. R. M. Johnston has given a large number of figures of plant remains collected by him, and described by Ettingshausen and von Mueller. The association of this flora is rather a curious one; next to such genera like *Betula*, which occurs in cold and Arctic climates, or *Fagus*, which is essentially a genus preferring a cooler climate, or *Quercus* and *Salix*, also genera existing in temperate cooler zones, we have in *Cinnamonum*, *Sapotacites*, or *Cassia*, genera of essentially a tropical nature. It is very difficult to accept such conflicting evidence as final, and considering the very unsatisfactory state of preservation, I cannot help thinking that somewhere a mistake has been made (10.)

If it could be shown that the tropical genera have been erroneously determined as such, and that only genera indicating a cool climate occur, the theory of the glacial origin of the Breccia would gain considerable support. In that case the leaf bed series had to be included in the

(9) At the same time it is pretty certain that a good many of the leaves were fairly macerated when they became deposited in the silt.

(10) During the discussion that followed the reading of this paper Mr. Rodway remarked that at that time when Ettingshausen determined these leaf-remains, phyto-palæontology was in rather a backward state, a remark with which I heartily agree. When I remember the unsatisfactory state of our knowledge of fossil plant remains, even as late as the end of the seventies or the beginning of the eighties, and when I consider the great progress made since, it is more than probable that Ettingshausen's determinations are more or less wrong. Mr. Rodway stated fossil leaves were usually given the names of those recent genera with which they had a general resemblance, a practice which is entirely wrong, because, without the knowledge of the fruits or blossoms, which are far more important than the leaves, the determination must always remain doubtful. I think that every palæontologist will agree with this, and that the many incongruities resulting from determining the geological age of a series of beds from plant remains alone result only from wrong identifications of such remains.

Pleistocene, and the Basalt would be of Post-Pleistocene age. This view would much better agree with observations made along the north coast of Tasmania. I have repeatedly expressed the opinion that the view of the Eocene age of the fossiliferous beds near Wynyard is erroneous. In a subsequent paper I will show that these beds are most probably contemporaneous with the stanniferous drifts. Considering that Mr. R. M. Johnston identified one of the leaves found in the Wynyard series with one of the most common ones of One Tree Point, viz., *Sapotacites oligoneuris*, the synchronism of the leaf beds in the Derwent valley with the Wynyard beds can be taken as an established fact. Granting this, the leaf beds are of Pleistocene age, and another objection against the glacial origin of the Breccia would disappear.

On the other hand, if it could be proved that the genera indicating a cooler climate were wrongly determined, and the flora were really one indicating a warmer climate, the glacial origin of the Breccia would not be quite disposed of, because it would be quite possible that instead of one glaciation only there were several alternating with warmer periods, as in Europe and Northern America. This is a view that must not be entirely overlooked. For the present this question must be held in abeyance till a revision of the determination of the flora has been made, but on the whole I am inclined to think that the final verdict will be to consider the leaf bed series as of Pleistocene but not of Eocene age.

C. *The Basalt.*

(Pl. vii., viii., and ix.).

The Basalt overlying the sedimentary rocks shows some peculiar features. In the first instance it must have had a rather low temperature when erupted. This is conclusively proved by the small alteration or metamorphism the leaf beds sustained. Nowhere has any evidence of fritting been observed; all the alterations produced are a change of colour from white into yellow, and even this is not always maintained. The low temperature of the Basalt is further proved by the small alteration of the included fragments of rocks through which the magma broke. This frequency of inclusions is another peculiar feature; some of these are of large size, but unfortunately they have so far not been examined. Mr. Johnston incidentally mentions that they consist of fragments of the "surrounding stratified rocks." Now, though I carefully searched for fragments of the Palæozoic mudstone, I failed to find them. On the other hand, fragments of schistose rocks, which do not occur anywhere near, are most numerous. This seems to indicate that the magma only broke through beds belonging to the Pre-Cambrian schists (11). Probably the explosions preceding the eruption completely shattered the overlying Palæozoic strata, and when eventually the eruption of the magma took place it only filled the cauldron-like cavity produced by the explosions, enclosing and enveloping only rocks from greater depths. The examination of these inclusions is another problem that awaits solution, and probably much information as to the composition of the strata in greater depth may be gleaned from it.

Another feature of the Basalt is its absence of columnar structure (Pl. vii.); instead of the customary columns the Basalt is massive, and rather inclined to part in horizontal layers. This peculiarity makes it appear as if there had been several eruptions producing different flows. Of these I have not found any evidence; the Basalt presents the appearance of one produced by a single eruption. Sometimes it shows a vesicular appearance, particularly in contact with the underlying strata. But such a layer of vesicular Basalt right in the middle of the massive one is also seen at the southern end of the section. I attribute it to a particularly strong percentage of water in this particular part of the magma, but it must not be taken as proof of several eruptions (12). Even a casual examination proves that enormous masses have been removed, and that what we see now forms only a small portion of the original mass. The Basalt eruption at One Tree Point was therefore not a fissure eruption, but is produced in harmony with other occurrences by a single eruption of a cone-like mass, of which now a small portion along its western edge is preserved. (Pl. viii.).

Messrs. McLeod and White made a chemical and microscopical examination of this Basalt, and have proved the complete absence of magnesia. They have further shown that the small red grains represent the red variety of Olivine, Fayalite; Augite, according to the authors, is

(11) This would indicate that in the Derwent Valley the Permian series most probably rests directly on Pre-Cambrian Schists.

(12) In the great Basalt stream flowing from the plateau of the Dscholan down the valley of the Yarmuk numerous layers of vesicular Basalt can be observed in the massive portions. These layers, which start as suddenly as they die out, are, in my opinion, due to local development of steam.

also absent. Accordingly the rock is considered a Basalt in which Fayalite has replaced Augite and Olivine. Whether under these conditions it is correct to term this rock a "basalt" appears somewhat doubtful to me, particularly when we consider that it greatly differs in its structure from the true Olivine Basalt. However, it would be confusing to introduce a new name, and until the terminology has been revised, I prefer to use the name Basalt.

Mr. R. M. Johnston states that he obtained some bones and teeth probably belonging to a small marsupial related to *Hypsiprymnus* in the cooling joints of an older sheet of Basalt. I have shown above that we have no reason to suppose that there was more than one eruption, and the probability that these bones are of much later age, and were washed into a cooling joint, has to be taken into serious consideration. As at the same time these bones are very poorly preserved, and do not allow for determination, except a vague resemblance to a family of marsupials, they might as well be left out altogether.

But if the possibility that the bones became subsequently washed into the cooling joints could be finally disproved, and Mr. Johnston's view become an established fact, the presence of the modern genus *Hypsiprymnus* would speak for a very recent age of the Basalt, and severely shake the opinion of its Eocene age.

5. Tectonical Features.

(Pl. iv., viii., and ix.).

A careful examination of the strata shows that the leaf beds of the northern portion are slightly bent upwards where they abut against the fault. This is conclusive proof that there is no overthrow, as Mr. R. M. Johnston assumes; but that the northern portion has slid down along the fault. Therefore, if we wish to know the position of the strata before their dislocation we must lift the northern portion for about 80 feet, and place it back in its original position.

I have attempted such a reconstruction on Plate ix., but we see that if the sunken portion is lifted and replaced in its original position a fresh difficulty presents itself. It has been shown that the total thickness of the leaf beds is much smaller in the southern than in the northern portion. Therefore, if the leaf beds of the northern portion are really the continuation of those of the southern one, a considerable portion of the latter must have been destroyed, and are now replaced by Basalt (13).

This is quite in harmony with the facts of volcanic activity. Before the eruption of the magma took place a considerable portion of the overlying strata is blown off by explosions. It is very probable that the peculiar mass of leaf beds above mentioned represents a portion of the destroyed leaf beds which fell back.

As the isolated patch of vesicular Basalt observed in the northern portion moves to a higher level than it is now, the boundary line between Basalt and leaf beds must have risen very rapidly towards north.

This indicates the former existence of a cauldron-like hole, which was subsequently filled with Basalt. In other words, the Basalt formed originally a cone, a great portion of which was subsequently destroyed.

We can now trace the history of the events which eventually resulted in the present features with the greatest accuracy, but for the moment we will refrain from expressing a view as to the geological time when they took place. In order to make the sequence of events clearer, we will not work backwards in descending order, but work upwards from the earliest event we are able to trace. On the supposition that Mr. R. M. Johnston's lake theory is correct, and that the leaf beds are practically in the same position now as they were when deposited, we have the following sequence of events:—

1. The formation by erosion of the Derwent estuary to nearly its present depth. This was followed by the formation of shore deposits, beginning with

2. Sandstone, followed by the deposit of

---

(13) I may be permitted to point out still another difficulty; supposing that the amount of the downthrow is more than 80 feet, in other words, that the northern part of the section does not represent the direct continuation of the southern one. This would naturally mean that the portions of the section on either side of the fault are not contemporaneous, as he assumed, but that the southern portion is older than the northern one. In an undisturbed section we would have, then, the following sequence:—

(7)	Basalt.	Northern portion.
(6)	c Leaf Beds.	
	b Breccia.	
	a Leaf Beds.	
(5)	Breccia	
(4)	Sandstone (?)	
(3)	Leaf Beds.	Southern portion.
(2)	Breccia.	
(1)	Sandstone (?)	

In this case the mass of strata removed above those that are now to be seen would be far greater than here assumed; all the strata, (4), (5) and (6), and a great part of (3) would have been destroyed.

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3. Breccia (a period of intense denudation), and terminated by the deposition of

4. Well stratified leaf beds. (The agencies producing the Breccia must have continued during the formation of the leaf beds, because layers of Breccia are intercalated in the leaf beds.)

5. Pause in the deposition of sedimentary rocks, during which the leaf bed series (including all the beds from 2 to 4) were laid dry. (It is very probable that during this process the leaf bed series acquire the remarkable regular dip towards south.)

6. Partial destruction of the leaf beds by volcanic explosions, followed immediately by the eruption of Basaltic magma of probably very low temperature.

7. Dislocation of the leaf bed series and the overlying Basalt by faults striking in an approximate north-western direction, and having a northern dip, going hand in hand with the destruction of the Basalt cone.

8. Period of extensive denudation and erosion of the bed of the Derwent below the present sea level. (Sea level lower than at the present day.)

9. Deposition of arenaceous beds on Basalt at Droughty Point.

10. Rise of sea to its present level. (Partial filling up of the Derwent valley with sea water.)

11. Formation of hill wash consisting of volcanic debris, ashes, etc., representing the present day soil.

12. Formation of shell deposits by the aborigines.

13. Present day deposits.

All these events can be traced with the greatest accuracy, and they must have followed each other in the above order. There can be not the slightest doubt that the period during which the Breccia was deposited in the lower parts of the Derwent valley must represent a period of most active denudation in other parts of Tasmania. Great masses of angular debris of sedimentary rocks mixed with well rounded blocks of Diabase were quickly moved and redeposited at convenient places. This period of great activity was followed by one of comparative rest, during which a fine silt was deposited which preserved the impression of delicate leaves floating about in the water. Occasional relapses of the former energetic denudation must have occurred, however, during this period, resulting in the deposition of Breccia beds between the well stratified leaf beds.

The climatic conditions of this period must have been different from those prevailing at the present day, because the list of plants given by Mr. R. M. Johnston would indicate a somewhat milder climate than that of the present day. However, as I pointed out above, the determinations of the species are not beyond doubt. One fact, however, appears to be certain, the annual rainfall must have been much heavier than it is now during the time the Breccia was deposited.

It is impossible to say anything as to the length of the period that lapsed after the leaf series had been tilted up and the outburst of volcanic action. In all probability it was not very long, however.

It further appears that the destruction and denudation of the newly-formed Basalt cone commenced no sooner than it had been built up. This destruction must again have taken place during a time of most energetic denudation. The River Derwent cut its channel right through the leaf series, probably deep into the underlying Permian beds. Simultaneously the whole series was broken by faults; the latter tectonic movements do not appear to have been very energetic, and they probably ceased very soon, while the denudation of the Basalt cone continued. Until the exact extent of the former cone is known, it is impossible to form an idea as to the quantity of matter removed, but it must have been of great magnitude, because what is seen to-day represents only a very small portion of the original bulk. (Pl. viii.). It is, further, probable that the process of active denudation came to a standstill when the level of the sea discontinued to recede, and a movement in the opposite direction set in. By this movement the valley of the Derwent became filled up to its present level; in fact, it almost appears as if it had been higher still. The data for this hypothesis are, however, very insufficient, and I do not wish to say more on this point.

6. The Age of the Leaf Bed Series and the Basalt.

Mr. R. M. Johnston, when speaking of the leaf bed series in his Geology of Tasmania, refers it to the Tertiary period generally, but on page 261 he states that in one of the leaf specimens of the *Turritella* group, near Wynyard, he recognised the well-known form *Sapotacites oligoneuris* Etting, which occurs in the leaf beds of the Derwent, notably at One Tree Point. Mr. Johnston, therefore, thinks that the infrabasaltic leaf beds belong to the Palæogene, and as he considers the fossiliferous beds of Table Cape to be of Eocene age, we must infer that he attributes the same age to the leaf bed series of the Derwent valley. Under these circumstances the erosion of the old Derwent valley in which the leaf bed series was deposited must have taken place in Pre-Eocene times; in other words, it would date back as far as the Cretaceous period.

More recent researches, particularly of Victorian geologists, have conclusively proved that Tate's views as to the Eocene age of the Australian Tertiary Beds are no longer tenable. All the Tertiaries of Australia are much younger; in fact, it appears very doubtful whether the Eocene is represented at all in Australia. It is more than probable that the Table Cape beds are of much younger age than hitherto assumed, and consequently the leaf beds of the Derwent are much younger than Eocene. If my views are correct, they cannot be older than Pleistocene, and we need not assume a Pre-Eocene erosion of the Derwent valley if, as I believe, the leaf bed series were at the time of their deposition in a much higher level than they are now, and only came to their present position by a downward movement which immediately preceded the eruption of the Basalt.

The Post-Pleistocene period represents, therefore, the time during which the leaf bed series were raised from the water, and it is probable that eruption of the Basalt took place during the same period, though it is by no means improbable that the latter is somewhat younger. The period following the eruption of the Basalt was a time of extensive denudation which destroyed an enormous portion of the Basalt cone and a large portion of the leaf beds. During the same period the Derwent valley was scooped out. As the sea level was then at its lowest, or nearly its lowest, this stage must represent the time when Tasmania was connected with the mainland of Australia. Towards the end of the Pleistocene, long after the glaciers had disappeared, a gradual rise of the sea level commenced, but previous to final separation from the mainland the present flora and fauna had settled in Tasmania. The remains of the former fauna were a few isolated specimens of gigantic marsupials which found a haven of refuge in Northern Tasmania, where they died out before they had time to spread. The last to follow were the aborigines, and very soon after their arrival the rising sea had completely severed Tasmania from the mainland.

The above results have been summarised in the appended table, which, however, requires a few words of explanation. Though the actual sequence of the strata is beyond doubt, the age attributed to the different beds is open to dispute. It all depends on the age of the leaf bed series. As far as this is concerned, one fact is certain, that it does not belong to the Eocene epoch, and we need not attribute a Pre-Eocene age to a pre-leaf bed Derwent valley. Even if my view as to the Pleistocene were not correct, the leaf beds are not likely to be older than Miocene.

PLATES.

iii. General view of One Tree Point.

iv. Section at One Tree Point.

v. Diabase boulder in breccia.

vi. Breccia and leaf-beds—boulder pressed into leaf-beds.

vii. Basalt overlying the leaf-beds.

viii. Section at One Tree Point.

ix. Partial reconstruction of One Tree Point Volcano.

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<tr><th>Geological Stages.</th><th>Deposits.</th><th colspan="2">Fauna and Flora.</th><th>Climate.</th><th>Sea-Level.</th><th>Geological Agencies.</th><th>Tasmania's Connection with the Mainland of Australia.</th></tr>
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<tr><td>Aryan and Tasmanian Races, 1803—1878.</td><td rowspan="2">Gradual rise of Sea-level.</td><td rowspan="2">Tasmania connected by narrow isthmus with Australia.</td></tr>
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<tr><td>Peat-deposits of N.W. Tasmania.</td><td colspan="2">Extinction of the Gigantic Marsupials.</td><td>Moderately Cold.</td><td>Formation of present Derwent Valley.</td></tr>
<tr><td rowspan="4">Pleistocene or Glacial.</td><td>Fayalite-Basalt.</td><td colspan="2">Marsupials. (?)</td><td>Temperate (?)</td><td rowspan="4">Gradual rise of Sea-level, which probably reached its highest point during the deposition of the leaf-beds.</td><td>? (Perhaps same as before).</td><td rowspan="4">Tasmania forms an ice-clad island in an Antarctic Ocean. Lat. of Tasmania about 70°</td></tr>
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<tr><td>Breccia.</td><td colspan="2">?</td><td>Arctic.</td><td>Period of most energetic denudation.</td></tr>
<tr><td>Sandstone.</td><td colspan="2">(Perhaps same as above).</td><td>(?)</td><td>Denudation.</td></tr>
</table>

SOME AUSTRALIAN BRACHIOPODS

By F. Blochmann,

Professor of Zoology in the University of Tübingen

(Communicated by W. L. May)

Plates x.-xii.*

Read 8th September, 1913.

The following Paper was sent by Professor Blochmann to Dr. J. C. Verco, of Adelaide, who translated it, and sent it to Mr. W. L. May, by whom it is communicated to the Society.

The specimens of *Terebratula* (*Liothyrina*) *fulva* and *Argyrotheca* (*Cistella*) *Mayi*, described below, were taken by Mr. May on 26th March, 1910, during a dredging trip of the Tasmanian Field Naturalists' Club. (*See Tasmanian Field Naturalists' Club Report on Easter Camp-Out, 1910, to Cole's Bay, Freycinet Peninsula, East Coast, Tasmania.*)

Dr. Verco, of Adelaide, who presented to me some time ago a fine collection of Australian Brachiopods, sent to me at the beginning of this year a number af Brachiopods, which were collected by Mr. W. L. May, of Forest Hill, Sandford, Tasmania, on the Tasmanian Coast. This material, for which I on this occasion heartily thank both these gentlemen, contains, besides two new species, complete and well preserved examples of the species *Terebratula* (*Liothyrina*) *fulva*, created by me in 1908, which was known hitherto only by one single empty shell, obtained by the Challenger expedition from Twofold Bay, on the South-East Coast of Australia. By means of the examples now lying before me, the specific independence of this Australian Terebratula, created by me, is quite certainly established. I give now a complete description of this species, and add thereto descriptions of the other two new species.

1. Terebratula (Liothyrina) fulva, Blochmann.

(Plates x., xii., fig. 1-6, 12a, 12b.)

(*T. uva*, Broderip p.p. Davidson, Chall. Rep. p. 31, Pl. ii., fig. 3, 3a, 3b. *Liothyris uva*, Broderip p.p. Davidson, Rec Brachiopoda, p. 10, Pl. 11., fig. 7. *Liothyrina fulva*, Blochmann, 1906, Zool. Anz. xxx., p. 698, and 1908 Zeitschr. f. Wiss. Zool. Bd. xc., p. 617, Pl. 38, fig. 22a, 22b, Pl. 39, fig. 26.)

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*The plates are from photographic prints supplied by the author. The prints were damaged before they reached the Society, and in consequence it has not been possible to produce clear plates.

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In outline, slender to broad pearshaped, broadest in the middle. Beak short, with slightly pronounced edges, moderately sharply curved dorsalwards. Deltidial plates touching each other. Lateral edges in the neighbourhood of the hinge with a weak convexity directed dorsalwards, otherwise straight. Ventral valve, somewhat deeper than the dorsal; both equally arched. Growth-striæ invalid. Colour, pure white, very transparent. The Brachial apparatus of both the new exmples (fig. 1, 5, and 6) corresponds essentially with the characters of the Challenger example. In the shell illustrated in fig. 6, the bridge of the Brachial apparatus is somewhat more strongly bent ventralwards, and at the front edge somewhat more excavated than in the Challenger specimen. (The peculiar yellowish colour of the Challenger example has arisen, as the present fresh shells show, through some circumstance after death of the animal.) The number of pores of the one example (fig. 1 and 2) amount to 136, of the other (fig. 3 and 4) to 104, in the Challenger example to 120-130. The inner surface of the shells shows the presence of mosaic, which is found in most of the Liothyrina, as illustrated by me for *L. vitrea* (1908, Pl. 37, fig. 15). *T. fulva* has no cirri bases, and in both rows of cirri slender spicula. (As the examples at my disposal are dry, the spicula of the arms are partly broken, and also somewhat out of position. I am, therefore, unable to give a good illustration.) The headplates on the dorsal side of the sidearms in the back half are stout, and plentifully branched, and fairly thickly thorned, but in the front half small, with few slender extensions, sparingly thorned. In the body-wall, particularly in the dorsal part, are found stout strongly thorned plates, differing somewhat in formation, in the two examined examples (fig. 12 a and b). The mantle contains only in the course of the sinus, and nearly to the extreme ends of the sinus-branches, simple fine spicula; on this account the course of the sinus, in dry examples, stands out very distinctly.

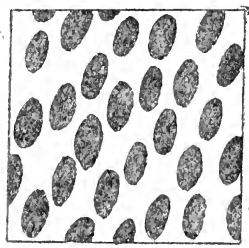
Dimensions of the two illustrated examples in millimetres.

	Fig. 1 and 2.	Fig. 3 and 4.
Length	17·0	15·0
Breadth	11·5	12·0
Thickness	9·0	9·0

Habitat, 3 miles east of Schouten Island, on the East Coast of Tasmania. Depth 73 m. (40 fathoms). This locality is about 500 km. distant from Twofold Bay, where the Challenger example comes from. It may consequently be assumed that this species extends to the South and the South-East Coast of Australia.

2. TEREBRATELLA MAYI, n. sp. (Plate xi., fig. 7, 8, 9.)

A small kind, nearly as long as broad. Greatest breadth in the middle. In the front half of the dorsal valve a faint median sinus. Growth-striæ distinctly to strongly developed. Ribbing slightly pronounced, and quite absent on the older parts of the shell. Beak, in young examples with faintly, in older ones distinctly, developed edges. Deltidial plates in the illustrated example touching each other. In the largest example (from which fig. 9 is derived) they are separated, which possibly results from absorption in the dead shell. The Brachial apparatus is not completely preserved in any of the examples (only empty shells are displayed), yet they show, as we can conclude from the remnants, the characters of *Terebratella dorsata* (fig. 9). There is a high median-septum developed, which is connected at the back with the hingeplate. At the point where the connection of the descending limb reaches the septum, this subsides, curving gently towards the front, to end rather far in front of the middle of the valve. The described general characters of the shell would, apart from its small size, hardly suffice to permit a definite distinction of the present species from *T. dorsata*. Nevertheless, the characters of the pores provide clear distinction.



Terebratella mayi—outer surface of the middle part of the dorsal valve (106 ×, 9 sq. mm.)

The number of pores in the sq. mm. amount to 300 (in *T. dorsata*, 180-212). The inner diameter of the shell tubes is 15μ., and the outer oval opening of the same measures 60/35μ.

Dimensions in millimetres.

	Largest example.	Example figs. 8,9.
Length...	12·0	10·5
Breadth...	11·0	9·3
Thickness	6·0	5·5

Habitat, off Cape Pillar, Tasmania, at a depth of 180 m. 100 fathoms).

3. Argyrotheca (Cistella) Mayi, n. sp. (Plate xi., fig. 10, 11.)

Outline, nearly rectangular, broadened more or less towards the front, so that the outline is nearly triangular. The front edge is slightly indented. Both valves have a slight median-sinus. Hinge line nearly straight. Dorsal-valve is perforated. Beak very short and broad; beak edges sharp. Adjoining these towards the middle is a flat area. Stem hole very wide, bordered on the side by very narrow deltidial plates, and in front by the edge of the hinge. The ventral valve is quite flat, the dorsal a good deal arched. In the ventral valve a moderately high median-septum reaching beyond the middle. In the dorsal valve a median furrow, bordered on the sides by a low ledge, sinks down from the hinge border nearly to the middle of the valve. Where the furrow ends a high, thick, median-septum arises, reaching quite to the edge of the valve, and the base resting upon the valve is about double the length of the free edge. The crura are short and broad, with pronounced crural prolongations. The descending limbs attach themselves, after a short course, on the inner surface of the valve, and disappear. On each side of the lower part of the side surfaces of the septum arises a small band descending to the surface of the valve, a remnant of the arm-loop. Number of pores in the sq. mm. about 200. Diameter of the outer opening of the shell-tube, 15-17 μ.

Dimensions in millimetres.

Length	2·5
Breadth	2·0
Thickness	1·0

Habitat, about 18 km. (10 miles) east of Schouten Island, East Coast of Tasmania. Depth, 145 m. (80 fathoms). Only empty shells were obtained. This species is certainly distinct from the *Argyrotheca (Cistella) australis* (Trans. Roy. Soc. S. Aus., Vol. xxxiv., 1910, Pl. xxvii., figs. 10-12), formerly described by me, also from all other known species.

NOTE ON STRZELECKI'S DETERMINATIONS OF HEIGHTS IN TASMANIA.

Messrs. Giblin, Piesse and Hutchison, in their paper on the Height of Ben Lomond (ante, pp. 5-14), refer, at p. 13, to Count Strzelecki's determinations of the heights of several summits on Ben Lomond.

Count Strzelecki, in 1841, determined many heights in Tasmania. These were published in the *Tasmanian Journal*, i., 147-9, and afterwards in the work quoted on p. 13. These heights, though determined with great care by the use of Gay Lussac's syphon mountain barometers and Wollaston's boiling point apparatus, differ considerably from the heights found subsequently in the trigonometrical survey.

The following note from these *Papers and Proceedings* for 1849 (i., 168) is therefore of some interest: —

13th June, 1849. "Sir William Denison stated that the "instruments used by Count Strzelecki, and since purchased "by Government, have been found very faulty—a fact which "may account for some obvious errors in the elevations re-"corded by that gentleman."

THE FOUNDATION AND EARLY WORK OF THE SOCIETY; WITH SOME ACCOUNT OF EARLIER INSTITUTIONS AND SOCIETIES IN TASMANIA.

(Plates xiii. - xx.)

By E. L. Piesse, B.Sc., LL.B.,

Honorary Acting Secretary.

(Read on 13th October, 1913, at a Meeting held in celebration of the Seventieth Anniversary of the Society.)

The completion of the seventieth year of the Royal Society of Tasmania is a fitting occasion for an account of its foundation and early work. If not the oldest scientific society in Australia, it is at all events the only one whose work and publications have been unbroken for seventy years (1); and the circumstances of its origin will be of interest to many besides its present members.

Scientific societies and institutions existed in Tasmania many years before the foundation of our Society. Some account of them and of their work, and particularly of those with which the origin of the Society is connected—the Colonial Gardens, the Mechanics' Institution at Hobart, the Tasmanian Society, the Franklin Museum at Ancanthe (Kangaroo Valley), and the Hobart Town Horticultural Society—will be an appropriate introduction to the narrative of the foundation of the Society.

I.—EARLIER SOCIETIES AND INSTITUTIONS.

The Van Diemen's Land Agricultural Society (1821).

The earliest Society having objects akin to those for which our Society was established was the Van Diemen's Land Agricultural Society, founded at Hobart in 1821 (2). The principal object of this Society was to put down sheep-stealing, but it was also concerned with the improvement of the husbandry of the colony. Governor Sorell was the President, and after him Governor Arthur. It is mentioned in the almanacs from 1824 to 1829, in which year the next Society to be mentioned, the Van Diemen's Land Scientific Society, was formed.

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(1) The only scientific society in Australia which claims an earlier origin than our Society is the Royal Society of New South Wales. It is commonly said that the latter Society originated in 1821 as the "Philosophical Society of Australasia." This Philosophical Society has not been traced after 1825. It is considered to have been revived in 1850 under the name "Australian Philosophical "Society." This also fell into decay, but was revived in 1856, under the influence of Sir William Denison (see note 57), as the "Philoso-"phical Society of New South Wales," which in 1866 became the present Royal Society of New South Wales. The earlier societies had no publications of their own; the Transactions of the Philosophical Society of New South Wales date from 1862. (See Rev. W. B. Clarke, Inaugural Address, *Trans. R.S., N.S.W.*, i. (1867), p. 1; Professor John Smith, Anniversary Address, *Journal and Proceedings R.S., N.S.W.*, xv. (1881), p. 1; J. H. Maiden, Presidential Address, *ib.*, xlvi. (1912), p. 1.)

(2) Curr, *An Account of the Colony of Van Diemen's Land* (London, 1824), p. 89. *Hobart Town Gazette and Van Diemen's Land Advertiser*, 5th January, 1822. W. C. Wentworth. *A Statistical Account of the British Settlements in Australasia* (London, 1824), ii. p. 58. At pp. 106-112 of the last work is an extract from a presidential address to the Society, in which a comparison is made of the relative advantages for immigrants and the stock-industry of New South Wales and Van Diemen's Land—between which settlements there was at the time great jealousy and rivalry.

1913.

The Van Diemen's Land Scientific Society (1829).

The *Hobart Town Courier* of 12th December, 1829, announced the formation of a Scientific Society in Hobart. in the following paragraph:—

"We have great pleasure in announcing that a very use-"ful society is now forming, called the Van Diemen's Land "Society. It is to be constituted, we learn, in imitation of "the Royal and other literary and scientific societies of "Europe and India, and its chief objects are intended to "be the collection of useful information regarding the "island and its productions, so as to promote the prosperity "of the colony—a museum of natural history for the forma-"tion of which Van Diemen's Land is so singularly adapt-"ed, abounding as it does with new and unknown speci-"mens in all the three kingdoms of nature, and—what we "approve of more than all is—the establishment of what "has been called an Economic or Experimental Garden, or "the cultivation of a piece of ground set apart for eliciting "and discovering the properties and uses to which the "vegetable productions of the island may be applied, and "to ascertain the improvements which may be adopted "in their cultivation."

Ross's *Hobart Town Almanac* for 1830 contains a list of the officers of the Society; His Excellency Colonel Arthur was Patron; Dr. John Henderson, President; Dr. Adam Turnbull, M.D., Secretary and Treasurer. A meeting for the election of new members was held on 15th January, 1830, (3) and on Saturday, 16th January, the "annual meeting" was held in the Courthouse at 3 p.m. (4) In the presence of the Patron, the President delivered his inaugural address, in which, after taking a view of the benefits likely to be derived from the Society, he "proceeded "to remark on the present state of the natural sciences, "particularly as regards their nomenclature"; and suggested, in place of the existing nomenclature, "the substitu-"tion of certain syllables and letters, of which might be "compounded names expressive of the diagnostic marks of "each particular plant." Several members debated these proposals; Dr. James Ross, LL.D., remarking that "what-"ever new species might be discovered by the members "would for many years to come readily find a place in the

(3) Andrew Bent states in the next issue of the *Colonial Times* that there were some differences among the members, and that four leading citizens who were candidates were blackballed on the ground that they were engaged in "retail trade." Regret for this occurrence was recorded in the minutes of a later meeting.

(4) *Hobart Town Courier*, 23rd January, 1830.

"excellent classification which learned men had adopted "in the old world."

In the evening the Society met again at the Macquarie Hotel, to entertain the Lieutenant-Governor at dinner. "Mr. Cox," reports the *Courier*, "had done his best to "cover the table of our philosophers with the first speci-"mens of our fish, flesh and fowl." The scientific occupations of the afternoon were laid aside, and a long toast-list occupied the company until midnight.

Thus successfully launched, the Society met monthly, and was occupied with papers and discussions on many subjects; and it established a museum. But a fuller account of its proceedings would keep us too long from our subject, and must be deferred to another occasion. (5)

The Colonial Gardens (1818).

The land now occupied by the Botanical Gardens, with other land at Pavilion Point, afterwards laid out as the grounds of Government House, 50 acres in all, was "pre-"sented" in 1806 or 1807 by Governor Collins to John Hangan, after whom the locality was called Hangan's Farm. The farm was purchased in 1813 by R. W. Loane, who in 1818 was dispossessed by Governor Sorell as having no title. Loane, writing in 1824 in support of an application for compensation for this land, says: "It now forms "part of the Government Garden"; and in 1825 a report was made to the Government that the 50 acres included "nearly the whole of the Government Garden," as well as a valuable freestone quarry. (6) No definite reference of an earlier date to the Gardens has been found; but in the statement of salaries from 1st April to 30th June, 1818, in the quarterly account of the Police Fund of Van Diemen's Land for the quarter ending 30th September, 1818 *(Hobart Town Gazette and Southern Reporter*, 9th January, 1819), there is an item "J. Faber, Superintendence of Government "Garden and Grounds, £5;" and the *Launceston Examiner* of 22nd July, 1848, refers to the Gardens as having been in cultivation for 30 years. It appears then that a garden was laid out at some time between 1817 and 1824, and probably in 1818. (7)

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(5) See West, *History of Tasmania* (Launceston, 1852), i., 127, Henderson, *Observations on the Colonies of New South Wales and Van Diemen's Land* (Calcutta, 1832), pp. iv.-vii.

(6) Chief Secretary's Office, 9,307 (Arthur).

(7) No record has been found of the exact date. Governor Sorell's letters and despatches, the most important records of the time, have long been missing from the proper official custody. Prior to the formation of this garden, there had been a garden belonging to the

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In 1826 Governor Arthur commenced the erection of a new Government House at Hangan's Farm. For several years previously there had been some uncertainty as to the site of the capital town of Van Diemen's Land. Brighton and New Norfolk (or Elizabeth Town, as the settlement to the south of the Derwent on the site of the present New Norfolk was then called) had been proposed; but Governor Arthur determined in 1826 that Hobart Town should remain the capital. Government House of those days was an incommodious wooden building on the site of the present Franklin Square, and the new Government House was to be a much more suitable residence. (8) The new Government House was shortly abandoned, (9) but Governor Arthur gave his attention to the garden, and on 28th September, 1827, in a minute to the Colonial Secretary, in which he directed that more labour should be supplied from the Penitentiary, he wrote:

"It was my wish that a Botanical Garden should be "proceeded with in the Domain, and I had hoped it might "have commenced this season; nothing having yet been "done in collecting the Plants, Shrubs, etc., with which the "Colony abounds. It is discreditable not to stir in this, "and I am anxious about it, as I find it is remarked by "strangers." (10)

Prior to 1828 the Gardens seem to have been in charge of an overseer. In 1828 the first Superintendent (Mr. William Davidson) was appointed. Mr. Davidson had

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Government on the site of Hutchins School. "The ground was "originally a garden belonging to the Government, but had ceased "to be cultivated in, when the large garden in the Domain was "appropriated to the use of the Lieutenant-Governor "— Despatch, 8 Sept., 1847, Lieut.-Gov. Sir Wm. Denison to Earl Grey, Secretary of State for the Colonies. (A garden in the vicinity of Hutchins School is shown on a plan of a survey made in 1804-5—see these *Papers and Proceedings*, 1889, p. 246, reprinted in J. B. Walker's *Early Tasmania*, p. 64).

(8) A few days after his arrival in Tasmania, Sorell wrote to Governor Macquarie (Despatch No. 2, 3rd May, 1817): "The State of the Government House "rendering it uninhabitable not only with regard to comfort, but even as to "security and common decency; I have undertaken some additions and alter- "ations—and I am at Mr. Birch's until the House can be occupied." In 1820 Governor Macquarie determined that a new Government House should be built at Macquarie Point, in line with Macquarie St. (Despatch No. 10, 3rd July, 1825, Arthur to Secretary of State). In 1825 Deputy Surveyor General Evans reported: "The present house occupied by the Governor of Van Diemen's Land has ever been "in an unsafe state since I first saw it in 1811—I think it probable that some severe "gale of wind will cause the destruction of it." The new Government House proposed by Arthur was to be a two-storey building of 25 rooms—C.S.O. 576/10 (Arthur), a file containing many papers on the proposed building.

(9) "It was the intention of the Governor to have built himself "a palace here, there being an excellent freestone on the spot, a great "deal of which was laid out and cut ready; the plan of the house "and foundations were laid, and a garden planted, but the project "was eventually abandoned, owing, as I understand, to the great "expense that would have been incurred before its completion."— Widowson, *Present State of Van Diemen's Land* (London, 1829), p. 27.

(10) C.S.O., 4,588 (Arthur).

come to Australia early in 1828, bringing with him "upwards of 2,000 vines and other fruit trees" (C.S.O. 16,124, Arthur), and he settled at Launceston. The Civil Commandant at Launceston, writing to the Colonial Secretary, reported that he was "a Northumberland man, aged 24 "years," and that he had obtained "a great many prize "medals from the Botanical and Horticultural Societies of "Northumberland and Durham and Newcastle-upon-"Tyne." (11) Mr. Davidson was appointed in November, 1828, at a "salary of £100 per annum, with a ration and "a house to live in."

In 1829 the house at the Gardens still occupied by the Superintendent was built, and the wall was commenced. The wall was of stone, faced with brick, and fireplaces and flues were built in it, so that the wall could be heated to assist the ripening of fruit. Governor Arthur gave vigilant attention to the building of the wall, as to many other matters connected with the Gardens, and the official papers contain a sharp reprimand to the Colonial Engineer, because stones for the wall "are drawn by carts up-"hill from a quarry at some little distance, when, it appears "to me, they might be equally well procured almost on "the spot."

Mr. Davidson developed the Gardens rapidly. In 1829 he applied for a quantity of worked trees from "the "Government Garden at Launceston and the Garden at "George Town," and in the same year a large quantity of trees and seeds were ordered from England. The *Hobart Town Courier* of 28th March, 1829, reported that Mr. Davidson had gathered the seeds of 150 species of native plants on the slopes and summit of Mt. Wellington for growth in the Gardens. By 1830 the area enclosed was about 13 acres, and Mr. Davidson reported that "12 "gardeners and 12 of the chain gang are necessary for "cultivating the Garden and cleaning the Domain." The Gardens became a popular resort, and on 19th December, 1832, Governor Arthur directed that they be closed on Sunday, the Superintendent having represented "the "extreme inconvenience and injury which arises from the "great number of persons who resort there on the Sun-"days."

Mr. Davidson remained Superintendent until 1834, when Mr. Martin Tobin was appointed. (12) In 1840 Mr.

(11) C.S.O. 7139/3 (Arthur). This file contains numerous papers relating to the Gardens from 1828 to 1834, from which most of the statements that follow are taken.

(12) C.S.O. 16124 (Arthur).

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Tobin was succeeded by Mr. Herbertson. (12a) The expenditure on the Gardens, which was about £300 a year in Governor Arthur's time, was much increased during Sir John Franklin's administration, and in 1842 was over £800. (13)

The Mechanics' Institution of Hobart (1826).

A Mechanics' Institution was founded at Hobart in 1826, under the patronage of Governor Arthur, and flourished for many years. In 1827 we read of lectures on astronomy, steam engines, and chemistry. In 1829 a library and apparatus were obtained. "In 1830 two hun-"dred members were enrolled, and the institution was pro-"moted by all classes of society." (14) In 1838 Sir John Franklin obtained a grant of £100 a year from public funds. In reply to a deputation from the Institution, he said that "in the new Custom-house now in progress, "there was a room constructing which was intended for a "museum, and that he should be most happy to appro-"priate that to the use of the Institution as a lecture-room, "together with an ante-room for their books, models, and "other property." (15) The Institution seems to have been very active in the forties, and one of the newspapers remarks that its proceedings were far above the heads of those for whom it was intended. An account of the Institution in 1853 is given by Captain H. Butler Stoney in *A Year in Tasmania* (Hobart, 1854), pp. 169-173.

The Hobart Town Horticultural Society (1839).

The *Courier* of 8th November, 1839, reports the formation of a Horticultural Society. Captain Swanston was its President; R. C. Gunn (16) one of its Secretaries.

(12a) C.S.O. 6958, 7231 (Franklin).

(13) Sir John Franklin revived the proposal for the new Government House. In the years 1841-3 a sum of £10,000 was appropriated for its construction but no great progress was made, and Sir E. Eardley-Wilmot, Sir John Franklin's successor, stopped the building. It was resumed under Sir William Denison and was completed in 1857, at a cost, it is said, of £120,000. — Fenton, *History of Tasmania* (Hobart, 1884), p. 311.

(14) West, *History of Tasmania* (Launceston, 1852), i., 125.

(15) *Hobart Town Courier*, 6th April, 1838. The *Courier*, in a review of Gould's *Birds of Australia*, published on 12th October, 1838, refers to a museum in Hobart; this museum may have been that of the Mechanics' Institution, or, possibly, the museum founded by the Society of 1829.

(16) R. C. Gunn, F.R.S. (1808-1881), "the most eminent botanist of "Tasmania," is mentioned several times in this narrative. He was elected to the Society in 1848, and contributed several articles to the *Papers and Proceedings*. He gave his herbarium to the Society in 1877. A large number of his papers are in the Mitchell Library, in Sydney. For an account of his life and botanical work see J. H. Maiden, Records of Tasmanian Botanists, these *P. and P.*, 1909, pp. 15-18, the references there cited, and the *Launceston Examiner* of 24th March, 1881.

Its first show was held on the regatta ground at Pavilion Point on 3rd December, 1839, the day of the Second Tasmanian Anniversary Regatta. It held three shows during the summer season; and in connection with the show of January, 1840, Lady Franklin gave a prize for "the neatest kept cottage and cottage garden." The Horticultural Society continued in existence until the foundation of the Royal Society.

The Tasmanian Society (1838).

In the year 1837 Sir John Franklin became Lieutenant-Governor of Tasmania. He was already famous for two voyages to the Polar Seas; he was a member of several learned societies; and he and Lady Franklin had many scientific friends. It was natural, then, that the Governor should attract to Tasmania the many distinguished men who were his guests during his Governorship; and that many others interested in scientific subjects should correspond with him. From the inquiries which were made of His Excellency, he was led to form a scientific society, the origin of which is thus described in a "Minute" of a meeting of the Tasmanian Society held on 3rd October, 1843. (17) "The Tasmanian Society was begun in the "latter part of 1838, under the patronage of Sir John "Franklin. Inquiries had been earnestly made to His "Excellency by men of the greatest eminence in Natural "History and Science to communicate to them information "on the subjects of their respective pursuits. Feeling that "neither his local information nor the time at his disposal "was sufficient to answer the wishes of these friends in "various parts of the world, His Excellency determined "upon inviting the gentlemen of the country, whom he "knew to be in possession of the requisite information, to "unite in forming a Society for the purpose of illustrating "the Natural History, Agriculture, Statistics, etc., of this "country."

The Society does not seem to have had at first any distinctive name. Its minute book for 1841 is entitled "Minutes of 'The Society, Van Diemen's Land'"; but in the first number of its journal, *The Tasmanian Journal of Natural Science, Agriculture, Statistics, etc.*, published in August, 1841, it is called the "Philosophical Society of Tasmania." In the preface to the first complete volume, published in 1842, the Society is called the Tasmanian Society, and this name it retained.

The following extracts from an "Introductory Paper,"

(17) *Hobart Town Advertiser*, 20th October, 1843.

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by the Rev. John Lillie, of St. Andrew's Church, Hobart, published in the first number of the *Tasmanian Journal*, give some account of the work of the Society, and of the objects of its journal:—

"The plan of the Tasmanian Journal of Science had its "origin with a few individuals, who recently formed them-"selves into a Philosophical Society, principally with the "view of assisting each other in the study of the natural "history of their adopted country. The meetings of this "Society have been held once a fortnight, in the Library "of Government House, where every facility and encour-"agement have been afforded them by their distinguished "patron, Sir John Franklin, who has taken the liveliest "interest in their proceedings, and contributed in no small "degree, by his zealous co-operation and advice, to the "publication of this Journal.

"At these Meetings it has been usual for one of the "members to read a paper upon some scientific subject, "which has afterwards been made the theme of conversation "and friendly discussion. It is the papers read upon these "occasions which have supplied materials for the present "Journal, which, *parvis componere magna*, may therefore "be regarded as the 'Transactions' of the infant Philosophi-"cal Society of Tasmania. Its members, however, would "not be understood as holding forth pretensions to the "ambitious appellation of philosophers in the modern ac-"ceptation of the term. On the contrary, they are deeply "sensible that, in matters of science, they are rather to be "estimated by the sincerity and fondness of their attach-"ment, than either the strength of their powers, or the "extent of their actual attainments. Most of them are "actively engaged in professional and other necessary "duties, which render it impossible for them to give more "than a very limited share of their attention to scientific "pursuits; and all of them labour under the great dis-"advantage of a wide separation from the philosophical "institutions and men of science in Europe. Living in "this new and remote quarter of the world, where there is "so much to awaken curiosity, they were naturally led, by "the very novelty of the objects, as well as for the sake of "their own mental improvement, to devote their few leisure "moments to the study of external nature. And in com-"ing thus broadly before the public, their object has prin-"cipally been, besides stimulating and giving method and "scope to their own exertions, to excite and cherish a "kindred spirit of inquiry among their fellow colonists. "Under the conviction that they are now living at the "fountain-head of what promises, ere long, to swell into a "mighty stream of civilisation, they have been anxious to "impress upon that stream, while it is yet susceptible of "it, a salutary direction towards liberal and scientific pur-"suits. And the hope which especially animates them is, "that their exertions, humble and feeble as they are, may "be the means of rousing abler minds to put forth their "energies in the same noble cause.

"They consider themselves only in the light of pioneers— "humbly leading the way to the accomplishment of a most "worthy and desirable end; and, while they are conscious "of the slenderness of their resources for such an important "object, they are not without hopes that the excellence "of their design will in some measure atone for the imper-"fection and faultiness of its execution.

"The leading and characteristic object of this Journal "is to furnish original papers upon the Natural History "and Physics of Tasmania. It is intended in the first in-"stance to embrace more particularly the departments of "Zoology, Botany, Geology, and Meteorology. An im-"portant part of the plan at present contemplated, and of "which this first number may be considered as affording "an average specimen, is to publish in consecutive articles "all the species of indigenous plants and animals which "are yet known, as well as such as may from time to time "be discovered; accompanying the scientific description of "each with such details of its economy, habits, geographical "distribution, and other particulars, which can only be "satisfactorily ascertained and described by those who have "had opportunities of examining the individual in its liv-"ing and natural state. It is also intended to give occa-"sional papers upon peculiarities in the structure and phy-"siology of the many curious plants and animals which are "natives of this country, some of the most interesting of "which are still desiderata among scientific men in Europe.

"Under the head of Geology, it is proposed to bring to-"gether, as far as our means of information may extend, "such facts as may contribute towards a systematic know-"ledge of the mineralogical characters, the relative posi-"tion, and fossil contents of the various rocks of this "Island; a most interesting field of research, which is as "yet unexplored.

"In Meteorology it is proposed to give the daily instru-"mental observations made at Port Arthur, together with "such additional facts and observations as may be obtained "from other parts of the country, in elucidation of the "laws and character of our climate.

"In this and other departments very important assist-"ance is anticipated from the Magnetic Observatory about "to be established at Hobart Town by the authority of the "Home Government. (18) . . . . . .

"In the prosecution of the plan of a Journal which we "have thus briefly sketched, it will be our aim to adhere, "as much as possible, to a simple exposition of facts, as "they present themselves in Nature; and especially to "shun all unnecessary discussion upon dubious and unde-"termined questions of theory. Such discussions must, we "conceive, in our present circumstances, be both prema-"ture and injurious. They are not likely to be possessed "of much scientific value in themselves; while they could "hardly fail to divert attention from the less showy and "imposing, but incomparably more solid and important "object of preparing and accumulating materials for future "and more advanced inquirers to operate upon. We should "like to impress upon this Journal the useful character of "being a trustworthy repository of well-ascertained facts—"a faithful record of the interesting forms and laws under "which mineral, vegetable, and animal existences exhibit "themselves in this comparatively unknown region of the "globe. Such a character may take off from its qualifica-"tions as a work of popular interest; but we are persuaded "it will add greatly to its value in the opinion of those "who are best able to judge of its merits.

"The importance of such a Journal to the interests of "the Colony is sufficiently apparent. The knowledge com-"municated by it may, in numerous cases, contribute "directly to the development of its natural resources. In "a soil and climate destined by nature for agriculture, "geological, and botanical researches are calculated to be "of the highest practical value. . . . . . .

"Now the information which a scientific journal might "afford, in regard to the qualities of soil, the different kinds "of manure, and even more appropriate methods and in-"struments of cultivation, might materially aid in dispos-"ing and encouraging, as well as directing, the settler to "more vigorous and successful exertions, both in widening "the limits of cultivation, and augmenting the fertility of "the land already cultivated.

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(18) The reference is to the Rossbank Observatory, established in Hobart in 1840 by Sir James Clark Ross, of the Antarctic Expedition in the Erebus and Terror. (Dr Lillie's paper had been written before the arrival of the expedition. For an account of the establishment of this Observatory see Ross' *Voyage of Discovery and Research in the Southern and Antarctic Regions during the years* 1839-43 (London, 1847), chapter v. There is a sketch of the Observatory at p. 95 of vol. i. The six sided stone building between Government House and the cottage now occupied by the Private Secretary was one of the Observatory buildings.

"Tasmania abounds in minerals, and in those chiefly "which experience has shown to be of most importance for "economical purposes. Iron, coal, lime, and sandstone are "found in great abundance. The first has not been worked "at all; and the second but very partially and imperfectly. "Very little attention, we believe, has been paid to the "application of lime for the improvement of land; and "scarcely any to the adaptation of particular kinds of lime, "or the limes of particular districts, to particular soils. "Every one must see what beneficial results might arise "from the diffusion of sound scientific views upon these "important subjects, and what a powerful impetus might "thereby be given to the evolution of those mighty re-"sources which the liberal hand of Nature has treasured "up in the bosom of our Island. . . . . . .

"But there is a more important view of our Journal, in "its relation to the general interests of the Colony—we "mean, its bearing on the intellectual and moral character "of the community. Though not professedly devoted to "moral or religious subjects, it may nevertheless perform "important service to both. In morals especially, causes "which operate by an indirect and unobtrusive agency are "not always the least efficacious. The circulation of a "Journal of Science, upon matters of local interest, among "the inhabitants of this rising country, is calculated to "produce a most salutary effect upon their character: by "leading them to the study of Nature, and habituating "them to reflect on the interesting objects around them, it "would afford valuable exercise to their mental powers, "and open up new and most productive sources of pleasure "and enjoyment. The situation of a settler in Australia is "peculiarly in want of such a stimulus. He is not unfre-"quently a man of intelligence and education. But living "in comparative seclusion, and far removed from the stir-"ring scenes and transactions of European society, his "mind is apt to become relaxed, and to lose its former "tone and vigour; or to be narrowed and contracted by "exclusive converse with petty details; or, still worse, to "be given up to the sordid passion for accumulating wealth. "In such circumstances, whatever would tend, like the "Journal in question, to excite his attention to, and lead "him to find an interest and pleasure in, the events and "appearances of surrounding Nature, could not fail to be "peculiarly beneficial. It would serve to alleviate the "monotony and tediousness of his situation—to prevent "the inactivity and consequent deterioration of his mental "faculties—to counteract the power of ungenerous and de-

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"basing passions, and to add the dignity of a cultivated "and well-informed mind to the simplicity of rural occu- "pation and sequestered life."

The first number of the *Tasmanian Journal* was published on 20th August, 1841, price 2/6. Sir John Franklin sent copies to the Secretary of State for the Colonies, with a despatch (19) in which he expressed his own interest in the Society, and explained the reasons which had led him to allow the Journal to be printed at the Government Printing Office: (20)

"I have the honour to transmit to Your Lordship two "copies of the 'Tasmanian Journal of Natural Science, "'etc.', a periodical work commenced by a Society in whose "labours I take great interest from a conviction that such "discussions as take place at the meetings of this body, "however imperfect and elementary may be the informa- "tion obtained, tend not only to the development of the "resources of a country like this, but to the general im- "provement and enlargement of the public mind.

"Such a Society would, I conceive, be beneficial to the "community, even if the only result of their deliberations "were to withdraw the mind for a time from the engross- "ing calculations of traffic, and the contemplation of mere- "ly local interests, which make so large a demand upon "the time and attention of the Colonists.

"But when the wide field of research is considered, which "this and the neighbouring Colonies present, both with "reference to Physical questions of universal interest, and "also—taking a more circumscribed view of the subject— "to the means which may daily be discovered of adding to "the natural richness of the Territory, or of extracting "from it wealth as yet undiscovered; and when it is re- "membered with what anxiety the Philosophers of Europe "have laboured, often unsuccessfully, to obtain accurate "information concerning the Natural History of these "Regions, the advantages to be derived from the publica- "tion of such a Journal appear in a still stronger light.

"With these impressions I have given to the Society "in question every encouragement in my power, and upon "its being represented to me by the Members that their en- "deavours to get the Journal printed at any of the Private

(19) No. 129, 27th August, 1841.

(20) This circumstance aroused much criticism in the local newspapers. The Government Printing Office had been established in 1839, under the superintendence of Mr. James Barnard (an original member of the Royal Society, and, except for a few years, a member of the Council from 1847 to his death in 1897), and the Governor had stated that the office was for the exclusive use of the Government, and that no private printing would be done.

"Printing Establishments had proved ineffectual from the "absence of the necessary type, etc., I thought it right to "allow the work to be printed at the Government Printing "Office, subject to the condition that the labour, ink, "and every expense attending upon it should be paid for "by the Society, which also, of course, provides paper, and "all other materials. . . ."

The Tasmanian Journal was at first published quarterly, and by the end of 1842, the first volume, of five numbers, was completed. (21) The contents of this volume, and of the two others afterwards published, are of extraordinary interest. There was then no other scientific society or periodical in Australia. The Society had corresponding members in the neighbouring colonies, and also in Europe; and consequently it had the opportunity of publishing much scientific work from other countries; and many names afterwards famous are to be found among its contributors.

Some time after the formation of the Society, Mr. Ronald Campbell Gunn, at that time Private Secretary to Sir John Franklin, became its Secretary. (22) In 1841 Mr. Francis Hartwell Henslowe, who had succeeded Mr. Gunn as Private Secretary to Sir John Franklin, also succeeded him as Secretary of the Society. (23) The Rev. John Philip Gell, Principal of the Queen's School at Hobart, became Secretary in 1842. (24)

The members of the Tasmanian Society, in August, 1843, at the end of Franklin's Governorship, are set out in the Appendix. (25)

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(21) This volume, and numbers 6 and 7, published about August or September, 1843, were printed at the Government Printing Office at the expense of Sir John Franklin (Minute of Tasmanian Society, 3rd October, 1843, published in *Hobart Town Advertiser*, 20th October, 1843).

(22) Minute of 3rd October, 1843.

(23) Mr. Henslowe continued to be Sir John Franklin's Private Secretary for the remainder of his term of office. He was afterwards appointed Police Magistrate at Campbell Town. He was a member of the Royal Society from 1851 to 1856.

(24) In 1838 Sir John Franklin had written to friends in England, asking them to select a principal for his projected College, and Mr. Gell was chosen by Dr. Arnold. (Franklin, *Narrative of Some Passages in the History of Van Diemen's Land*, London, 1845, p. 75.) Mr. Gell came to Tasmania, and the foundation stone of the College was laid at New Norfolk on 6th November, 1840. But difficulties intervened, the building was not carried on, and Mr. Gell became Principal of the Queen's School. He was afterwards incumbent of St. John's, Goulburn-street, for a time, and when Sir John Franklin's College was revived as Christ's College, Bishopsbourne, Mr. Gell became its Warden. He returned to England in 1848. He married Sir John Franklin's daughter, and was for many years rector of Buxted, in Sussex.

(25) See p. 162.

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The Franklin Museum at Ancanthe, Kangaroo Valley (1842).

Early in 1842 Lady Franklin purchased two blocks of land, one of 400 acres, and one of 10 acres, together forming the "Ancanthe" estate, situated in Kangaroo Valley, "a "secluded but picturesque valley at the foot of Mount "Wellington, three miles from the city and a mile from "New Town." (26) On the smaller block Sir John Franklin, on 12th March, 1842, laid the foundation of a museum, to be built "on a classic model" and collections and a library were placed in the building. "It was originally "intended by Lady Franklin," writes Sir John Franklin, (27) "that the Tasmanian Society of Natural History should "be the trustees of this property, but as that body had no "legal or chartered existence, and was, moreover, threat-"ened with extinction when I left Van Diemen's Land, "this part of her wishes could be no further carried into "effect than by making complimentary mention of them "in the deed, and selecting the trustees from their number. "Some circumstances which occurred in Van Diemen's "Land, shortly before my departure, induce me to be thus "minute. . . . The endowment was not made to the "favourite foundation at New Norfolk, for over this the "shadows of annihilation had already fallen, but to any col-"legiate institution whatever which might be founded in Van "Diemen's Land with the approbation of the bishop of "the diocese for twenty years to come, and in default of "any such foundation at the end of that period, to the "improvement of the existing schools of the colony at the "discretion of the trustees."

Anticipating a later part of this narrative, it may be added here that the completion of the deed of settlement was one of the last acts of Sir John and Lady Franklin, who executed it on 2nd November, 1843, the day before they embarked from Hobart for England. The trustees under the deed were Bishop Nixon, Mr. J. E. Bicheno (Colonial Secretary), the Rev. T. J. Ewing (Principal of the Queen's Orphan Schools, New Town), the Rev. J. P. Gell, and Mr. R. C. Gunn. The trust in regard to the Tasmanian Society directed that until a College or University, having the approbation of the Bishop, should be established, the trustees were to permit the Museum "to be used "and inspected by the Society for some time established in

(26) Captain H. Butler Stoney, *A Year in Tasmania* (Hobart, 1854), p. 156.

(27) *Narrative*, p. 78.

"Hobart Town, called the 'Tasmanian Society,' or by any "other Society or Societies, person or persons, or by the "public at large," as the trustees might think proper.

Of the collections, little record remains; they are said to have come into the custody of the Society (28), no doubt at about the time when the cases and fittings were purchased by the Society. (See p. 156) A catalogue of the books, 152 in all, in the library of the museum in 1844 is published in the "Tasmanian Journal," ii., 313-6. Some of these books are now in the library of the Society; others, doubtless, are among the books belonging to Christ's College. The rules of the library were as follow:—(29)

"Rules of the Library of the Franklin Museum. Ancan- "the. 1844.

"I. That the books admissible into the library be of "three classes only.

A. Works illustrative of Tasmania and the neighbouring colonies.

B. Works written by authors who are, or have been, inhabitants of Tasmania.

C. Works printed and published in Tasmania, unless of a kind objected to by the trustees.

"II. That the books be taken out of the library with the "permission of one of the trustees.

"III. That they be called in once every year, in the "month of December."

The Tasmanian Society seems to have received the rents for some years, and afterwards they were received by Christ's College. (30) The Rev. J. P. Gell, in a letter to Archdeacon Marriott in 1847, writes as if Christ's College already had the disposal of the Ancanthe estate. It does not appear that any Bishop of Tasmania has expressed his approbation of Christ's College as required by the deed of trust, and in the decree pronounced in the equity suit of 1874 the Court declined to state that the College had a title to the property; but the rents have continued to be received by the trustees of the College property. (31)

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(28) Affidavit of Bishop Bromby in the equity suit in connection with the property and trusts of Christ's College in 1874, the Bishop of Tasmania and others v. Reibey and others.

(29) *Tasmanian Journal*, ii., 316.

(30) See note 58.

(31) The Tasmanian Society, the New Norfolk College, and the Ancanthe Museum do not complete the list of the benefactions of Sir John and Lady Franklin to Tasmania. Of others, it is appropriate to mention here the gift of Betsy (or Willaumez) Island (now also called Franklin Island) in Storm Bay, near the entrance to the Derwent. Lady Franklin purchased this island in 1840, and it was conveyed to Dr. E. S. P. Bedford and Mr. R. C. Gunn as trustees for her (deed registered No. 4723). In 1866 the Tasmanian Acclimatisa-

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The Termination of Sir John Franklin's Governorship.

Sir John Franklin, when he succeeded Arthur, found the principal residents of Tasmania divided into factions; but he had been welcomed by all, and he strove to restore social peace, and to promote the harmony of parties. In these aims he soon found success to be impossible. A tribute he paid to his predecessor endangered his popularity; while the supporters of Arthur's policy found that the Governor was critical of them. Two of Arthur's nephews occupied important offices—Captain John Montagu as Colonial Secretary, and Captain Matthew Forster as Chief Police Magistrate—and they had considerable local influence, particularly in connection with the Derwent Bank, of which Captain Swanston was manager, and which towards the end of Franklin's governorship held mortgages over the greater number of estates in the island. Franklin soon formed the opinion that these connections were not in the interest of the country, and an estrangement gradually arose between him and the party of Captain Montagu. The estrangement became acute through certain incidents connected with the removal of the District Surgeon of Richmond and with the erection of the tower of St. George's Church, Hobart; and early in 1842 the Governor suspended Montagu from office.

Montagu returned to England to place his case before the Colonial Office. Meanwhile the sources of the differences between the Governor and the Colonial Secretary had become well known, and were vigorously debated in

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tion Society was formed, and on 29th November, 1866, Lady Franklin executed a deed, in which she declared that she wished the island to be vested in trustees, by whom it should be held for the purposes of the Society so long as those purposes should be carried out in a manner beneficial to the public of Tasmania, but that if the purposes of the Society should not be so carried out, then the island should be held by the trustees for such other purposes beneficial to the public of Tasmania as the trustees should direct. On 27th December, 1868, the island was conveyed by Dr. Bedford and Mr. Gunn to Messrs. Robert Officer, R. C. Gunn, Morton Allport, and John Woodcock Graves, as trustees (No. 5 6667). Mr. John Woodcock Graves was the Secretary of the Acclimatisation Society, and the island was used for many years by that Society. In 1903 it was vested by Act of Parliament (1903 No. 42, s. 15) in the Trustees of the Tasmanian Museum and Botanical Gardens. (Betsy Island had much earlier been the scene of an experiment in acclimatisation—of the rabbit. In the chronological table of events in Bent's Tasmanian Almanack for 1829 there are the following items:—"1827, May 10th.—Silver-haired rabbits, pheasants, and "peacocks imported from England per the ship Tiger; many thousand of the "rabbits increase on Betsy Island, Mr. King intending to make the skins "an article of export to China. 1828, March 20th.—30,000 silver-hair rabbits "belonging to Mr. King upon Betsy Island." The common rabbit was already in Tasmania. The *Hobart Town Gazette and Van Diemen's Land Advertiser* of 24th June, 1825, mentions that rabbits were being bred in various parts of the country, and gives directions for the growth of parsley as being "their "favourite food." The *Colonial Times* of 11th May, 1827, mentions that "the "common rabbit is becoming so numerous throughout the colony, that they are "running about on some large estates by thousands.")

the local press. (32) Sir John Franklin's friends had an organ in Hobart, and another in Launceston, while the Montagu party controlled several papers. The Secretary of State received Montagu favourably, and, after considering his case, decided that Franklin's suspension of him from office had not been well-judged. The despatch in which his decision was conveyed to Franklin was also communicated to Montagu, and by him was sent to Tasmania, and was published in the newspapers. The turmoil thus created was increased by the circulation in Tasmania of Montagu's "Book," a bound folio of 312 manuscript pages, which contained the case stated by him to the Secretary of State against Franklin, and other statements considered by Franklin to be libellous reflections on the character and honour of himself and his household. "The Book" could be seen at the Derwent Bank by any who chose to ask for it, and its contents became generally known. The colony thus became rent with dissensions, and partisan feelings were daily enflamed by the press.

The state of society and of the administration at the end of Franklin's office have been referred to thus in detail, for they had much influence on the circumstances of the foundation of the Society. (33)

Franklin's term of office expired early in 1843, but the despatch announcing his recall and the appointment of Sir John Eardley Wilmot as his successor was delayed by storms, and Sir Eardley Wilmot arrived before Franklin had had official notice of the termination of his office. Franklin was still in occupation of Government House, and an embarrassing situation was relieved by Sir Eardley Wilmot visiting Launceston.

Six days after Sir Eardley Wilmot had landed the members of the Tasmanian Society met at Government House to present an address to their founder and president. The proceedings are thus recorded in the *Tasmanian Journal*, Volume ii., No. 7, pp. 158-9:—

"Government House, 23rd August.

"The members of the Society met specially for the pur-
"pose of presenting the following address:—

" 'To His Excellency Sir John Franklin, K.C.H., K.R.,
" 'Lieutenant-Governor of Van Diemen's Land,
" 'etc., etc. The Address of the Resident Mem-
" 'bers of the Tasmanian Society for the Promo-
" 'tion of Natural Science, Agriculture, Statistics, etc

(32) There were six newspapers in Hobart about this time.

(33) The preceding paragraphs are based on West's chapter on Franklin's governorship and on Franklin's *Narrative*.

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" 'May it please Your Excellency.

" 'The approaching termination of Your Excellency's " 'residence in this Colony imposes upon the members of " 'the Tasmanian Society the painful duty of express- " 'ing, however inadequately, their sorrow at an event which " 'entails upon them so irremediable a loss.

" 'While the share which Your Excellency has contri- " 'buted to the scientific renown of our native country com- " 'mands the warmest expressions of our admiration and " 'gratitude, we feel more especially bound to acknowledge " 'the part you have taken in promoting what we must " 'ever consider to belong to the best and highest interests " 'of Tasmania.

" 'In you we lose the founder of our Society, and a " 'benefactor of unsparing liberality; in you we are about " 'to be deprived of the Guide whose scientific experience " 'has given effect to our feeble exertions, and invested " 'them with an importance which they could not other- " 'wise have obtained.

" 'Nor can we permit it to pass unremembered, that the " 'friends of science have, upon this and no other claim, " 'been ever treated as your personal friends, and admitted " 'to your domestic circle; and that our heartfelt regrets " 'attend our approaching separation from one who is her- " 'self the brightest ornament of that circle, whose zeal " 'and whose kindness have enhanced the value of all Your " 'Excellency has bestowed or we received, and have " 'augmented the deep concern with which we lament your " 'departure.

" 'We have the honour to be,

" 'Your Excellency's faithful and affectionate Servants,

" 'F.R. Tasmania' " [and 34 others].

"His Excellency was pleased to receive the Society's "Address very graciously, and to acknowledge it in the "following terms:—

" 'My Lord Bishop and Gentlemen,

" 'It is impossible for me to receive unmoved an Address " 'of this nature from my associates of the Tasmanian " 'Society.

" 'You have kindly enhanced what little services I may " 'in former fields of exertion have been able to perform " 'for the cause of science far beyond their deserts; and, in " 'this country, I can only regret that neither my means " 'nor my ability have been adequate to give more than " 'some initiatory encouragement to your efforts for the " 'development of the natural phenomena of this very " 'interesting portion of our globe.

"'Under auspices still more favourable than my own, "'I cannot doubt that you will steadily pursue your exer- "'tions in a cause which you justly consider to belong to "'the best and highest interests of Tasmania, and which "'I am persuaded will tend much to elevate the colony "'in the estimation of the European community. Your "'transactions have already been received with favour and "'interest by names whose patronage is an encouragement "'and an honour; and I shall not fail to keep alive and "'cultivate those kindly dispositions, and to procure for "'you every assistance in my power.

"'My connection with you, endeared as it has been by "'the domestic hearth around which we have assembled, "'will ever be cherished, not by me only, but by her to "'whom you have so kindly alluded, and who feels deeply "'and gratefully the manly and generous sentiments in "'which your tribute to her originates.

"'John Franklin.'"

II. THE ROYAL SOCIETY OF TASMANIA, 1843-8.

The Foundation of the Society, 14th October, 1843.

Franklin required time to arrange his affairs, and there were few suitable vessels sailing for England, and it was impossible for him to leave Tasmania for some months. Sir Eardley Wilmot directed that his predecessor should be treated with the honours due to his late office, and Franklin retired to the house of one of his friends, and, shortly before his departure, made a sort of progress through the country, in which addresses of farewell were presented to him from all sections of the colonists.

Meanwhile Sir Eardley Wilmot had determined upon a plan for reconstituting the Tasmanian Society. Before narrating his proposals, however, it is necessary to refer to some of the details of the establishment of the Lieutenant-Governor in those days. Franklin had found when he succeeded Arthur that three official residences were provided for him—the Government House in Macquarie-street, Hobart, the Government Cottage at Launceston, and the Government Cottage at New Norfolk—and that he was also entitled to the use and profits of the Colonial Farm at New Town, and of the Colonial Gardens; and for the service of all these, liberal provision was made at the public expense, in addition to the official salary of the Governor. Franklin continued to enjoy these privileges; but before the termination of his office, it was decided by

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the Secretary of State that in future these establishments were not to be maintained from public funds, and, in consideration of the additional expense thus thrown upon the Governor, the Governor's salary was increased. Sir Eardley Wilmot received instructions on these matters before he left England.

Immediately on his arrival in Tasmania he visited his various residences, the Farm and the Gardens, and on 15th September in a despatch to the Secretary of State he reported on their condition, and made the following proposal for the future disposition of the Gardens (34):—

"The fact is that every building, and every part of all "these above-mentioned places, as well as my official resi- "dence at Hobarton, are in the most extraordinary and most "unjustifiable state of dilapidation.

"The Colonial Gardens are an exception to the above "remark, being one of the greatest ornaments, as well as "benefits, to this colony; and as it was impossible as well "as unnecessary for me to keep up the Garden at my own "expense, and as I did not understand from Your Lord- "ship's instructions, that, although I was not personally "to receive any pecuniary benefit from the Gardens, yet "that they were to be abandoned, I have proposed that the "Government should place them under the management of "a society called 'The Van Diemen's Land Horticultural " 'and Botanical Society,' which Society, with some assist- "ance from the Government, will take the expense on "themselves.

"The rules and regulations of this Society are modell'd "after those of the Linnæan and Horticultural Societies in "England; and I have respectfully to ask Your Lordship "to approve of this arrangement, and to ask you to lay "before Her Majesty our humble request, that she will be "graciously pleased to be Patroness of this Society, and "allow it to be called the Royal Society of Van Diemen's "Land, for Horticulture, and Botany, and the advancement "of Science. As the Colonial Gardens now cost the "Government eight hundred and two pounds per annum, "I propose that the Government shall be saved half that "expense, and that four hundred pounds per annum shall be "allowed to the Society to assist it in carrying out the "great national objects it has in contemplation."

The Tasmanian Society met on 3rd October, and elected Sir Eardley Wilmot as President, in succession to Sir John

(34) Despatch No. 2, 15th September, 1843.

Franklin. A minute of the proceedings (35) contained an account of the formation and work of the Society, and has already been quoted. The minute also contained the following paragraph:—

"The promotion of Art as well as Science has of late "been recognised among the objects of the Tasmanian "Society. It is believed that while the promotion of "scientific inquiry cannot but assist in developing the re-"sources of the Colony, and in exciting interest respecting "it abroad, yet that the promotion of Art will have an "immediate effect on our social improvement of a more "decided character; and that our efforts will be zealously "approved of at Home in this respect. The election of "the Bishop of Tasmania as our Vice-President is a pledge "that this development of our labours will be neither in-"efficient nor unsuccessfully prosecuted."

Sir Eardley Wilmot then convened a meeting of the Society to be held at Government House on 14th October, and to this meeting were also invited members of the Horticultural Society and the Mechanics' Institution, Sir Eardley Wilmot's intention being that the three societies should be "blended together, and each form a section of "one extended Society." (36)

The members of the Tasmanian Society found themselves somewhat unprepared for the proposals of their President; and some of them objected to the proposed exaction of an entrance fee as a condition of their joining the reorganised Society They pointed out that Lady Franklin had provided them with an endowment, and that they already had a well-established position in scientific circles; and they thought that the proposals of the President showed insufficient consideration for them. They asked for time to consider the new rules; but the Governor was averse from delay; and upon signs of further opposition from the members, he adjourned the meeting of the Society sine die. West remarks (i., 236): "They thought "past services demanded a consideration of their wishes. "They had received in trust an endowment from Lady "Franklin of some prospective value; they corresponded "with men of the first scientific circles; and they "had published a journal which widely extended the phy-"sical knowledge and European fame of this hemisphere. "None who are experienced in the causes of political dis-"content will consider such trifles without serious effect "on the tempers of parties and the peace of rulers."

(35 *Hobart Town Advertiser*, 20th October, 1843.

(36) *Launceston Examiner*, 11th October, 1843.

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"With the exception of five," says the *Launceston Examiner*, (37) "the members quitted the room, with "many others; and Sir Eardley Wilmot forthwith proceed-"ed to establish a new Society from among those who re-"mained. . . . His Excellency then revised the rules to "adopt them to the new Society, which he at once entitled "'The Horticultural and Botanical Society of Van Diemen's "'Land,' striking out all the irrelevant clauses."

The estrangement between the two Societies appears from paragraphs in the newspapers to have been associated with the social and political divisions of the community. Paragraphs commenting on the merits of the Societies, worded in the vigorous language then customary in the colonial press, appeared in the papers of each party, and doubtless hindered the healing of the breach. (38)

In a book of rules shortly afterwards published by the Society, the following account is given of the proceedings at the after-meeting, at which our Society was formed:

"*At a Meeting of Gentlemen assembled at Government House,* "*on the 14th of October,* 1843, *at the request of the Lieu-*"*tenant-Governor,* Sir EARDLEY EARDLEY WILMOT, *His Ex-*"*cellency, after expressing an opinion that the formation of* "*a Botanical and Horticultural Society, having in view* "*likewise the development of the natural resources of the* "*Island of Van Diemen's Land, would be attended with* "*great advantage to the community generally, was pleased to* "*state, that if such a Society were formed upon a plan* "*then proposed by His Excellency, a large portion of the* "*Garden in the Government Domain should be placed at the* "*entire disposal of the Members: and further, that he, the* "*Lieutenant-Governor, would recommend to the Government,* "*that an Annual Grant of Four Hundred Pounds should* "*be made to the Institution, for the purpose of paying its* "*Officers and promoting its objects generally. His Excellency* "*was then requested to take the Chair, and the following* "*Resolutions were moved and carried:—*

"1st.—That a Society be formed, to be called 'THE "'BOTANICAL AND HORTICULTURAL SOCIETY OF VAN DIE-"'MEN'S LAND.'

"2nd.—That the leading objects of the Society shall be to "develope the physical character of the Island, and illustrate "its natural history and productions.

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(37) The report of the meeting published in the *Launceston Examiner* of 21st October, 1843, is printed in full in the Appendix (p. 163).

(38) The organ of one party published a satirical account of a meeting of the "Hypothetic Geoponical Society" (*Courier*, 23rd August, 1844); the appointment of a new superintendent of the Gardens provoked the *Advertiser* (16th May, 1845) to a leading article on "that very "extraordinary scientific scheme, the Royal Horticultural Society"; while *Murray's Review*, the least restrained of the papers of the day, attacked the Tasmanian Society in an article headed "The Mud-Fog Society" (20th October, 1843).

"3rd.—That the Society shall consist of a President, "Twelve Members of Council, a Treasurer, Secretary, and an "indefinite number of Fellows.

"4th.—That the Lieutenant-Governor of the Colony for "the time-being shall be the President.

"5th.—That the President shall annually appoint four per- "sons, Members of Council, to act as Vice-Presidents, and to "perform his duties during his absence.

"6th.—That the President and Council shall have the "ordering and management of the Property, Officers, Ser- "vants, and affairs of the Society.

"7th.—That the President shall nominate and elect as "Fellows, such persons as he shall deem fit, until the number "shall reach Fifty.

"8th.—That when the Society shall consist of Fifty Fellows, "the nominations and elections of all persons proposed for "admission shall be by ballot, according to the Rules to be "hereafter established.

"*The President then nominated the following Gentlemen to "be Fellows of the Society, viz.*—

"Major H. C. Cotton,
"Mr. W. T. N. Champ,
"Capt. C. Swanston,
"Mr. J. Hone,
"Rev. John Lillie,
"Mr. P. Fraser,
"J. Allport,
"R. Kerr,
"T. Horne,
"J. Barnard,
"T. D. Chapman,
"Dep. Com. Gen. Maclean,
"Mr. J. Burnett,
"J. L. Burnett,
"J. Burnett, jun.
"Dr. A. Turnbull,
"Mr. A. H. Maning,
"A. T. Maning,
"R. Power,
"W. Sorell,
"R. K. Nuttall,
"J. Roberts,
"T. Welsh,
"A. F. Kemp,
"Capt. F. C. Smith,
Mr. A. Perry,
J. Kerr,
G. T. Boyes,
As. Com. Gen. Fletcher,
Mr. E. P. Butler
Dr. Officer,
Mr. R. Pitcairn,
Capt. Forster,
Mr. J. E. Bicheno,
J. Dunn,
J. Dunn, junior,
Mr. T. G. Gregson,
J. Beamont,
Capt. A. Rice, 51st Regt.
Lieut. Scott, do.
Mr. T. Anstey,
V. Fleming
W. Proctor,
Sir J. L. Pedder,
Mr. W. Kermode,
J. Abbott,
G. D. Holcombe,
J. P. Poynter,
J. Milligan.

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"*It was then resolved,—*

"9th.—That the following Fellows shall constitute the "Council until the first Annual Meeting of the Society, viz.—

"Sir J. L. PEDDER,	Mr. CHAMP,
"Mr. BICHENO,	Major COTTON,
"Rev. JOHN LILLIE,	Mr. BOYES,
"Capt. SWANSTON,	FRASER,
"Mr. HONE,	J. BURNETT, senior,
"ALLPORT,	BUTLER.

"10th.—That Captain Swanston be the Treasurer of the "Society.

"11th.—That Mr. Champ be Secretary until the First "Annual Meeting.

"*The President then named the following Members of the "Council to act as Vice-Presidents until the first Annual "Meeting, viz.—*

"Sir J. L. PEDDER,	Rev. JOHN LILLIE,
"Mr. BICHENO,	Capt. SWANSTON."

Rules for the Society were adopted at a meeting held at Government House on 28th October. These contain many of the provisions of our present rules. But it is of interest to notice that the Council was required to "meet regularly "once in every week," and there was provision also far special meetings. The rules provided (contrary to the practice of many learned societies then and since) that ladies might be admitted as Fellows, with the same privileges as gentlemen, except that if they nominated "any "Gentleman, being a Fellow of the Society, to be their "proxy," such proxy "shall not be changed within the "year." The Secretary, it was provided, "shall possess a "scientific knowledge of the leading branches of Natural "History, particularly of Botany and Geology"; and the rules contemplated the formation of a museum and library.

A few days afterwards, on 3rd November, Sir John Franklin embarked from Hobart, "amidst a burst of gen-"erous and enthusiastic feeling," he remarks in his *Narrative*, "which, much as I had confided in the attachment "of the people of Van Diemen's Land, could not but sur-"prise as well as deeply affect me." Accompanied by Bishop Nixon, the party "first visited a settlement of respectable "free agriculturists, on the banks of the Huon River. Here, "located upon land belonging to my wife, upon terms which "were to enable them to become shortly the independent "possessors of it, they had hewed themselves an opening in "the dense forests which clothe the banks of that river, and "had laid its soil open to the sun." Sailing for Launceston, Franklin landed at Swan Island, and laid the first stone of the lighthouse. After visiting Goose Island and Flinders Island, the vessel called at George Town, and a deputation from Launceston presented an address of farewell. Franklin then visited Circular Head, the last spot on which he set foot in Tasmania; and on 29th November he quitted our shores. (39)

The story of his last voyage is well known. Numerous expeditions were sent out by the British Government to discover his fate; and when official efforts had been abandoned, and Lady Franklin fitted out a last expedition, under McClintock, the people of Tasmania contributed £1,600 towards the cost. McClintock, in 1859, found the record of Franklin's death, on 11th June, 1847. A copy of McClintock's narrative, presented to the Society by Lady Franklin, is still in our library.

The Society from 1843 *to* 1848.

On 20th November, 1843, Sir Eardley Wilmot announced to the Legislative Council the formation of the Society, and his plans for the management and maintenance of the gardens (40); and on 1st January, 1844, the Society entered into possession of the portion of the gardens entrusted to it. (41)

On the 12th September, 1844, Sir Eardley Wilmot announced to the Society that Her Majesty the Queen had signified her consent to become Patron of the Society; that the constitution of the Society had been approved; that the grant of £400 per annum had been confirmed; and that its designation should thenceforward be "The "Royal Society of Van Diemen's Land, for Horticulture, "Botany, and the Advancement of Science." (42)

Mr. W. T. N. Champ was the first Secretary of the Society. At that time he was Chairman of the Commissioners for Titles; he afterwards became Colonial Secretary; and he was the first Premier of Tasmania under

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(39) Abridged from Franklin's *Narrative*, pp. 96-99, the preface to which was written a few days before he sailed from Greenhithe on 19th May, 1845, on his last voyage to the Arctic Seas.

(40) Finance Minute, 1844.

(41) At about the same time Wilmot handed over the Government Garden at Launceston to the Launceston Horticultural Society, this being in addition to the grounds it already had fronting on Brisbane and Cameron streets (*Launceston Examiner*, 18th October, 1843). This Society had been established in 1838 (*Tasmanian Journal*, ii., 312). As early as 1834 R. C. Gunn had proposed to devote part of his land near Launceston to a Botanical Garden (C.S.O., 15,700 (Arthur)). The Horticultural Society's Gardens were transferred to the Municipal Council in 1863, and are now the City Park.

(42) The Society seems to have been the first "Royal Society" outside of the United Kingdom.

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responsible government (1856). He afterwards settled in Victoria—see obituary notice in Hobart *Mercury*, 30th August, 1892.

On 1st February, 1844, (43) Mr. John Abbott, Registrar-General of Births, Marriages, and Deaths, and later a member of the Council, became Honorary Secretary. Mr. Abbott was a son of Major Abbott, Deputy Judge Advocate of Van Diemen's Land, and afterwards Civil Commandant at Launceston. He contributed a paper on vital statistics of Tasmania to Volume 2 of the Papers and Proceedings (1854) Mr. Abbott died in 1875—see obituary notice in Hobart *Mercury* of 12th July, 1875.

On 12th September, 1844, Dr. George F. Story (44) became Secretary, receiving the salary of £200 a year. In November, 1845, in consequence of the Lieutenant-Governor having intimated that the grant would be reduced to £200 a year, (45) Dr. Story resigned, and Dr. John Lillie, D.D., (46) became Honorary Secretary. He continued to act as Secretary until Dr. Milligan's appointment in 1848.

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(43) The date is taken from a notebook of Mr. Francis Abbott, Jun. (Superintendent of the Gardens, 1859-1903), and now at the Botanical Gardens. The minutes of the Society for 1844 have not been found, and Mr. Abbott's notebook has enabled several gaps in the narrative to be filled.

(44) George Fordyce Story, M.D., 1800-85. Dr. Story lived for many years at Kelvedon, near Swansea. See notice in Mr. Maiden's Records of Tasmanian Botanists, these *Papers and Proceedings*, 1909, pp. 27-8.

(45) The grant was not, however, reduced.

(46) Sir Robert Hamilton, in his Inaugural Address to the Australasian Association for the Advancement of Science at its meeting in Hobart in 1892 (*Report*, pp. 1-21), says of Dr. Lillie (pp. 6-7):—"Born and educated in Scotland, Dr. Lillie "came out to Tasmania in 1837 as Minister of St. Andrew's Presbyterian Church "in Hobart. He was a man of rare eloquence, as well as of great grasp and power, "and his influence in directing the public mind into higher channels than are "occupied by the mere desire for the accumulation of wealth, by awakening it to "objects of liberal and scientific enquiry, and by enlarging on the advantages "arising from the possession of an enlightened and well-disciplined understanding, "must have had a beneficial effect on the minds of the rising community of Tas-"mania. He was constantly inculcating the maxim that a community, not less "than an individual, must look to itself for the means of developing its resources "and forming and establishing its character. 'It is not what stands in casual and "'adventitious connection with us, but what grows out of us—the living and "'genuine offspring of our own social organisation—which must ultimately give "'us our place and name among the nations of the world.' As President of the "Van Diemen's Land Mechanics' Institute, he delivered addresses on 'The Ad-"'vantages of Science,' on 'The Opportunities of Intellectual Improvement, "'chiefly with reference to the circumstances of this Community,' and on 'Know-"'ledge as the means of correcting Prejudice,' which are models of clear and "vigorous thought, and show a true appreciation of the lofty aims and objects of "scientific training and teaching. These addresses, which are as true and as "applicable to the circumstances of the community now as the day they were "written, would be well worthy of republication. They are the only published "addresses by him of the sort which I have been able to obtain; but he was "indefatigable as lecturer on scientific subjects, and he devoted much time and "thought to the furtherance of education generally, and especially to the necessity "of directing it into proper channels. He left the Colony in 1858, and died in "New Zealand in 1866 at the age of 59. I hope that some sympathetic hand may "yet be found to write some account of his life and work, and to rescue from "oblivion such lectures of his as are still to be found in scattered pamphlets pub-"lished at the time." Dr. Lillie was an original member of the Society, and remained a member until 1861. He served on the Council for many years.

For the first four years, the gardens absorbed all the energy of the Society. (47) In the first annual report (May, 1845), the Council gives the following account of its management of the Gardens (pp., 8-11):---

"The attention of the Council was, in the first place, "directed to such alterations as by the division of the "original Garden were rendered necessary, in order to "carry out with efficiency the primary objects of the "Society; and it having always been intended that the "Secretary should reside in the house theretofore occupied "by the Superintendent, (48) accommodation was pro-"vided for the Secretary in town, until a cottage could be "built in the Garden for the Superintendent. The cottage "was therefore begun, and will now be very shortly effect-"ed, and when finished, a space will be left capable of being "converted into a public entrance to the Garden, through "which Visitors will hereafter be admitted.

"On the public drive through the Government Domain "being laid out, (49) at least an acre of excellent land was "left between the Garden fence and the new road, which "the Lieutenant-Governor has permitted the Society to "add to the Garden, and steps are now taking for the "purpose: when this is completed, it is proposed to divide "the entire area into such compartments as may best tend "to develop the physical character of the island, and "illustrate its natural history and productions. Three "compartments are at present in view: namely, one for "the botanical arrangement of plants, classified and label-"led; another for the cultivation of such plants as are "used in agriculture, medicine, and the arts; and a third "for the reception of such trees, fruits, and plants which "it may be in any way useful or desirable to introduce "into the colony.

"It may be remarked that, at the recent General Meet-"ing before adverted to, it was proposed to investigate, by

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(47) Sir Eardley Wilmot, early in 1844, erected a wall at the Gardens at the public expense. After Sir Eardley Wilmot's death the expenditure was disallowed by the Colonial Auditor as an improper charge on public funds (Despatch No. 168, 19th November, 1847, Lieutenant-Governor, Sir William Denison, to Earl Grey, Secretary of State for the Colonies). Possibly this wall is the brick wall to the east of the Government House kitchen-garden. Probably it is to Sir Eardley Wilmot's wall that a tradition at the gardens refers—that a former Governor built a wall to keep out grasshoppers, using for it bricks intended for Government House, and that he incurred the censure of the Secretary of State for so doing.

(48) This is the stone cottage now occupied by the Superintendent, built in 1829.

(49) "One of the first acts of Sir Eardley Wilmot was to give directions for the formation of roads through the Government Domain for carriage drives, and convenient space on each side for promenades."—*Hobart Town Advert scr*, 26th September, 1843.

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"chemical analysis and otherwise, the nature and proper-"ties of the gums, resins, and other vegetable products of "this island, as well as the qualities of those vegetable sub-"stances that may be rendered useful in medicine, dyeing, "etc. . . . .

"The Society has had two Horticultural Shows: one in "December, for summer flowers, fruits, etc.; the other in "February, for autumnal flowers, fruits, vegetables, etc.; "both of them proved very satisfactory. The first was "held at the Pavilion on the day of the regatta; the latter "in the Music Hall in Collins-street."

The horticultural shows held by the Society were discontinued at the end of 1845, in consequence of the establishment of the Hobart Town Gardeners' and Amateurs' Horticultural Society; and the shows of the new Society were supported by the members of the Royal Society. (50)

Towards the end of 1845 Mr. F. W. Newman, of Sydney, was appointed Superintendent of the Gardens. (51)

During 1844, 1845, and 1846, the meetings of the Society were held in town, frequently at the office of the Colonial Treasurer. In 1846 and 1847 the Society met in the house at the Gardens.

The report presented at the annual meeting held in February, 1846, indicates that the Society was about to carry out its higher objects as a scientific institution (p. 9):---

"It is proposed that the Monthly Meetings, which have "been hitherto almost exclusively occupied in ballotting "for Members and appointing Office-bearers, shall be "specially devoted to the reading of a paper, and extem-"poraneous discussion upon some point either theoretically "or practically connected with those branches of natural "science which it is the design of the Society to cultivate "and encourage. . . . Agreeably to the suggestions of His "Excellency, the President of the Society, the Council "intend, as soon as they shall have adequate funds at "their disposal, to fit up the rooms of the cottage lately "occupied by the Secretary, as a Museum and Reading "Room."

At the monthly meeting held in June, 1846, Dr. Lillie read a paper on "The Eucalyptus and other genera of the "natural order Myrtaceae indigenous to Van Diemen's

(50) Report, 1846, p. 8.

(51) Mr. Newman is the first Superintendent mentioned in the Reports of the Society. Mr. Abbott's notebook records that Mr. Herbertson (who had previously been employed under the Governor) was appointed head gardener on 16th November, 1843; Mr. Grant became Superintendent on 30th May, 1844; and Mr. J. Dickenson on 5th May, 1845.

"Land, in relation to the peculiar character of the soil and "climate." There is no record of any other paper being read, however, and the proposed development of the Society was not carried into effect until after the appointment of Dr. Milligan as Secretary, in 1848.

The Tasmanian Society, 1843-1848.

In November, 1843, Sir Eardley Wilmot resigned the office of President of the Tasmanian Society, and Sir John Franklin was unanimously re-elected. (52)

Mr. Abbott's note book records that on 7th March, 1844, a proposal was received by the Royal Society from the Tasmanian Society seeking amalgamation, and that the Royal Society subsequently determined that it could not entertain the proposal.

The Tasmanian Society seems about this time to have retired to Launceston, where its most active member, Mr. R. C. Gunn, resided. No. 9 of the *Tasmanian Journal*, published about April, 1845, (53) contains the minutes of meetings held at Launceston from June, 1844, to March, 1845. At the meeting of 4th June, 1844, the Rev. J. P. Gell resigned the office of Secretary, and Mr. Gunn became Secretary in his place.

The Society met "in a private and domestic way," (54) writes Mr. Gunn. It continued to attract members of considerable distinction, and papers of great value were contributed to its journal. The journal was published quarterly from April, 1845, to January, 1847, and afterwards half-yearly until January, 1849. The second volume (1843-6) and the third and last volume (1846-9) were published in Tasmania by Henry Dowling, of Launceston, and in London by John Murray. To the end the *Tasmanian Journal*, under Gunn's editorship, maintained the high standard of its early numbers. In type, in paper, in illustrations, in its record of discovery, in the distinction of its contributors, it is safe to say that the earliest of Australian scientific journals has never since been surpassed in the Southern Hemisphere.

Efforts continued to be made to reconcile the two societies. The Tasmanian Society applied in 1846 for a share of "the amount voted for the advancement of science" (mean-

(52) R. C. Gunn to His Excellency, Mr. C. J. Latrobe, 26th November, 1846.—C.S.O., C.B., volume 225, No. 795.

(53) No. 8, at an interval of at least 12 months after No. 7 had been published late in 1844 or early in 1845. Nos. 8 and 9 were printed at the office of the *Launceston Examiner*.

(54) Letter to Mr. Latrobe, 26th November, 1846.

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ing the £400 a year granted to the Royal Society). It was natural that the older Society, with no resources (unless, indeed, it still received the rents of Ancanthe), should feel that it deserved some help when another Society which did little scientific work received a considerable grant. Mr. Latrobe, to whom the application was made, was disinclined to help two societies, but willing to make a grant to a combined Society, and he made efforts to bring the two societies together. (55) It was probably as a result of his intervention that a special meeting of the Council was held on 29th January, 1847, for "the consideration of a "proposition for uniting the Royal Society and the Tas-"manian Society." The minutes of the meeting record that:—"After maturely deliberating on the question, the "Secretary was instructed to communicate with the Secre-"tary of the Tasmanian Society, with the view of ascertain-"ing the distinct grounds on which such union should take "effect, the Council being unanimously of opinion that "such union is most desirable, in itself."

The minutes of the next meeting of the Council that a meeting of the Tasmanian Society held at Launceston on 24th February, 1847, had negatived the proposal of a union.

The *Tasmanian Journal* contains the minutes of various meetings of the Tasmanian Society in 1847 and 1848, the last on 10th May, 1848 (in the number for July, 1848). The last number (January, 1849) does not mention any meetings. (56).

III. THE SOCIETY FROM 1848 TO 1863.

The Expansion of the Society, 1848.

Sir William Thomas Denison, a captain of the Royal Engineers, and a Fellow of the Royal Society of London, assumed the governorship of Tasmania early in 1847. He will long be remembered in Tasmania for the many public works he carried out, and for his many projects for the advancement of Tasmania. He seems to have interested himself at once in the Society, and to him must be attributed its expansion in 1848.

No materials are available for an account in detail of Sir William Denison's intervention. He refers to its result in a letter to Admiral Beaufort, 5th February,

(55) See his minute in C.S.O., C.B., vol. 225, No. 795.

(56) For further references to the Tasmanian Society, see p. 150.

1849: "I have set on foot a scientific society; that is, I "have succeeded in making a society, which had been nominally established several years, perform some work, and "I hope to be able to forward home a specimen of its "labours shortly." (57)

Sir William Denison resumed Mr. Latrobe's efforts to unite the Royal Society and the Tasmanian Society, as appears from a reference to "negotiations with the local "Government" in the minutes of a meeting of the Council on 7th June, 1847.

In his finance minute for 1848, read to the Legislative Council on 17th March, Sir William Denison said: "I "have retained the amount of £400 allowed to the Van "Diemen's Land Society, and have inserted a sum of £100 "to be paid to a similar Society at Launceston. I have "placed these sums, however, on the estimates in the hope "that, by some mutual arrangement, or by a coalition "between all the individuals or societies having at heart "the promotion and diffusion of scientific knowledge, a "general Society might be formed, to whom the Government might with justice be called upon to afford assistance to a greater amount than is now done to these "detached societies, in consideration of the benefit likely "to accrue to the country from its operations."

In the report presented to the annual meeting held on 4th May, 1848, the Council, after referring to the desirability of appointing a paid Secretary, say:

"The Council recommended this step in their last Annual Report to the Society; but it was not acted upon, "in consequence of a wish expressed on the part of His "Excellency the President to reorganise the Society, and "combine it with other societies, in order to promote, as "His Excellency believed, its usefulness. . . . It is "understood that His Excellency now finds his plan of "amalgamation impracticable."

In April, 1848, Mr. William Henty, the Secretary of the Launceston Horticultural Society, proposed to Sir William Denison that a "federal" society should be formed from

(57) *Varieties of Vice-Regal Life* (London, 1870), 1., 107. Sir William Denison seems to have rendered a similar service to the Philosophical Society of New South Wales (see note 1). In a letter to Sir Roderick Murchison, 25th June, 1856 (ib., i., 354), Denison wrote: "I have got my "Philosophical Society to work at last. . . . I determined I would not be "President of an effete body, so I called the members together, read "a paper on railroads, got them to agree to meet regularly once a "month for eight months in the year, and shall now by the help of "occasional papers from myself, and of suggestions to others, manage, "I dare say, to generate, first, an appetite for writing, and then a "taste for observation, in order to have something to write about."

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existing societies. (57a) His proposals are contained in a "prospectus" which was published in the *Examiner* of 22nd July, 1848.

"PROSPECTUS for an enlargement of the objects and "constitution of the Royal Society.

"Name.—The Royal Society of Van Diemen's Land.

"Objects.—The advancement of agriculture, horticul-"ture, agricultural chemistry, botany, and geology, and "other branches of science and natural history, and the "various objects of productive industry, arts, and manu-"factures.

"Means of Support.—The Government grant of £ "and a subscription of 10s. 6d. per annum from each "member.

"Constitution and Procedure.—All subscribers to be "*ipso facto* members, to elect their President, and Council, "and Secretary, the latter to receive a salary of £ "per annum and travelling expenses. Each Member to "be entitled to a copy of the proceedings. The following "societies to be affiliated branches, but their present "management not to be interfered with, viz., the Horticul-"tural Societies of Hobart Town and Launceston, the "Tasmanian Society, the Midland Society. (57b) These "societies will continue to raise and spend their own funds "as at present. Their privileges will be that of inserting "in the Transactions of the Royal Society their selected "papers, also abstracts of their reports, and the right of "correspondence for advice and co-operation with the "Secretary of the Royal Society.

"Prizes to be offered by the Royal Society for essays "and reports connected with the objects of the Society.

"Stated meetings to be held at Hobart Town, also at "Oatlands, Campbell Town, Launceston, Westbury, etc. (in "manner of the Chemical Association of Scotland), for the "discussion of selected topics and reading of papers and "lectures.

"The Secretary.—His duties will be the general superin-"tendence of the affairs of the Society (subject to the "Council); to visit the districts of the colony as geologist "and botanist; to arrange the meetings for reading of "papers, etc.; to give lectures; to arrange for the periodi-"cal publication of the Transactions, and correcting them

(57a) *Hobart Courier*, 15th April, 1848. *Launceston Examiner*, 6th May, 22nd July, 1848.

(57b) The Midland Agricultural Association, established at Campbelltown in 1838.

"for the press; foreign correspondence; correspondence "with the affiliated societies; preparing the annual report, "etc.; superintending the museum and library."

(Signed by about forty gentlemen representing the Tasmanian and Horticultural Societies, and the Midland Agricultural Associaton).

Sir William Denison sent these proposals to the Council, which received them somewhat coldly. (57c) Meantime, however, the rules of the Society had been revised, and a new rule (17) was added, as follows:—"Any Member of "the Tasmanian Society may be admitted into the Royal "Society, without recommendation and without ballot, on "his application to that effect to the Secretary, accom- "panied with the year's contribution."

The *Tasmanian Journal*, as already stated, does not mention any meetings of the Tasmanian Society after May, 1848, while the *Papers and Proceedings* of our Society for 1849 record meetings of the Society for the reading and discussion of scientific papers from August, 1848. Mr. R. C. Gunn, the most active member of the Tasmanian Society, was elected to the Royal Society in July, 1848. Five other prominent members of the Tasmanian Society joined the Royal Society in 1848, and four in 1849. The *Launceston Examiner* of 18th August, 1849, in a review of the last number of the *Tasmanian Journal*, wrote: "We "understand the Society is at an end." (58)

Early in 1848, Dr. Joseph Milligan (59) was appointed

(57c) Minutes of Meeting of Council, 13th July, 1848.

(58) Captain H. Butler Stoney in *A Year in Tasmania* (Hobart, 1854), after referring to the trusts of the Ancanthe estate, writes (p. 157): "We are uncertain whether the College at Bishopsbourne fulfils all "the conditions; but there is reason to believe that the Museum and "the lands, etc., forming its endowments, have been handed over to "the trustees for that College. The funds upon which the Tasmanian "Society depended for its support, in a great measure, being thus "withdrawn, and the Royal Society having been formed about the "same time with similar objects, most of the members of the former "joined the latter, under the impression that one strong Society would "more effectually accomplish its end than could be effected by two, "having only the same amount of means at command, and double the "amount of expenditure to defray."

It is clear that there was nothing of the nature of a formal union of the societies. None of the property of the Tasmanian Society passed to the Royal Society. One of the sets we have of the *Tasmanian Journal* was given to us by R. C. Gunn in 1849; the other we obtained in 1854. None of the books or records of the Tasmanian Society seem to have come into our possession at that time; the Minute-book for 1841 did not come to us until 1878. A large number of unbound sheets of the *Tasmanian Journal* remained in R. C. Gunn's possession, and after his death were bought by a bookseller.

(59) Joseph Milligan, 1807-1884. He obtained the diploma of the Royal College of Surgeons of Edinburgh in 1829, and in 1830 he was appointed surgeon to the Van Diemen's Land Company at Surrey Hills, where he remained 10 or 12 years. Sir John Franklin appointed him to be inspector of convict discipline. He was subsequently superintendent of the aborigines at Flinders Island. He was a member of the

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paid Secretary of the Society "in its proper and originally "intended character of a Scientific Society," in succession to Dr. Lillie. Sir William Denison rendered it possible for the Society to secure Dr. Milligan's services, by giving him at the same time an appointment under the Government. The salary proposed to be paid by the Society was £150, but at Dr. Milligan's request this was reduced to £100 for several years, in order that funds might be available for other purposes of the Society.

Dr. Milligan's appointment, and the constant interest shown by Sir William Denison in the Society—of which ample evidence is given by the numerous resolutions of thanks passed from time to time by the Council and the Society, and by the numerous papers he read—at once resulted in the expansion of its work. The Gardens were maintained as heretofore; but the Society now held frequent meetings for the reading and discussion of papers, a Museum and a Library were established, and in 1849 the first number of the *Papers and Proceedings* was published.

For the reorganisation of the Society the members will always hold Sir William Denison in grateful memory. It was he who brought into the Society the most active of the members of Sir John Franklin's Society, and who inspired in our Society the good traditions which they had established. Sir Eardley Wilmot was the founder of our Society; but with him we may associate as founders of its traditions his predecessor Sir John Franklin and his successor Sir William Denison. To these three Governors the Society owes its existence, and the spirit in which its early work was done.

Before referring in some little detail to the work of the Society from 1848 to 1863, it is convenient to mention now that in 1854 an Act of the Legislative Council made provision for vesting the property of the Society in trustees, and for other matters connected with the management of its affairs. In 1855 the name of the Colony was changed to Tasmania, and the Society then became "The Royal Society of Tasmania for Horticulture, Botany, and the "Advancement of Science." This remained the correct title of the Society until 1911, although both in the Society's Rules and publications, and in common usage, the shorter

Tasmanian Society and an original member of the Royal Society. He contributed many papers to the *Tasmanian Journal* and to the *Papers and Proceedings*, of which one of the best known is a vocabulary of the language of the aborigines of Tasmania. See later references in this narrative, an obituary notice in the Report for 1884, and Mr. Maiden's Records of Tasmanian Botanists, these *Papers and Proceedings*, 1909, p. 22.

title was used. In 1911, by the Royal Society Act, 1911, the Act of 1854 was repealed, and the Society was made a body corporate by the name of "The Royal Society of Tas-"mania," with perpetual succession.

The Membership.

The number of original members nominated by Sir Eardley Wilmot on 14th October, 1843, was 50 (including the President). By the beginning of 1844 the number had increased to nearly 100.

The number of members in 1847 was 81. After Dr. Milligan's appointment, the numbers grew rapidly. At the end of 1848 there were about 120; in 1849 about 140. The prosperity which followed the discovery of gold enabled the Society to increase rapidly. In the years 1853 to 1855 the number of names in the lists in the annual reports (in addition to honorary and corresponding members) is about 330; but the names of those who failed to pay their subscriptions were not then removed so promptly as our rules now require, and this number included many whose membership had lapsed. The largest number who paid subscriptions in any year was about 240 (in 1854). In comparing these numbers with the membership in later years, it must be remembered that in the early fifties many scientific men in neighbouring colonies which had no scientific societies joined our Society; and the privileges in connection with the Gardens attracted many local members. From 1856 the membership decreased, and in 1863 only about 100 annual subscriptions were received. (60)

The subscription was originally £1, with an entrance fee of £2. The entrance fee was abolished in 1844 or 1845 (61). In 1853 the subscription was raised to £1 10s. (62)

A Northern branch was formed at Launceston on 26th September, 1853, at a meeting held at Franklin Lodge, a building in the Horticultural Society's Gardens, now the

(60) The Society has always had the support of many members who have not been specially interested in its work as a learned body, and the number of these has varied with the prosperity of the island, and the energy with which members have invited their friends to join. From 1860 to 1880 the number who paid annual subscriptions was usually from 80 to 100, rising occasionally to 120. In the early eighties the numbers were about 120, and in 1885 and 1886, 148. After 1886 the numbers decreased again, and by 1904 the Society was reduced to 67 ordinary members. The number increased from 1907, and now is 156, the largest for over 50 years.

(61) Report, May, 1845, p. 11.

(62) Report, 1853, p. 4. No change in the subscription was made until 1908, when associates were admitted at 15/, and the subscription for country members was reduced to £1. In 1912 the subscription for all members became £1/1/.

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City-park. Later, the branch held its meetings in a room in the Public Buildings. Some show cases were obtained from the Society in Hobart, and a collection of specimens of geology and mineralogy was got together. (63)

In 1857 the branch had about thirty members. Interest waned, and there does not seem to be any reference to it in the Society's Reports after 1860; but it is mentioned in Walch's Almanac until 1878.

The cases and specimens of the museum of the Northern branch were afterwards bought by the Mechanics' Institute of Launceston. The collections were kept for a time at the Public Buildings, but in 1885 or 1886 were moved to the Institute. In 1887 the Victoria Museum and Art Gallery was commenced, and on its completion the collections of the Institute were moved to it. (63a) The Royal Society was thus the parent both of the Tasmanian Museum and the Victoria Museum.

The Museum and Library.

The original Rules of the Society provided for a Museum and a Library; and as early as 1844 there is mention of "some dried plants for our Museum." In the Report for 1845, the Council reported that Sir Eardley Wilmot had given a valuable collection of specimens of natural history, and had written to the Royal Society, the Linnæan Society, and the Antiquarian Society (of all of which he was a member), and other societies, asking for books for the library; and that it was intended to fit up the rooms of the cottage lately occupied by the Secretary as a Museum.

In 1846 the first book for the Society's Library—Loudon's Encyclopædia of Plants—was ordered; and in 1847 the University of Cambridge presented several bibles and books on divinity.

In June, 1848, Sir William Denison gave permission for the use, free of charge, of "the large Committee Room at "the Legislative Council Chamber" as a Museum and Library and meeting-room for the Society; and obtained a grant of £100 a year towards the expenses of the Museum. The Committee Room and an adjoining room were occupied by the Society until 1852.

The Report for 1848 records that a Library was now

(63) Henry Button, *Flotsam and Jetsam* (Tasmania and London, 1910), p. 315.

(63a) *Flotsam and Jetsam*, pp. 315-6. Ernest Whitfeld, *History of the Launceston Mechanics' Institute and Public Library* (Launceston, 1905), p. 10.

being got together. The Library appears to have been intended to be a public one:—

"The nucleus of a Public Library has been formed, "which, it is to be hoped, may, through the cordial sup-"port of Members of this Society, and of the community, "aided by the liberality of Government, expand into an "institution at once creditable as a national undertaking, "and of the highest importance in making available to "practical purposes in this new country the rich stores of "knowledge accruing from the labours and researches of "the learned and scientific in other parts of the world. The "Library comprises at present only about eighty volumes, "besides pamphlets; almost all of which are presentations "from Members."

"The Books are being registered, and Rules and Regula-"tions are about to be framed for rendering them as wide-"ly accessible to the public as the circumstances of the "Society will permit." (64)

In 1849, the Tasmanian Public Library (65) was formed, and the Council consequently restricted the purchase of books to such as were of a scientific character:

"In the last Annual Report it was said 'the nucleus of " 'a Public Library has been formed.' Since then the Tas-"manian Public Library has been established, claiming as "a separate institution the sympathy and support of the "community.

"This has led the Council to restrict the purchase of "Books for the Society's Library to such as are of a scien-"tific character. Amongst the books bought are 20 parts "of 'Gould's Birds of Australia'; the residue will be pro-"cured through Mr. Gould's agent here. It is a costly "work, but indispensable to the study of Australian Or-"nithology. Equally expensive, and quite as essential to "a student of the Natural History of Tasmania, is the " 'Mammals' of the same author; of this the first part has "been procured, and Mr. Gould's agent will supply the rest "as they issue from the press. The increase of the Library "has, of course, been limited—the register comprising only "about 250 volumes besides pamphlets." (66)

The first catalogue of the Library was published in the Report for 1850. A second catalogue was published in 1856. (67)

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(64) Report, 1848, pp. 15-16.

(65) The Library was at first a subscription library, and in 1849 a grant of £100 a year for the purchase of books was made by the Government. The Library was at first at No. 1 Barrack-street. There had been a subscription library in Hobart as early as 1826.

(66) Report, 1849, p. 18.

(67) The Library was again catalogued in 1885, by Mr. Morton.

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Considerable sums were expended in the purchase of books, and in 1860 it was reported that the expenditure had become "beyond the means of the Society." The expenditure on the Library for the previous five years had been nearly £90 a year; and was one of the sources of the debt under which the Society laboured until, by Dr. Agnew's exertions, it was paid off in 1864.

The Museum collections grew rapidly, and the accommodation at the Legislative Council Chamber was soon inadequate. In 1851 the Council entered into negotiations with the Building Committee of the proposed Royal Exchange. It was proposed to provide rooms in the Exchange building both for the Society and the Public Library; but the negotiations were broken off.

In 1852 the Society took a lease of premises in Harrington-street, opposite St. Joseph's Church, and its Museum and Library were moved from the Legislative Council Chamber. The Society had now to provide rent, and the Council was anxious that as soon as possible the Society should be in premises of its own. The accommodation at what was now called the Museum was also likely soon to be exhausted, if the collections continued to grow. The Council pointed out that they had been encouraged by the Government to undertake a Museum; and that the Museum, being open to the public, had become an important local institution. They therefore felt justified in applying to the Crown for a site for a Museum, at the same time undertaking to raise by public subscription a sum towards the erection of a building.

The Government received the Council's application favourably, but it was some years before a site was decided on. In 1854 it was suggested that the Council should receive Fitzroy Crescent (68); and the Report for that year says (p. 8):

"The Council have now the pleasure of stating that the "Government has agreed to the transfer by the Crown to "the Society of that valuable area of enclosed ground "known as Fitzroy Crescent for a building site, and for the "purpose of initiating a Zoological Garden, for which it is by "Nature admirably adapted, being possessed of considerable "diversity of soil and surface, and having a perennial "stream of pure water running through it."

The Society seems to have come into the occupation of

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(68) In 1851 a public subscription had been raised for forming a promenade and pleasure grounds at Fitzroy (or Garden) Crescent. In 1854 the subscribers agreed to the site being given to the Society. C.S.O., Denison, volume 267, No. 5,979.

Fitzroy Crescent for a time; but no steps were taken towards the erection of a building or the formation of gardens—one reason being the scarcity and high price of labour.

In 1853 the Society purchased "the highly-finished and "well-contrived cases and fitttings of the Franklin Museum "at Ancanthe, New Town," and these were gradually brought to Hobart and re-erected in the Harrington-street Museum. In 1854 the grant for the Museum was increased to £200.

In 1856 the Secretary wrote to the Colonial Secretary, stating that some members of the Council considered that the site in Fitzroy Crescent—as also a site suggested in the Domain—was inconveniently situated for a public museum, and asking that a site be reserved in one of the following situations:—"At the corner formed by Mac-"quarie-street and Murray-street, in the quadrangle en-"closed by the wall of the gaol, which it is understood will "very soon be removed; or at the corner formed by Mac-"quarie-street and Argyle-street, now garden ground, oc-"cupied by the Aide-de-camp; or in Collins-street, upon a "piece of ground between Elizabeth-street and Murray-"street, the property of the Crown, which is now occupied "as a Coachmaking Establishment." (69)

In reply, the Colonial Secretary informed the Society that a portion of the gaol site would be reserved; that a grant of money towards the erection of a building would be made; and asked that plans be prepared.

In 1857, however, the Society was informed that the gaol site was to be sold; but that the claims of the Society would be considered when the land attached to Government House (Macquarie-street) was available.

In 1858 a site, in what is now Franklin Square, was gazetted; and the Council at once undertook the collection of public subscriptions towards a building. Mainly by the exertions of Dr. Milligan, there was raised by the end of 1859 a sum of £1,646 13s., (70) and this sum grew with interest to over £1,800.

But in 1859 the Government decided to reserve the whole of the Government House grounds, in order that the site might be available at a future time for new Houses of Parliament, and the Society was offered accommodation in the new Government Buildings then about to be erected in Murray-street. (71)

(69) Report, 1856, p. 16.
(70) The subscription list is printed at pp. 48-52 of the *Report* for 1859.
(71) Report, 1859, p. 20.

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Finally, in 1860, the site of the present Museum was given to the Society. (72)

The Papers and Proceedings.

During the first five years of its life the Society published only annual reports. There was little else, indeed, to publish, for scarcely any original papers were read before the Society. Many of the members were members also of the Tasmanian Society, and contributed to its Journal.

The last number of the *Tasmanian Journal* is dated January, 1849; and our *Papers and Proceedings* appear to have been intended to take its place. The Council, at a meeting held on 7th March, 1849, decided that the size, form and type of the forthcoming Journal of the Society should be those of the *Tasmanian Journal.*

Volume i., Part 1, of the *Papers and Proceedings of the Royal Society of Van Diemen's Land* is dated May, 1849. It consists entirely of reports by Dr. Milligan on the Coal Basins of the island, illustrated by hand-coloured sections; and, by the good offices of Sir William Denison, was printed at the Government Printing Office.

Volume i., Part 2, was published in January, 1850, and its contents were similar to those of the *Tasmanian Journal* — original papers read before the Society, detailed reports of the proceedings of meetings, and miscellaneous notes and articles from other sources. This form our *Papers and Proceedings* retained during the remainder of Dr. Milligan's Secretaryship.

Part 3, completing Volume i., was published in 1851; Parts 1, 2, 3 of Volume ii. were published in 1852, 1853, and 1854; Part 1, of Volume iii., in 1855; and Part 2, which completed Volume iii., in 1859.

After 1859, there was no publication (except annual reports) until 1863. (In one of the Society's sets, there is bound a paper by F. Abbott, F.R.A.S., which seems to have been published in 1860; but probably this was not intended to form part of a volume.) In 1863, publication was resumed, in monthly numbers, and in a different form.

The Gardens.

Mr. F. W. Newman remained the Superintendent of the Gardens until his death in 1859. The Annual Reports of the Society contain many references to Mr. Newman's excellent management, and the Gardens grew rapidly in

(72) Report, 1860, p. 19.

favour as a resort of the public. In those days visitors signed their names in a book at the entrance, and there was consequently some record of their number. In 1847, there were 2,287 visitors; in 1850, 9,191; in 1853, 12,635; in 1856, 13,251; in 1859, 15,725; in 1863, 20,488; in addition to many names not entered on days when the band of the regiment in garrison played in the Gardens.

The pond in the Gardens was made in 1848, and saved much expense for water, which previously had been carted from the town.

In 1854, the Government grant for the Gardens was increased to £600; in 1863 it was reduced to £550, and in 1867 to £400; in 1877 it was raised to £600; in 1880 it was reduced to £450; and in 1881 raised again to £600.

The Annual Reports record the introduction of many new varieties of fruits, grains, and grasses. In 1847, 28 new kinds of apples were introduced; and the *Papers and Proceedings* for 1854 (Volume ii., p. 485) record a list of 42 varieties of apples submitted for the opinion of members. The Reports for 1846 and 1854 mention the introduction of new pasture grasses; and in the Report for 1860 is published a list of grasses adapted for agricultural purposes, then cultivated in the Gardens.

The area of the Gardens, originally about 12 acres, was gradually enlarged, until in 1856 over 20 acres were in cultivation.

In 1857 a catalogue of the plants growing in the Gardens was published. The Report for 1858 contains a supplementary list; and lists of plants introduced each year are published in the Annual Reports.

In 1859, Mr. Francis Abbott, jun. (a son of Francis Abbott, F.R.A.S., whose meteorological observations were published by the Society) was appointed Superintendent. Mr. Abbott had been apprenticed in the Gardens in 1850. He remained Superintendent until his death in 1903.

In the straitened circumstances of the Society in the early sixties, the Society had some difficulty in maintaining the various brances of its work, but the Council considered that the Gardens must not be allowed to suffer. An extract from the Report for 1862, p. 19, is of some interest, as showing that Tasmania was already becoming a summer resort:

"The Society has ever felt that, irrespective of their "great scientific value, it was a duty in reference to the "more immediate interests of Hobart Town and the Colony "generally, to keep the Gardens in such order as should

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"enhance the advantages of the place as a summer residence."

Meteorological Observations.

The *Tasmanian Journal* contained meteorological observations taken at various places in Tasmania; and the Society continued this work. The Society superintended the keeping of meteorological observations at several lighthouses and other stations in Tasmania, and the preparation of the observations for publication. The most important of the observations were those of Mr. Francis Abbott, F.R.A.S., of Hobart, which extended from 1841 to 1878. These observations were published from time to time by the Society, and in 1859 a compilation of the observations for the years 1856-8 was published as an appendix to Volume iii. of the *Papers and Proceedings*. Other compilations, extending the averages over longer periods, were afterwards published.

The Society seems to have provided the instruments for country observations. In 1859 no less a sum than £93 16s. 8d. was expended for instruments and printing.

International Exhibitions.

In 1850, Sir William Denison invited the aid of the Society in preparing and arranging the contributions from Tasmania to the Exhibition of Industry of all Nations, to be held in London in 1851. A Committee of members was formed, and a considerable collection, of which a catalogue was printed, was sent to London. One exhibit attracted some attention in England, although the difficulty of carrying it prevented it from reaching England until long after the Exhibition had been closed—"an 'Enormous "'Plank,' 144 feet in length, 20 inches in breadth, and 6 "inches in thickness . . . of 'Blue Gum,' cut at Long "Bay, in D'Entrecasteaux Channel." (73)

The Society also assisted in preparing exhibits for the Paris Exhibition of 1855; and when a permanent exhibition of the products of Tasmania at the Crystal Palace was established in 1857, the Society again undertook the collection and preparation of the exhibits. (74)

Fisheries.

There were many papers and discussions in the Society during the fifties on the introduction of the salmon into Tasmania. In 1858 the Society presented a valuable re-

(73) *Papers and Proceedings*, 1852, volume ii., p. 335.
(74) *Report*, 1857, p. 24.

port to the Government on this subject; and at about the same time experiments were carried out at the Crystal Palace, with a view to determine the most suitable temperature and the best means of obviating unfavourable conditions of climate, etc., in the course of the voyage to Tasmania. (75)

The Report for 1860 mentions the introduction of tench into the pond at the Gardens; and large numbers of this fish were afterwards distributed throughout Tasmania.

The Secretaries.

Early in 1860, Dr. Milligan, who had served the Society since 1848, obtained 18 months leave of absence to enable him to visit England; and the Society placed on record its appreciation of his services. Dr. Milligan did not return to Tasmania; but he did not forget the Society, and presentations to our Library and Museum reached us almost yearly until his death. He died in 1884, and by his will he left the Society the sum of £350.

The Honorable William Archer, F.L.S., M.H.A., (76) acted as Secretary until July, 1861. Mr. Archer was a botanist of some distinction, and to him, jointly with R. C. Gunn, Hooker dedicated his Flora of Tasmania.

In July, 1861, Dr. (after Sir James) Agnew became Honorary Secretary. Dr. Agnew remained Honorary Secretary until a time within the memory of most of the present members; and the Reports for many years contain tributes to the distinguished services he gave to the Society.

The New Museum.

With a reference to the building of the present Museum, this narrative will fitly come towards a conclusion. To the sum raised by the Society by subscription, the Government added £3,000; and when the site was at last settled in 1860, a contract was let to Messrs. Seabrook and Son to erect a building to designs by Mr. Henry Hunter.

The portion of the building then erected was the two rooms at the corner of Argyle and Macquarie Streets, the two galleries parallel to Macquarie-street, and the entrance hall and stairs. The total cost, with fittings, was about £4,800.

On 29th January, 1863, the Society held its first meeting in the new building, which, twice enlarged, has now been our home for over 50 years.

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(75) *Report*, 1859, p. 24.

(76) See Mr. Maiden's Records of Tasmanian Botanists, these *Papers and Proceedings*, 1909, p. 11.

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It only remains to add that at the end of 1885 the Society gave back to the Crown the Botanical Gardens and the Museum, which, with the collections of the Museum, were vested in a body of trustees, of whom six are chosen from the Society; and that, in consideration of the services rendered by the Society in the promotion of science, and in the formation and management of the Museum and Gardens, the right was reserved to the Society to have exclusive possession of sufficient and convenient rooms in the Museum, for the safe custody of its Library, and for its meetings, and for all other purposes connected with it. (77)

Tasmania is now a more highly organised community than sixty or seventy years ago. Not only are the Museum and Gardens vested in a public trust, and supported entirely from public funds, but Departments of the Government—the Department of Agriculture, the Geological Survey, the Weather Bureau, the Fisheries Board—are now charged with various duties formerly performed by the Society. The Society is now able to give all its activities to the work usually attempted by kindred societies—the reading and publication of papers, and the acquisition and maintenance of a library. Our annual volume of *Papers and Proceedings* places on record papers on the history, the resources, and the natural phenomena of Tasmania. It is sent to the principal libraries of the world, to the Governments and learned societies of the Empire and of foreign countries. In friendly correspondence with societies and institutions throughout the world, the Society takes its part in adding to the common fund of knowledge; and in return we receive from them the records of their work. The Library, though not always cared for, has grown steadily, and not the least valuable of its contents are those which our predecessors of fifty years ago obtained for us. It is for the members of the present day to see that our contributions to knowledge are maintained, and that we in turn pass on to our successors a library which they will value, as we value that which we have received. Maintaining the traditions of our founders, we may look forward to future anniversaries at which the continued interest of the Society to its members and its usefulness to Tasmania may be commemorated.

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(77) Act 49 Vic., No. 34 (1885).

Appendix.

THE TASMANIAN SOCIETY IN AUGUST, 1843.*

Resident Members.

HIS EXCELLENCY SIR JOHN FRANKLIN, K.C.H., K.R., F.R.S., D.C.L.
THE LORD BISHOP OF TASMANIA.

JAMES W. AGNEW, ESQ., M.D., *Saltwater Creek, Tasman's Peninsula.*
MRS. ALLPORT, *Hobart.*
GEO. BAGOT, ESQ., 51*st K.O.L.I. Regt., A.D.C.*
JAMES BARNARD, ESQ., *Hobart.*
W. H. BAYLIE, ESQ., *Longmarsh, Ross.*
EDWARD S. P. BEDFORD, ESQ., *Hobart.*
T. L. BELCHER, ESQ., 51*st Regt.*
HON. J. E. BICHENO, ESQ., *Colonial Secretary.*
CAPT. BOOTH, *Commandant, Port Arthur.*
HON. G. T. W. B. BOYES, ESQ., *Auditor.*
C. BRADBURY, ESQ., *Hobart.*
WM. HENRY BRETON, ESQ., P.M., *Launceston.*
DAVID BURN, ESQ., *Rotherwood.*
MAJOR COTTON, *Deputy-Surveyor-General, Hobart.*
W. L. CROWTHER, ESQ., *ditto.*
REV. R. R. DAVIES, *Norfolk Plains.*
R. H. DAVIES, ESQ., *Westbury.*
REV. T. DOVE, *Maria Island.*
REV. THOMAS J. EWING, *Head Master of the Queen's Orphan Schools, New Town.*
HON. P. FRASER, ESQ., *Colonial Treasurer.*
M. C. FRIEND, ESQ., F.R.S., *George Town.*
JAMES GRANT, ESQ., *Launceston.*
HON. T. G. GREGSON, ESQ., M.L.C., *Risdon.*
R. C. GUNN, ESQ., *Penquite, Launceston.*
F. H. HENSLOWE, ESQ., *Hobart.*
H. JEANNERET, ESQ., M.D., *Flinder's Island.*
W. P. KAY, ESQ., *Director of Public Works.*
J. H. KAY, ESQ., *Lieut. R.N., Magnetic Observatory, Hobart.*
T. J. LEMPRIERE, ESQ., D.A.C.G., *Port Arthur.*
R. H. LEWIS, ESQ., *Hobart.*
REV. JOHN LILLIE, *ditto.*
JOSEPH MILLIGAN, ESQ., *ditto.*
W. R. PUGH, ESQ., *Launceston.*
MRS. WHITEFOORD SMITH, *ditto.*
W. VALENTINE, ESQ., *Campbelton.*
M. VERREAUX, *Naturaliste, Hobart.*

Corresponding Members.

JAMES BACKHOUSE, ESQ., *York, England.*
M. LE CAPITAINE BERARD, *Le Rhin.*
REV. PROFESSOR BUCKLAND, *Oxford.*
R. H. BLAND, ESQ., *York, Swan River.*
REV. W. B. CLARKE, *Paramatta, N. S. Wales.*
W. COLENSO, ESQ., *Paihia, New Zealand.*
CAPT. ARTHUR F. COTTON, *Madras Engineers.*
CAPT. F. R. M. CROZIER, R.N., *H.M.S. Terror.*
HON. HENRY ELLIOT, *St. Petersburg, Russia.*
HON. E. C. FROME, ESQ., *Surveyor-General, Adelaide, South Australia.*
HIS EXCELLENCY SIR GEORGE GIPPS, *Sydney, New South Wales.*
JOHN GOULD, ESQ., F.L.S., *London.*
HIS EXCELLENCY CAPT. GREY, *Adelaide, South Australia.*
JAS. HAMLIN, *Missionary, Orooa, New Zealand.*
EDMUND C. HOBSON, ESQ., M.D., *Port Phillip.*
JOSEPH HOOKER, ESQ., M.D., *H.M.S. Erebus.*
M. JAQUINOT, *Captain in the naval service of H.M. the King of the French.*
H. JOHNSON, ESQ., M.D., *New Zealand.*
J. B. JUKES, ESQ., F.G.S., *H.M.S. Fly.*
CAPT. P. P. KING., R.N., *Port Stephens, N. S. W.*
HIS HONOR C. J. LATROBE, ESQ., *Port Phillip.*
H. LYALL, ESQ., *H.M.S. Terror.*
ROBERT M'CORMICK, ESQ., *H.M.S. Erebus.*
W. M'LEAY, ESQ., *Sydney, New South Wales.*
ALEX. MACONOCHIE, ESQ., *Commander R.N., Superintendent of Norfolk Island.*
FELTON MATTHEW, ESQ., *New Zealand.*
REV. J. MAUNSELL, *Manikau, New Zealand.*
REV. T. B. NAYLOR, *Norfolk Island.*
CAPT. PARKER, *London.*
M. RENAUD, *Le Rhin.*
PROFESSOR RENNIE, *Sydney, New South Wales.*
JOHN RICHARDSON, ESQ., M.D., *Haslar Hospital.*
CAPT. RICHMOND, *New Zealand.*
JAMES ROBERTSON, ESQ., *H.M.S. Terror.*
CAPT. JAMES C. ROSS, R.N., *H.M.S. Erebus.*
ANDREW SINCLAIR, ESQ., *Surgeon R.N.*
CAPT. STOKES, R.N., *H.M.S. Beagle.*
COUNT STRELESKI, *London.*
CAPT. STURT, *Adelaide, South Australia.*
REV. R. TAYLOR, *Waimati, New Zealand.*
REV. CHAS. P. WILTON, *Newcastle, N.S.W.*
WM. WYATT, ESQ., *Adelaide, South Australia.*

Secretary.

JOHN PHILIP GELL, ESQ., *Queen's School, Hobart.*

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THE INAUGURAL MEETING OF THE SOCIETY, 14th OCTOBER, 1843.

(From the *Launceston Examiner*, 21st October, 1843.)

Sir Eardley Wilmot, having accepted the office of President of the Tasmanian Society, convened a meeting of its members at Hobart Town on Saturday last: a number of other gentlemen were also invited to attend, with a view to the enlargement of the Society, and the extension of its sphere of usefulness. His Excellency addressed those present, and explained the alterations in the constitution of the Society which he proposed to adopt, and read such of the new rules as were of chief importance.

We are informed that the preamble read set forth the origin of the Society by Sir John Franklin, and stated that the great object contemplated by its founder was the development of the resources of the Colony by the illustration of its natural phenomena. Fully appreciating the value of the ends in view, Sir Eardley Wilmot had determined to appropriate the Government Garden, about 14 acres in extent, as an endowment for the Society, in addition to a money grant of £400 per annum from the public funds. His Excellency candidly avowed that the Secretary of State had forbidden the Garden to be cultivated any longer at the public expense; that in consequence some addition had been made to the Governor's salary, and that therefore there was no credit due to him for making a sacrifice.

It was proposed to change the name from the "Tas-"manian" to the "Royal Tasmanian Society," Sir Eardley Wilmot promising to solicit Her Majesty to become its Patron. The rules provided for the government of the Society by the election of a President (Sir Eardley Wilmot); four Vice-Presidents (the Bishop, Mr. Bicheno, Rev. Mr. Lillie, and Captain Swanston); a Council of twelve to be nominated by His Excellency; and at first fifty Fellows—in which number the members of the Tasmanian Society were to be included, as of right. The annual subscription was fixed at £1, with an entrance fee of £2 by all the members, whether old or new.

Rev. Mr. Lillie cordially approved of the new organisation of the Society as unfolded by His Excellency; but an objection was taken to the entrance money by the Rev. Mr. Ewing, who thought the existing members should not be subject to that preliminary expense. Mr. E. Bedford suggested that the £2 should be paid by the old members as a "donation," and not as an "entrance fee," in order that the "Tasmanian Society" about to be merged in the extended one should be fully recognised. In answer to a question by Mr Champ, as to the grounds upon which the old Society claimed exemption from the payment of the entrance money, or to be dealt with otherwise than the new members, Mr. Henslowe replied that, in his opinion, the Society had fairly earned its position; and, moreover, that it already possessed property to some extent, Lady Franklin having made over to it her estate of Ancanthe, comprising a museum, with four hundred acres of land attached; a cottage, letting for £25, and the land for £50 per annum---an income of £75 a year---was available for keeping up the Museum and other purposes of the Tasmanian Society.

A disposition to make concession as to the entrance money for the old members was then evinced. It is right to state that Sir Eardley Wilmot was not till then aware of Lady Franklin's munificent gift. Much desultory conversation ensued, and a rather growing irritability was visible. The Rev. J. P. Gell proposed the printing of the new rules, in order that they might be fully considered by the members, who, he doubted not, would most readily accede to the propositions when made acquainted with them; but His Excellency was averse from any delay, and seemed to entertain the belief that the objections against immediate amalgamation, without further modification, were not tenable. Mr. Belcher then got up and said that he believed the members of the Tasmanian Society were against the proposed increase of its body; upon which His Excellency, as its President, immediately adjourned the meeting of the Society sine die.

With the exception of five, the members quitted the room, with many others; and Sir Eardley Wilmot forthwith proceeded to establish a new Society from among those who remained, having resolved that the object connected with the grant of the Government Garden should be carried into immediate effect. His Excellency then revised the rules to adopt them to the new Society, which he at once entitled "The Horticultural and Botanical "Society of Van Diemen's Land," striking out all the irrelevant clauses. In the list of Vice-Presidents, for the Bishop, the name of Mr. Foster, Controller-General, was inserted, and the names of Sir John Pedder and Mr. Maclean were also mentioned for the honour; but we believe

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it was not fully decided. There were eighteen persons present, besides His Excellency, who was at first anxious that the "council of twelve" should have been at once nominated from them; but the election was at length deferred to the next meeting, fixed by His Excellency for to-day. Capt. Swanston was appointed Treasurer, and Mr. Champ requested to officiate as Provisional Secretary until the next meeting, with instructions to get the rules printed and circulated in the interval.

It is impossible to deny the utmost credit and praise to the Lieutenant-Governor for his energy and disinterestedness in thus accomplishing a beneficial public object, as well as for his obvious desire to unite all parties and sections on the neutral and common ground of science. The only shadow of an imputation that can possibly attach to His Excellency in the prosecution of the present design is the appearance of undue hastiness, approaching to precipitancy, in having, as President of the Tasmanian Society, called that body together, and before they were individually even made acquainted with what was contemplated, and had had the opportunity of calmly discussing and recording their opinion on the measure, admitting strangers outnumbering them to share in the discussion---a wise man said "that he took time to make haste": in this case it does seem that the most eligible and regular course would have been for the President first to have communicated with the existing Society separately, when a unanimous and cheerful acquiescence would doubtless have been immediately yielded.

On one point alone could the Tasmanian Society have been justified in being tenacious, and that was its name: an object most effectively secured by His Excellency. The liability to payment for entrance could certainly have been easily arranged—even better than in the way proposed by Mr. Bedford—of calling it a "donation" instead of "en-"trance"---a distinction almost without a difference, as was made manifest by Sir Eardley Wilmot. The Society could have shown a "set off" and pleaded "valuable considera-"tion" as well in its property of £75 a year, as in its organisation and copyright. By organisation---a work of time---is meant its correspondence, with eminent men in various parts of the globe, as, for instance, Sir John Herschell, Dr. Buckland, Professor Murchison, Dr. Richardson, etc.; and by copyright is meant its name and its journal, which have already acquired for this Colony some little celebrity and distinction in Europe.

LIST OF OFFICERS.

Superintendents of the Botanical Gardens.

WILLIAM DAVIDSON, 1828-1834.
MARTIN TOBIN, 1834-1840.
J. HERBERTSON, 1841-1844.
— GRANT, 1844-5.
J. DICKENSON, 1845.
F. W. NEWMAN, 1845-1859.
FRANCIS ABBOTT, Junr., 1859 1903.
JOHN WARDMAN, 1911-

Secretaries of the Royal Society.

WILLIAM THOMAS NAPIER CHAMP, *Secretary*, 1843-1844
JOHN ABBOTT, *Honorary Secretary*, 1844.
GEORGE FORDYCE STORY, *Secretary*, 1844-1845.
JOHN LILLIE, *Honorary Secretary*, 1845-1848.
JOSEPH MILLIGAN, *Secretary*, 1848-1860.
WILLIAM ARCHER, *Secretary*, 1860-1861.
JAMES WILSON AGNEW, *Honorary Secretary*, 1861-1881, 1884-1894.
JAMES BARNARD, *Honorary Secretary*, 1881-1884.
ALEXANDER MORTON, *Assistant Secretary*, 1886, *Secretary*, 1887-1907.
ROBERT HALL, *Secretary to the Council*, 1908-13.
FRITZ NOETLING, *Honorary Secretary*, 1910-1911.

Curators of the Museum.

THOMAS ROBLIN, 1862-1883.
ALEXANDER MORTON, 1883-1907.
ROBERT HALL, 1908-1912.
T. THOMPSON FLYNN, *Honorary Curator*, 1912-1913.
G. H. HURLSTONE HARDY, *Assistant Curator*, 1913-

PLATES.

xiii. Government House, Macquarie-street.

xiv. The Franklin Museum. Superintendent's House, Botanical Gardens.

xv. Customs House and Legislative Council Chambers. The Royal Society's Museum, Harrington-street.

xvi. The Royal Society's Museum. The Tasmanian Museum and Art Gallery.

xvii. Sir John Franklin. Lady Franklin

xviii. Sir J. E. Eardley Wilmot. Sir William Denison.

xix. Ronald Campbell Gunn. William Thomas Napier Champ. George Fordyce Story. John Lillie.

xx. Joseph Milligan. William Archer. James Wilson Agnew. Thomas Roblin.

NOTES ON A FOSSIL WHALE FROM WYNYARD, TASMANIA.

Plates xxi., xxii.

By H. H. Scott,

Curator of the Launceston Museum.

(Communicated by Mr. R. N. Atkinson.)

Read 13th October, 1913.

The specimens here referred to were discovered by Mr. R. N. Atkinson in the tertiary fossil-bearing strata of the Table Cape series, imbedded at the present tide line. This horizon is practically basic, and is therefore here assumed to be miocene. The history of the several recoveries of fossil cetacean remains in Australia, New Zealand, and Tasmania, has of late years been made the subject of an extensive paper by Dr. T. S. Hall, of the Melbourne University. (1) Quite recently, also, Mr. F. Chapman, of the National Museum, Melbourne, has noted the occurrence of *Scaldicetus* in the Beaumaris cliffs. (2) In these several records Tasmania is accredited with a single fossil tooth, discovered by Prof. Baldwin Spencer, and referable under Dr. Hall's revised taxonomy to *Parasqualodon Wilkinsoni*—being therefore generically and specifically homotaxial with Victorian specimens first recorded by Prof. McCoy in 1864. (3) As far as is known to me, this is the first recorded instance of fossil whale bones belonging to the appendicular skeleton being noted in Australia or Tasmania, and therefore the find is of more than local interest. Against this obvious gain there must be set the manifest disadvantage, that all the tertiary fossil whales have been described from teeth and skulls, while the appendicular skeleton remains quite unknown.

In the present Table Cape cetacean the teeth and skull being unknown makes direct comparison with the recorded tertiary whales of Victoria impossible. In a general way also this applies to other tertiary fossil whales, including those recorded from Europe, North and South America.

As illustrating this point, I may just say that out of 343

(1) On the systematic position of the species of *Squalodon* and *Zeuglodon*, described from Australia and New Zealand. *Proc. Roy. Soc. Vict.* 23 (N.S.) 1911, p. 257.

(2) On the occurrence of *Scaldicetes* in Victoria. Records Geological Survey of Victoria, vol. 3, part 2.

(3) *Geological Mag.* v. 4 (1864) p 145 pl. 8, f. 1.

distinct finds of fossil cetacean remains recorded in the catalogue of the British Museum (4) the several parts of the skeletons thus preserved are as follows:—Vertebræ, 141; tympanics, 62; perotics, 8; skulls, 47; jaws, 9; teeth, 55; humeri, 6; radii, 4; ulnæ, 4; ribs, 6; scapula, 1.

It will thus be obvious that the discovery of the arm bones of the Table Cape whale, without any fragments of the skull for collateral evidence, renders the problem unusually complicated, even when a large comparative collection is available for study, and doubly so in the absence of such. Lastly, in this connection it must be said that the cetacean that left its remains in the Table Cape rocks was an immature animal, and as the skeletal variations due to immaturity, sex, and individuality are enormous—even among existing whales—the problem is still further complicated.

In some whales the epiphyses of the vertebræ, and even the limbs, never completely ankylose, while in other genera they ankylose to extinction. The bones available, in the case of the present fossil, consist of parts of one arm, some vertebræ and ribs, with various vertebral epiphyses, all of which, in point of size, approximately agree with a fully grown dolphin of the genus *Tursiops*. But, as will be shown presently, these bones could not have been derived from any dolphin of the genera *Delphinus*, *Tursiops*, or *Globiocephalus*.

Taking the arm bones first, as being of the greatest importance, I propose to compare their epiphyses with those of a common dolphin *(D. delphis)* dissected by me in August, 1903. This was an immature male, of a total length of 6 feet 5 inches, as against 8 feet 1 inch for an adult of the same species, also similarly dissected.

Mature Dolphin.	*Immature Dolphin.*
Humerus--all epiphyses ankylosed to extinction.	Humerus--all epiphyses ankylosed.
Radius and Ulna—all epiphyses ankylosed to extinction.	Radius and Ulna—proximal epiphyses ankylosed to extinction, distal epiphyses still open.
Metacarpals — epiphyses all ankylosed.	Metacarpals proximal, epiphyses still open.
All vertebral epiphyses ankylosed to extinction.	Vertebral epiphyses still open.
Sternum—all segments ankylosed, thus presenting a single solid piece of bone.	Sternum—in three pieces, viz., manubrium, gladiolus, and ziphioid.

(4) With the exception of the *ziphioids*, this total does not include the smaller toothed whales, whose congeners still exist in our seas.

1913.	
Tongue Bones—so called—basihyal—a single solid bone.	Tongue Bones—so called—basihyal—in three pieces—viz., 1 true basihyal, and 2 thyro-hyals—all distinct moieties.

A careful examination of these data will prove that the epiphyses in the smaller toothed whales ankylose up according to the same general rules as those that govern the growth of land vertebrates generally, including man himself. Therefore a dolphin with its humeral epiphyses closed, and only the distal epiphyses of the radius and ulna open, is very close to the standard of full growth. This conclusion is also reached by another method of computation, namely, by taking the actual lengths of the two dolphins under review, a proceeding which yields a four-fifths growth for the immature creature. Reverting now to the fossil whale:—In the arm of this animal all the epiphyses, both proximal and distal, are open, and therefore if it belongs to a genus in which ankylosis takes place at maturity the animal may be fairly assumed to be less than four-fifths fully grown and perhaps only half grown.

From my personal knowledge of the smaller whales, added to such comparative tests as are available to me, I should say the animal at the time of its death did not exceed 12 feet in length. If this is correct, we are dealing with an animal whose length at maturity did not exceed thirty feet and was possibly less. Just here it may be convenient to say that one arm of a whale may show more epiphysial development than the other, so that if two workers were to study these arms without knowing their history, one might grant the whale a slightly more advanced age than the other would—all of which, of course, suggests the need for great caution.

The humerus of this fossil whale is devoid of its proximal epiphysis, but in the dolphin family this does not add to the total length since the head is at right angles to the shaft. If we assume that the same rule applies to the fossil, we get the following comparative measurements of the arm bones of three animals:—

Fossil Whale.	*Tursiops* (fully grown 12 foot male).	*D. Delphis* (fully grown 8 feet 1 inch).
Humerus (including distal epiphysis) = 125 mm.	Humerus (adult) = 95 mm.	Humerus (adult) = 70 mm.
Radius (distal epiphysis missing—10 mm. allowed) = 100 mm.	Radius (adult) = 110 mm.	Radius (adult) = 90 mm.
Ulna (distal epiphysis mutilated—10 mm. allowed) = 130 mm.	Ulna (adult) = 85 mm.	Ulna (adult) = 80 mm.

Expressed in another form we get:—

Name of Whale.	Largest Arm Bone.	Second Largest Bone.	Smallest Arm Bone.
Dolphin	Radius	Ulna	Humerus
Tursiops	Radius	Humerus	Ulna
Globiocephalus	Radius	Ulna	Humerus
Table Cape Fossil Whale	Ulna	Humerus	Radius

This information assists us in our search, since the humerus is the longest bone in the arms of cachalots and platanists, but shorter in whalebone whales, *Ziphius*, *Hyperoodon*, *Grampus*, and all dolphins. We can eliminate the cachalot and the platanistid. Again, we can, with the osteological data available, immediately cut out *Delphinus*, *Tursiops*, and *Globiocephalus*, since the shafts of both bones of the lower arm in the fossil are of equal diameter, and not as much flattened as in the dolphin group, where also the radius exceeds the ulna in width. Geologically, it may be added, that the largest members of the dolphin group, viz., *Orca* and *Pseudorca*, are unknown earlier than the newer pliocene, and since our fossil is (with all caution exercised in the act of presumption) older than that, our field is practically rid of the modern dolphin group altogether. We have next to consider the whalebone whales, and the ancient, though still lingering, group of ziphioid cetaceans, which, according to Prof. Flower, are "the survivors of an archaic family that once played a far more important part than now among the cetacean inhabitants of the ocean." These latter were apparently fairly numerous in the miocene oceans of Australia, and their remains were recorded by Prof. McCoy from Geelong.

In the right whale (*Balæna mysticetus*) the radius and ulna vastly exceed the humerus in length, in fact in about the ratio of eight to five. The rorqual is somewhat similar in this respect, although the ratios may not be quite so high. Influenced by these facts, I am tempted to discount the possibility of the fossil whale having any affinities with the whalebone whales, for even in the young of these animals the brachial and anti-brachial measurements would manifest the ratios of maturity. If, therefore, we are not dealing with an absolutely new whale altogether, its affinities by the above chain of reasoning should be with the ziphioid cetacean group, and it now remains for us to see what osteological evidence supports this conclusion.

The first thing that strikes an observer is the disproportion between the size of the arm and the ribs, for while the arm suggests a whale larger than *Tursiops*, the ribs are intermediate between that animal and the common dolphin of eight feet in length.

This agrees very well with the osteology of the ziphioids, in which whales the ribs are slender and less numerous than obtains in the dolphin group. Also, the sternal ribs are unossified in the ziphioids, and as far as the evidence yielded by the remains of the fossil animal goes, the sternals are absent. Naturally this latter point must not be pushed too far in dealing with fragmentary remains.

The shapes of the ribs in the fossil make many interesting departures from the dolphin type, their sections conforming to a more oval outline.

The epiphyses of the centra approach more nearly to *Tursiops* than they do to *Delphinus*, having the same amount of flattening as they contribute moieties to the naural canal.

From such fragments of the neural spines as have survived, I should judge them to have been more slender, and taller than those found in the dolphins, which also agrees with the osteology of an immature ziphioid, as far as it is known. I have been unable to collect any trustworthy data respecting the articulation of these fossil ribs, with their respective diapophyses and centra. One specimen looked promising, but as it has obviously sagged in the matrix I reluctantly abandoned the quest.

Coming now to the arm, which is the most perfect part of the whole find. The ratios between the upper and lower arm are agreeable with those found among ziphioids, as are also the straighter shafts and more even development of the bones of the lower arm. The departures from the dolphin group may be thus recapitulated :—

(1) Humerus more uniform in width throughout.

(2) Ulna not constricted in the region of the olecranon process.

(3) Olecranon, a wide fan-like crest and not a mere tubercle as in the dolphins.

From the published descriptions of the *Squalodons* it differs in having the arm bones more flattened, and thus making a nearer approach to the true whales; as also in having articular surfaces that apparently manifest no approach to the land carnivora.

Comparison with *Eurhinodelphis* is impossible since no description of the arm bones is available to me—if indeed these parts of the skeleton have been recovered. The extensive cetacean collection of the British Museum is not enriched with a single fragment of these creatures. In classification, Dr. Beddard allies *Eurhinodelphis* with the *Platanistidæ*, and if this taxonomy is sound it would cut out the Table Cape whale on the ratios of the upper and lower arm (vide supra).

Lydekker, however, allies *Eurhinodelphis* more directly with the *Ziphiidæ*.

From such evidence as I have thus set forth I consider that the fossil whale approaches more closely to an immature ziphioid than anything else, and provisionally classify it as being such. In conclusion, I wish to thank Messrs. E. D. and R. N. Atkinson for granting me the honour of collecting these notes from their interesting specimen.

The Launceston Museum, 4th Sept., 1913.

THE DEMOGRAPHY OF TASMANIA.

By L. F. Giblin.

(Read 8th September, 1913.)

Abstract

The chief results of the Census of 1911 are now accessible, and this circumstance naturally suggests a review of Tasmanian demography. The returns, however, are still incomplete, and all that is attempted in this paper is to call attention to some of the more remarkable phenomena in Tasmanian population, leaving a fuller discussion until all the data are available.

Migration.

The seasonal fluctuations in Tasmanian migration are well known, but need emphasising as a warning against comparing the population at different times unless both estimates are for the same day of the year. By distributing the annual loss equally throughout the year, and taking it away from the migration figures, we get the average quarterly fluctuation for the last ten years.

Quarter ending	*Fluctuation.*
March 31st	-1,320
June 30th	-1,851
Sept. 30th	-2
Dec. 31st	+3,173

The average annual loss since 1901 is 1,535, but different years show very marked variations, of which it is not easy to find an adequate explanation. The figures, however, have been a good deal adjusted, and it is not yet certain that they represent the facts exactly.

Natural Increase.

The Tasmanian figures are now ahead of those recorded for any country of the world, the average for the last five years just beating the last available figures for Bulgaria, which previously headed the list. There are no very special features about the death-rate, but the birth-rate has several points of interest.

Birth-rate and the Maternity Bonus.

Last year there was a rise in the recorded rate in all the Australian States, coincident with the coming into effect of the Maternity Bonus on October 10, 1912. It was at first thought that this was due to registration of births being more promptly carried out. But the greater part of the increase has persisted during the first six months of 1913, and it is now clear that it corresponds to a permanent increase in registered births per 1,000. It may be simply that births are registered which were formerly not registered. We have no means of checking the registration of births. The difference between successive census enumerations of course equals natural increase plus net immigration. It is always assumed that the figures for natural increase are correct, and that the large errors which occur are due to defective record of migration. But it may very well be that the birth figures are in defect, and that this deficiency is now being corrected to a large extent by the effect of the Maternity Bonus. The alternative is that there is a real increase of the birth-rate—after a long period in which it has been first decreasing and then almost stationary—due partly to general prosperity and partly to the large increase in immigration durng the last two years.

Fertility.

In place of the crude birth-rate the census makes available the figures for fertility, that is, the number of births per 1,000 women aged 15—45.

The comparison with crude birth-rate is of interest:—

		Birth-rate.	*Fertility.*
Australia	1880	35.2	170
	1890	35.0	159
	1900	27.3	117
	1912	28.6	126
Tasmania	1912	30.5	134

It will be noticed that the position of Tasmania relative to the whole of Australia is practically unaltered by taking fertility in place of birth-rate.

There is another test which may be taken. Birth-rate is as much an economic as a physiological phenomenon, and the readiness of the man to undertake the burden of parentage may be gauged by the number of births per 1,000 males aged 20—55.

For 1912 these figures are:—

Australia 117,
Tasmania 133,

a rather striking result in view of the lower economic status of the Tasmanian population.

Religion and Size of Families.

The influence of Religion on the birth-rate may be shown by taking out the average size of family. Taking the religion of the mother as the test, we have—

Religion of Mother.	*Average Family.*
Church of England	3.74
Roman Catholic	4.14

There is then a difference of about 11 per cent. in favour of the Roman Catholic in the birth-rate, or about 20 per cent. in the rate of natural increase, assuming that the marriage-rates and death-rates are practically the same for both denominations.

Birth-rate and Districts.

We find the high birth-rate—33 to 36—in certain districts mainly occupied with dairying, potatoes, fruit, mining, and timber. In the pastoral districts and old-settled farming districts, which are more concerned with grain, hay, and stock, the birth-rate is low—about 25. The figures for the towns, Hobart and Launceston, are high, but are swollen by births that properly belong to the surrounding districts; their real figures are probably about the average for the whole island—30 to 31.

There are three anomalous districts. Sheffield has a birth-rate of 26 or less, while six similar North-Western districts have an average of 36. Beaconsfield has a birth-rate of 27, when the other mining districts average 34. Port Cygnet has a birth-rate of 19 or less, while the other fruitgrowing districts average 33. These figures are only approximate, on account of changes which have taken place in the boundaries of registration districts. The explanation may possibly be found when the age distribution in these districts is available.

Birth-rate and Occupation.

A tabulation of births according to occupations of fathers gives extraordinary results. In the following table the number of males over 20 following different occupations is taken from the census results, and the occupations of the fathers of children from the registration of births.

Number of Births per 1000 Males over 20 Years According to Occupation.

	Commonwealth.	*Tasmania.*
Domestic	70	68
Land	72	82
Professional	72	78
Mining	78	80
Commercial	88	89
Transport	105	87
Industrial	142	212

The figures for "Industrial" occupations are hardly credible. One may suspect that farm labourers, who were tabulated as "Farming" at the Census, were put down as labourers simply and so became "Industrial" on registering a child. Unfortunately, on account of the registration work having changed hands frequently, the Tasmanian Statistical Office is not able to express a definite opinion on this point. Even allowing for a considerable error, there is a suggestion in the above table of a selective birth-rate of a most unpromising kind, which calls for full investigation.

Masculinity.

The Masculinity of Tasmanian population, i.e., the number of males per 100 females, is fairly steady at 104 to 106 for all ages, but the variations with age are remarkable. Beginning at 105, it keeps that figure to the age of 15, and then falls abruptly, so that at 20 years it is 92. It then rises strongly and continuously till the age of 55, when there are 118 males per 100 females, and then falls till the age of 80, when the masculinity is 92, while in the last few years of life the males are once more in excess.

A similar graph for Hobart shows the same phenomena exaggerated. The masculinity at the age of 20 sinks to 62. It then rises till the age of 48, but does not get above 91, and then falls again till it reaches 66 at the age of 77, with the same superior longevity of the male showing itself in the closing years.

TASMANIAN BRYOPHYTA, Part III.*

By L. Rodway.

(Read 13th October, 1913.)

Fam. 7—BRYACEAE.

Habit erect or suberect, simple, new branches springing from the base or in pairs from close below the inflorescence. Leaves in many rows, ovate, lanceolate or subulate, nerved, often dentate and limbate at the margin, smooth surface, cells rather large rhomboid or hexagonal to nearly linear. Capsule on a long seta, globose, ovate, or pyriform, usually cernuous or pendulous; lid conic or shortly rostrate; calyptra small, cucullate. smooth, narrow; peristome in the most advanced forms of two well-formed series; the exostome of 16 lanceolate, cartilaginous teeth, formed of a double row of short cells with a zig-zag suture in the centre on the exterior surface, trabecules on the inner; endostome with a deep membrane and 16 slender, porous processes, two or three slender cilia between the processes. From this all states of reduction may be met with till both series are reduced to a rudimentary condition.

A natural family most easily recognised by the cell structure. Also in the more typical forms by the pendulous pyriform capsule with perfect peristome, besides the habit of innovations obscuring the terminal insertion of the seta.

Peristome poorly developed.

Mielichhoferia. Exostome rudimentary; endostome of 16 slender processes from a short membrane. Leaves lanceolate.

Orthodontium. Exostome of 16 very short lanceolate teeth; endostome of 16 short, slender processes. Leaves narrow linear.

Peristome well developed. Fruiting terminal.

Mniobryum. Cells long-rhomboid. Leaves ovate-lanceolate. Capsule short and broad.

Pohlia. Cells linear. Leaves ovate-lanceolate. Capsule oblong.

Leptobryum. Cells nearly linear. Leaves long-linear. Capsule pyriform with a slender neck.

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* Parts I. and II. of this revision of the *Bryophyta* of Tasmania were published in these *Papers and Proceedings*, 1912, pp. 3-24 (Part I.), 87-138 (Part II.). The present part completes the Mosses; the Hepatics will be included in a subsequent part. No new species are proposed.

Peristome well developed. Fruit from below innovations.

Brachymenium. Endostome an erose membrane.

Bryum. Endostome with processes and cilia.

Mielichhoferia Hornsch.

Small, tufted, suberect, sparely branched, fruit on a short lateral branch placed low down on the stem. Leaves lanceolate, small; nerve bold, vanishing above; cells linear, thin walled. Seta long; capsule horizontal, clavate-pyriform, often gibbous on the lower margin so as to curve the capsule upwards, mouth small; lid short, convex; calyptra cylindric; exostome reduced to 16 convex protuberances; endostome of 16 erect, slender, rather long processes arising from a short membrane.

Mielichhoferia Echloni Hornsch.

Stems slender, mostly under 1 cm. Leaves pale green, erecto-patent, broadly lanceolate, acute, imbricate, about 1mm.; margin serrate above; nerve broad below, narrow above and vanishing below the apex. Seta 1cm.; capsule horizontal, nearly cylindric to gibbous on the lower margin, 2-4 mm.

Knocklofty. Colebrook.

Orthodontium Schw.

Small, tufted, erect, simple or with innovations below the seta. Leaves linear with a flat slender nerve, cells large lax, linear, thin walled, becoming rather hexagonal towards the tip, very long in the lower part. Seta slender, long; capsule erect or nearly so, clavate-oblong, mouth narrow; exostome of 16 short, lanceolate teeth; endostome of 16 short, slender cilia; lid shortly rostrate, oblique; calyptra cucullate.

Small mosses with a superficial resemblance to *Weissia*.

Capsule sulcate.
- Capsule oblong ... ... *australe*
- Capsule fusiform ... ... *sulcatum*

Capsule plain.
- Capsule narrow oblong ... ... *lineare*
- Capsule pyriform ... ... *lanceolatum*

Orthodontium australe H.f. et W.

Small, erect, in dense or loose mats; stems about 5 mm. Leaves erect, linear, 3-6 mm., acute; nerve lost a little below the apex. Seta 1-3 cm.; capsule narrow-oblong, with a tapering base, 2-3 mm., slightly oblique. Exostome teeth slender, erect; endostome processes slender, slightly longer.

Slopes of Mt. Wellington, Eaglehawk, etc.

Orthodontium sulcatum H.f. et W.

Habit of the last. Leaves erecto-patent, linear, 4-5 mm., acute; nerve slender, continuous, or lost in the apex. Seta 1-2 cm.; capsule nearly fusiform, erect, sulcate, 2-3 mm. Exostome teeth slender, erect; endostome processes slender, rather longer.

Doubtfully distinct from *O. australe*

On deadwood slopes of Mt. Wellington.

Orthodontium lineare Schw.

Small, gregarious; stems about 1-2 mm. Leaves linear, 3 mm., acute; nerve narrow, lost below the apex. Seta slender, 1 cm.; capsule narrow-oblong, 1.5 mm.

Beaconsfield, on the ground.

Orthodontium lanceolatum Mitt.

Small, gregarious. Leaves linear-lanceolate, subacute, 3 mm.; nerve lost at a distance from the apex. Seta 5-8 mm.; capsule pyriform, with a rather wide mouth and slender neck, 1 mm.; exostome teeth linear, short, erect; endostome processes much shorter.

On bark of living trees. Gully near Gordon, D'Entrecasteaux Channel.

MNIOBRYUM Schimp.

Slender plants growing in compact tufts. Leaves small, lanceolate; nerve rather bold, not excurrent; cells long, narrow-rhomboid, thin walled. Seta from the apex, slender; capsule inclined short and usually with a broad mouth; lid hemispheric, mamillate; peristome as in *Bryum*, or ly the cilia very short.

The habit and very lax cells distinguish the genus.

Mniobryum tasmanicum Broth.

Stems 3-5 cm., reddish where mature. Leaves ovate-lanceolate, acute, 1-1.3 mm.; margin distantly serrate; nerve flat, vanishing below the apex. Rest not seen.

New Town Rivulet.

POHLIA Hedw.

Slender mosses with new branches springing from the base and not close under the inflorescence as in *Bryum*.

Leaves lanceolate, elongating round the inflorescence; nerve bold; cells narrow to linear, broader towards the base. Capsule pendulous, clavate-pyriform, with a shortly tapering neck. Peristome as in *Bryum*. Often included in *Bryum*. Differing in shape of cells and not innovating from the top of fertile stems.

Pohlia nutans (Schreb). Lindb.

Stems short, erect, usually under 1 cm., new branches spring low down the stem, that is, not close below the fertile apex. Leaves broadly to narrowly lanceolate, tapering to an acute apex, erect, mostly 3 mm., margin coarsely or obscurely serrate, not bordered, revolute in the middle, nerve lost in the apex in lower leaves, excurrent in the upper ones, cells long, nearly linear, strongly incrassate. Seta terminating the stem, long, slender, 3-4 cm., capsule pale reddish yellow, cernuous or pendulous, 3-4 mm., narrow pyriform or nearly clavate, narrowed into a slender neck below, constricted below the mouth, broadest below the middle. Lid rather broad hemispheric, apiculate.

Very common.

Pohlia cruda (L.) Lindb.

Rather robust, branches often 3-6 cm., slender. Leaves shining, ovate to ovate-lanceolate, acute, 2.5 mm.; nerve lost at a distance from the apex; margin remotely serrate; cells long, vermiform.

In and about streams on plateau of Mt. Wellington. Barren specimens only.

LEPTOBRYUM Wils.

Small, erect, stems simple or with few branches arising only from the base. Leaves narrow, flexuous-subulate with a broad nerve; cells nearly linear, broad towards the base. Capsule pendulous with a long neck, narrow pyriform; peristome well developed, as in *Bryum*.

Leptobryum pyriforme Br. et Sch.

Pale yellow-green in silky masses, stems usually under 1 cm. Leaves chiefly on the ends of the branches, filiform, flexuose, 5 mm., flat, formed of a broad nerve except at the sheathing base, margin serrate at apex. Seta slender, 2-4 cm.; capsule inclined or pendulous, broadly pyriform, suddenly contracted below into a long slender neck, 2 mm.; lid broadly pyramidal.

Tasman's Peninsula, Back River, Nile.

Brachymenium Schw.

Small, erect, innovating from below the fertile apex as in *Bryum*. Leaves ovate; nerve bold; cells rhomboid. Seta long; capsule oblong; lid conic; exostome of 16 closely articulate teeth; endostome reduced to the membranous base, and few irregular processes.

Differing from *Bryum* only in the endostome.

Brachymenium Preissianum (Hpe.)

Small, caespitose, usually 2 mm. high. Leaves ovate-acuminate, 1 mm.; margin plain, closely revolute; nerve bold, shortly excurrent; cells rhomboid, rectangular below. Seta 2 cm., slender; capsule oblong, dark red, 1.5 mm., horizontal, neck short, mouth constricted; lid conic, calyptra very small, cucullate; exostome teeth lanceolate, fairly long; endostome membrane with long slender cilia.

On wall, Hobart.

Bryum Dill.

Small plants with terminal fruiting, but innovating by two shoots arising close below the fertile apex so as to obscure the true position. Leaves ovate-spathulate to lanceolate; nerve well developed, usually excurrent; cells rather large, thin walled, hexagonal or rhomboid, broader towards the base Seta long; capsule pyriform to oblong with a solid neck, inclined or pendulous; lid convex, apiculate; peristome double; exostome of 16 lanceolate attenuated teeth; endostome a deep carinated membrane bearing above 16 narrow usually porous processes as long as the teeth, with one to three intervening cilia. The shape of the processes varies a little in different species, also the size and number of the cilia. These latter when well developed bear cross appendages.

A very large genus usually divided into subgenera upon habit and the structure of the endostome. In systematic work the relation of the antheridia is generally made much use of, but not always with advantage.

Group A. Plants rather large for the genus. Leaves mostly clustered at the ends of the shoots, ovate, oblong, or spathulate, apex little acuminate. Capsule with a tapering base.

With a distinct border.
  Margin with many serrations.
    Nerve excurrent in a short, bold point.
      Cells large lax ... ... *Billardieri*
      Cells small stiff ... ... *breviramulosum*

Nerve just excurrent in a slender point.
Border broad, well-defined... ... *leptothecium*
Border ill-defined... ... ... *microrhodon*
Nerve excurrent in a long point.
Margin with short serrations ... *rufescens*
Margin coarsely serrate .. ... *creberrimum*
Margin with a few serrations at apex, or none ... ... *bimum*

Border little or none. Nerve shortly excurrent.
Margin serrate ... ... *campylothecium*
Margin plain.
Mouth of capsule constricted ... ... *tasmanicum*
Mouth broad ... ... *crassum*

Group B. Leaves ovate, with a tapering acuminate apex, to lanceolate. Nerve excurrent. Plants mostly smaller than in Group A, and the leaves often not clustered at the ends of the shoots.

Leaves ovate, clustered at the tips; border narrow.
Margin serrate.
Capsule deep red ... ... *pyrothecium*
Capsule brown ... ... *capillare*
Margin plain.
Mouth constricted ... ... *intermedium*
Mouth broad ... ... *microsporum*
Leaves ovate, dispersed ... ... *torquescens*
Leaves lanceolate, dispersed, unbordered.
Margin subserrulate ... ... *caespiticioides*
Margin plain... ... ... *curvicollum*

Group C. Leaves dispersed along the shoot. Nerve lost in or below the apex, rarely very shortly excurrent. Capsule with a short tapering neck. Plants of various sizes.

Rather robust. Leaves oblong obtuse. Nerve lost in or below the apex.
Margin unbordered ... ... *blandum*
Border of 1-2 linear cells ... ... *laevigatum*
Border of incrassate cells ... ... *rubiginosum*
Small. Leaves narrow, oblong, rather obtuse, unbordered. Nerve lost below the apex ... ... *chrysoneuron*
Small. Leaves acuminate unbordered... *erythrocarpoides*
Small. Leaves with a broad border, serrulate above ... ... *laevigatulum*

Group D. Small plants with dispersed leaves. Capsule small, the base very shortly tapering or obtuse; when fresh the barren base or apophysis usually broader than the spore-case.

Base of capsule not obtuse.
- Nerve excurrent ... ... *ovicarpum*
- Nerve lost in the apex to shortly excurrent.
  - Margin plain .. .. *Sullivani*
  - Margin subserrulate ... ... *subcupulatum*
- Nerve lost in the middle ... ... *argenteum*

Base of capsule very obtuse.
- Margin not revolute. Nerve shortly excurrent.
  - Border thickened, serrulate ... ... *dichotomum*
  - Border plain ... ... *cupulatum*
- Margin revolute. Nerve boldly excurrent.
  - Leaves broad. Excurrent nerve shorter than lamina .. .. *gambierense*
  - Leaves narrow. Excurrent nerve as long as lamina... ... ... *argillicola*

Bryum Billardieri Schw.

Medium sized, seldom exceeding 1 cm. Leaves clustered at the apex, erect, broadly oblong to obovate-spathulate, 2-4 mm.; margin with a conspicuous border of 3-4 series of linear incrassate cells, revolute below, sharply serrate; nerve shortly excurrent in bold cuspidate point. Cells rather regularly rhomboid, rather thin-walled, averaging 55 x 20μ. Seta 2 cm. Capsule cylindric, 4 mm., base very tapering, straight or curved, mouth little or not at all constricted; lid broad hemispheric with a central umbo.

Common in grassy places, slopes of Mt. Wellington, Bruni Island, Sheffield, etc.

Bryum breviramulosum Hpe.

Medium with short robust innovations under 1 cm. Leaves rigid, numerous, erecto-patent, densely packed at the ends, obovate-spathulate, 2.4 mm.; margin with a broad thickened border, revolute except towards the apex, where it is sharply serrate; nerve rather strong, red, excurrent in a short cuspidate point; cells rather regularly rhomboid, averaging 25 x 11μ. Seta 3 cm.; capsule clavate, 4 mm., cernuous or pendulous, mouth not constricted, neck tapering, but not long; lid pyramidal, umbonate.

Very similar to *B. Billardieri*, but more compact, leaves more rigid and cells only half as large. In some specimens the cells are rather large, excurrent nerve longer, the border less developed, and the serration smaller than in the type.

Very common about Hobart.

Bryum leptothecium Tayl.

Often robust and exceeding 3 cm. Leaves rosulate and spreading at the tips of the innovations, often appearing as whorls along old stems, obovate to broadly spathulate, 3 mm.; margin with a broad border of linear incrassate cells, sharply serrate above, revolute below; nerve only just excurrent from the apex in a minute, cuspidate, recurved point; cells long-rhomboid, unequal, averaging 54 x 12μ Seta very long, capsule clavate, usually curved, 3 mm., tapering at the base, mouth little contracted; lid pyramidal, umbonate.

Very common everywhere in woods.

Bryum microrhodon C.M.

Medium size, erect, the innovations about 1cm. Leaves mostly clustered in globose rosulate tufts at the ends, often in tiers along the branches, erecto-patent, not spreading, broadly ovate, oblong to oblong spathulate, shortly acuminate, 2mm.; margin revolute below, serrulate above, slightly thickened, but without a well-defined border; nerve red excurrent in a short mucro; cells regularly broadly rhomboid, 35 x 13μ. Seta 3 cm.; capsule oblong, 3 mm., with a shortly tapering neck; lid hemispheric with a very small umbo. With much the appearance of *B. leptothecium* it is intermediate between that species and *B. campylothecium*.

Slopes of Mt. Wellington, Mt. Field, Bruni Island, Forth River, etc.

Bryum rufescens H.f. et W.

Medium sized, innovations short except in strong shade. Leaves oblong-spathulate, acuminate, erecto-patent, densely clustered at ends of innovations or more dispersed when elongated, 2 mm.; margin with a narrow border of thickened linear cells, revolute below, with short serrations above; nerve excurrent in a long slender cuspidate point; cells irregularly rhomboid, thin walled, averaging 65 x 20μ. Seta slender, 3 cm.; capsule broadly cylindric, 4 mm., with a tapering base; mouth not constricted; lid broadly hemispheric with a central umbo.

Very close to *B. Billardieri* and apparently connected by intermediate forms. The typical plant has a reddish colour, with a deep red nerve, seta and capsule, but this is inconstant.

In woods, Mt. Wellington, Cradoc, Strahan, etc.

Bryum creberrimum Tayl.

Short, the innovations seldom reaching 0.5 cm. Leaves crowded at the tips, erecto-patent, oblong-spathulate, 1.5 mm.; margin with a distinct border of 2-3 series of linear indurated cells, coarsely serrate above, slightly revolute below; nerve excurrent in a rather long, slender, cuspidate point; cells irregular, more rectangular than rhomboid, thin walled, 60-80 x 12-20μ. Seta 3 cm.; capsule clavate with a slender tapering neck, mouth not constricted, 3 mm.; lid pyramidal with a sharp umbo.

Near *B. rufescens* but smaller in all parts.

Mt. Wellington, Mt. Nelson, Richmond, Lake Sorell, etc.

Bryum bimum Schreb.

Rather large, the innovations slender, often attaining 3 cm. Leaves dispersed along the shoot but larger towards the apex, ovate-oblong, acuminate, 2-3 mm.; margin with a narrow thickened border of linear cells, revolute below, a few serrulations at the apex, otherwise plain; nerve bold, very shortly excurrent; cells rhomboid, averaging 40 x 14μ. Seta long, capsule clavate-pyriform, 4 mm., neck tapering, mouth little constricted; lid hemispheric, umbonate.

Very common in woods.

Bryum campylothecium Tayl.

Stem generally about 1 cm. Leaves clustered at the tips, spreading, obovate, 2.5 mm.; margin unbordered, serrulate; nerve bold and shortly excurrent to slender and excurrent in a longer point; cells rather regular, averaging 40 x 20μ. Seta rather strong, 2-3 cm.; capsule clavate-pyriform, neck tapering, 3-4 mm., mouth slightly constricted, lid pyramidal.

Mt. Wellington, Bruni Island, Tunnack, etc.

Bryum tasmanicum Hpe.

Medium to rather robust, stems with the innovations often reaching to 2 cm. Leaves larger upwards but not rosulate, concave, erect, imbricate, ovate, acuminate, 1.7 mm., marginal cells rectangular, but not forming an indurated border; margin plain; nerve bold, shortly excurrent in a slightly recurved tip; cells rhomboid-rectangular, very thin walled 60 x 17μ. Seta long; capsule linear-pyriform with a tapering neck and constricted mouth; lid small, rather flat, umbonate; endostome with a shorter base than in most species, processes short with large pores, cilia not developed.

Very common in woods.

Bryum crassum H.f. et W.

Small, but in damp localities the innovations elongating. Leaves of firm texture, erect, imbricate, 1.5 mm., broadly to narrowly ovate, nearly obtuse; margin quite unbordered, plain or minutely subserrulate; nerve bold, very shortly excurrent; cells oblong-rhomboid, incrassate, averaging 30 x 10μ. Seta 1.5 cm.; capsule pyriform, 2 mm., neck shortly tapering, mouth slightly constricted, lid large hemispheric, umbonate.

Slopes of Mt. Wellington.

Bryum pyrothecium Hpe. et C.M.

Stem short with short innovations. Leaves erect, clustered at the tip, ovate, gradually acuminate above, 1.5 mm.; margin with a very narrow thickened border, revolute below, serrulate above; nerve excurrent in a slender cuspidate point up to $\frac{1}{4}$ length of lamina; cells irregularly rhomboid, thin walled, averaging 60 x 17μ. Seta long, red; capsule clavate-pyriform, deep red, 3 mm., base shortly tapering, mouth little constricted; lid hemispheric, umbonate.

Very close to *B. capillare*.

Mt. Wellington.

Bryum capillare L.

Rather small, densely caespitose, stems usually under 5 mm. Leaves mostly in a terminal cluster, broadly ovate, oblong or subspathulate, acuminate, 1.5 mm.; margin with a narrow yellow border of very long, linear incrassate cells, serrulate above; nerve narrow yellow, merging above into the border and forming a long, slender, cuspidate, hair point; cells rhomboid, thin walled, averaging 60 x 18μ. Seta long, capsule clavate, 3 mm., neck gradually tapering, mouth not constricted, lid broad, pyramidal, acute.

Mt. Nelson.

Bryum intermedium Bridel.

Rather small, closely caespitose, stems seldom exceeding 5 mm., densely radiculose below, the leaves usually in a globose terminal tuft, but more dispersed when growing in moist situations. Leaves from broadly to narrowly ovate, but always gradually tapering above into an acuminate apex, about 2 mm.; margin revolute with a narrow border of incrassate linear cells, otherwise plain; nerve broad, red, rather long excurrent in a slender, cuspidate, point; cells irregularly rhomboid, averaging 60 x 17μ. Seta long; capsule clavate-pyriform, 2-3 mm., neck gradually tapering, mouth constricted, lid small, hemispheric, umbonate.

Colebrook, Mount Nelson.

Bryum microsporum Broth.

The shoots including innovations seldom exceeding 0.5 cm. Leaves clustered at the tips, erect, ovate, with a tapering acuminate apex, 1.7 mm.; margin with a narrow border of 2-3 series of incrassate linear cells, plain or with one or two obscure serrations near the apex, generally revolute; nerve in the upper leaves long excurrent; cells irregularly rhomboid, thin walled, averaging 64 x 20μ. Seta long; capsule clavate-pyriform, base little tapering, mouth not constricted; lid pyramidal, umbonate.

Very close to *B. intermedium.*

Mt. Nelson, Woodbridge.

Bryum torquescens Br. Sch.

Densely caespitose, stems 5-10 mm. Leaves dispersed, twisted when dry, broadly ovate, shortly acuminate, 2mm.; margin revolute with a very narrow border of rectangular cells, serrulate above, sometimes plain; nerve excurrent in a long cuspidate tip; cells irregular, rhomboid, thin walled, 60 x 18μ. Seta long, capsule clavate, curved, 4 mm.; neck long tapering, mouth not constricted, lid pyramidal, acute.

Specimen in Gunn's collection with no record of locality.

Bryum caespiticioides C.M.

Small, but under favourable conditions the innovations elongating to 2 cm. Leaves dispersed, lanceolate, 1.5-2.5 mm.; margin revolute, serrulate above, marginal cells rectangular, not incrassate; nerve bold, with an excurrent cuspidate tip, varying in length from under $\frac{1}{4}$ to $\frac{3}{4}$ the length of the lamina; cells narrow rhomboid, 50 x 9μ Seta 3-4 cm.; capsule linear pyriform with a short to long tapering neck, mouth slightly contracted; lid pyramidal, shining. Variable in breadth of leaf, length of excurrent nerve and base and size of capsule which varies from 1.5 mm., with a bluff base to 3 mm., with a slender neck.

West Coast, slopes of Mt. Wellington, Lake Sorell, etc.

Bryum curvicollum Mitt.

Densely caespitose, usually under 1 cm., but sometimes the innovations elongating. Leaves dispersed, patent, narrow lanceolate to broader, 2-3 mm.; margin plain with

3-4 series of linear cells, but not forming a distinct or thickened border; nerve bold excurrent in a very short bold point; cells long rhomboid, walls thin, averaging 40 x 10μ. Seta long; capsule clavate-pyriform, dark, with slender curved neck, but in drier conditions the capsule pale, and the neck not conspicuously long or bent; mouth slightly constricted, lid pyramidal.

Mt. Nelson, slopes of Mt. Wellington, Colebrook, etc.

Bryum blandum H.f. et W.

Rather robust, in dense mats in running water, dark with livid yellowish-green shining tips, branches 1-2 cm. Leaves erect, imbricate, oblong, obtuse, of thin texture, transparent, 2 mm., margin entire or subserrulate; nerve slender, red, vanishing in the extreme apex; cells linear-rhomboid with an ill-defined border of linear cells on the margin, towards the apex becoming short rhomboid. Rest not seen.

On rocks in running water, slopes of Mt. Wellington, Meander River, Maria Island, etc.

Bryum laevigatum H.f. et W.

Robust, often exceeding 3 cm., black below, yellowish-green at the tips. Leaves erecto-patent, distributed along the shoot, concave, translucent, of rather firm texture, broadly oblong, generally apiculate, 3 mm.; margin with one or two series of linear cells, subserrulate; nerve bold, tapering above and lost in or below the apex; cells shortly rhomboid, strongly incrassate, unequal, averaging 29 x 16μ. Seta slender, 5-6 cm.; capsule pyriform, 2.5 - 4 mm., base tapering, mouth rather constricted; lid hemispheric, umbonate.

Slopes of Mt. Wellington, Alma Tiers.

Bryum rubiginosum H.f. et W.

Erect, densely caespitose, stems simple, often 5 cm., rather robust and red. Leaves delicate, broadly oblong, slightly apiculate, 2.3 mm.; margin with a thickened border of long incrassate cells, broader and revolute below, plain above; nerve red, vanishing at a distance from the apex; cells regularly rhomboid, thin walled, averaging 50 x 17μ. Rest not seen.

St. Patrick's River.

Bryum chrysoneuron C.M.

Rather small, in dense cushions, stems about 5 mm. Leaves dispersed, lanceolate, rather obtuse, 1 mm.; margin plain, quite unbordered; nerve very bold, lost below the apex; cells oblong-rhomboid, averaging 50 x 12μ. Seta 1.5 cm.; capsule clavate, 2 mm.; neck slender, tapering; mouth little constricted; lid pyramidal.

Kingston - Longley-road.

Bryum erythrocarpoides Hpe. et C.M.

Small, seldom exceeding 5 mm. Leaves oblong to oblong-lanceolate, acuminate, 1mm.; margin quite unbordered, subserrulate above; nerve vanishing in or below the apex, rarely percurrent, cells rhomboid, 27 x 8μ. Seta 1.5 cm.; capsule oblong, brown, 2 mm., with a short tapering neck and slightly constricted mouth; lid short, broadly pyramidal.

Very common on shaded soil about Hobart.

Bryum laevigatulum Broth.

Rather small, the shoots seldom exceeding 5 mm. Leaves dispersed, oblong to oblong-lanceolate, 1.7 mm.; margin with a broad border of elongated cells below, lost above, serrulate; nerve lost in apex to just excurrent; cells irregularly rhomboid, incrassate, averaging 45 x 12μ. Seta 2-3 cm.: capsule dark, broadly pyriform with a tapering neck, 2.5 mm., but the breadth sometimes reduced and the neck less tapering; mouth rather constricted; lid pyramidal.

Slopes of Mt. Wellington, Meander River.

Bryum ovicarpum Broth.

Small, densely caespitose, shoots seldom exceeding 3 mm. Leaves erect, broadly ovate, acuminate, mostly under 1 mm.; margin plain or very slightly subserrulate with one series of rectangular cells on the margin; nerve bold percurrent or shortly excurrent in a cuspidate tip; cells obtusely rhomboid, rather incrassate, 21 x 8μ. Seta 1 cm.; capsule oblong, dark, 1.2 mm.; base swollen, rugose, a little tapering to rather obtuse; lid conic.

Very near *B. Sullivani*.

On wall, Waterworks, Hobart; Huon-road, Barnes Bay, Longley, Colebrook.

Bryum Sullivani C.M.

Stems slender, 1-2 cm., forming a rather dense livid green mat. Leaves dispersed, patent, ovate, concave, subobtuse to shortly acute, 1 mm.; margin plain, unbordered; nerve brown, lost in the apex to shortly excurrent; cells regularly rhomboid, 36 x 8μ. Seta 1.5 cm.; capsule oblong, dark, 2mm., base swollen rather obtuse; lid convex-conic, acutely umbonate.

Circular Head, Huon-road 9 miles.

Bryum subcupulatum C.M.

Pale yellow green, slender, about 1 cm., densely tufted. Leaves distributed along the stem, ovate, acuminate, subacute, 1 mm.; nerve percurrent to very shortly excurrent, margin subserrulate towards the apex, about two series elongated, otherwise not bordered; cells rhomboid, very irregular. Seta slender, 1 cm.; capsule inclined, oblong, 1-1.5 mm., with a rather swollen apophysis and a very shortly tapering neck.

Zeehan.

Bryum argenteum L.

Small, densely caespitose, silvery white or pale green, innovations usually under 5 mm. Leaves erect, imbricate, shining, broadly oblong, subacute to acute, base green, colourless and transparent above; margin plain; nerve vanishing about the middle, 1.4 mm., cells very large, rhomboid. Seta slender, 1-2 cm. Capsule pendulous or inclined, brown, oblong, 1 mm.; mouth rather broad, base shortly tapering; lid pyramidal.

Common on damp rocks, roadsides, roofs, etc.

Bryum dichotomum Hedw.

Syn.: *B. pachytheca* C.M.

Small, caespitose, the innovations under favourable circumstances occasionally elongating to 1 cm. Leaves dispersed, lanceolate, acute, 1.5 mm., with a border of 2-3 series of linear-rectangular cells, serrulate; nerve bold, shortly excurrent; cells linear-rhomboid, incrassate, unequal, mostly 40-60 x 12μ. Capsule dark red, broadly oblong, 2-3 mm., mouth slightly constricted, the apophysis dark, swollen, rugose with a very obtuse base; lid broad hemispheric, umbonate, shining.

Slopes of Mt. Wellington, Bruni Island, Huon, George Town, etc.

Bryum cupulatum C.M.

Small, caespitose, in dry places stunted, in protected localities the innovations slender, often 1.5 cm. Leaves dispersed, ovate-lanceolate or ovate-acuminate, the base narrowing, 1.3 mm.; margin plain, not revolute, sometimes obscurely subserrulate, not bordered, but 1-2 series of cells elongated; nerve shortly excurrent in a white, cuspidate tip or very short; cells narrow rhomboid, thin walled, 40-60 x 16μ. Seta often very long; capsule broadly oblong, in some cases very short, apophysis very swollen, rugose, obtuse, dark; lid broad, pyramidal, shining.

Very close to *B. dichotomum;* differing in the broader leaves with simple nearly entire margin.

Launceston streets, Fitzroy Place (Hobart), Evandale Junction.

Bryum gambierense C.M.

Small, under 5mm., caespitose. Leaves clustered at the ends of the shoots, ovate-lanceolate from a broad base, 1.3 mm.; margin revolute below, serrulate above, bordered by linear cells; nerve strongly excurrent and white at the cuspidate tip; cells very unequal, the lower ones nearly quadrate, the upper ones irregularly rhomboid, rather incrassate, averaging 45 x 10μ. Capsule dark red, oblong, 2 mm., mouth slightly constricted; apophysis dark, swollen, rugose, obtuse; lid broad, shining pyramidal.

Very close to *B. dichotomum*, and many specimens appear intermediate.

Very common in grassy country.

Bryum argillicola Broth.

Very small, yellow green, caespitose, 2-3 mm. Leaves erecto-patent, mostly in a terminal cluster, narrow ovate lanceolate, 1.3 mm., inclusive of the excurrent nerve; margin revolute, obscurely subserrulate above; nerve red with a bold excurrent, cuspidate apex as long as the lamina; cells broadly rhomboid, 20 x 8μ. Seta 1.5 cm.; capsule ovate, 2 mm., mouth slightly constricted, base broader and obtuse but not swollen and rugose.

Port Cygnet, Margate.

Fam. 8—BARTRAMIACEAE.

Habit various; from small erect and densely tufted to creeping and often long and robust; branches few and irregular. Leaves lanceolate with long acute points, seldom shorter; nerve round, excurrent; cells usually oblong to rectangular, each with a prominent papilla, rarely smooth; margin and nerve serrated, rarely almost entire. Seta long; capsule globose or oblong, the sterile base small, inclined or pendulous rarely erect, striate or furrowed rarely smooth; mouth small; lid small convex; calyptra small linear, cucullate; peristome double, single, or none, seldom well developed; peristome teeth 16 simple, of one series of cells; endostome when present rudimentary. Antheridia, in most genera, numerous in a terminal disk.

A natural group readily known by the leaf structure.

BARTRAMIA. Densely tufted, rarely elongated, antheridia in the terminal axils but not gathered into a conspicuous disk.

BARTRAMIDULA. Decumbent, very small. Leaves small, ovate, imbricate, the nerve vanishing below the apex.

PHILONOTIS. Elongating and vaguely branched. Leaves small, the cells thin walled, rectangular, not much reduced towards the base. Antheridia in a terminal disk.

BREUTELIA. Coarse plants, vaguely branched. Leaves long, tough; basal cells quadrate, which usually extend as a band up the margin. Antheridia in a terminal disk.

CONOSTOMUM. Tufted. Leaves with strongly excurrent nerves. Peristome well developed, the teeth adherent at the apex, forming a cone over the mouth.

BARTRAMIA Hedw.

Erect, dichotomously branched, usually small in dense tufts, cuticle of the shoot of small cells. Leaves opaque lanceolate to narrow-subulate, papillose; cells small, rectangular. Capsule globose, striate; lid shortly conic; calyptra fugacious; exostome of 16 teeth or none; endostome a narrow basal membrane with 16 keeled processes. Antheridia in the terminal axils, not forming an expanded disk.

Stems elongated ... ... *Norvegica*
Stems short, tufted.
  Leaf-base rectangular.
    Leaves spreading... . ... *papillata*
    Leaves erect ... ... *fragilis*
  Leaf-base not rectangular ... ... *strictifolia*

Bartramia Norvegica Lindb.

Syn.: *B. Halleriana* Hedw.

Stem elongated and pendulous, often 12 cm., with few irregular branches, at a high altitude reduced to 3 cm. and erect. Leaves squarrose, long and slender, from a sheathing base, 10 mm.; margin spinulose, recurved; nerve continuous; cells rotundo-quadrate, small, incrassate, elongated in the sheathing base. Seta on a short lateral branch, 5 mm.; capsule inclined, oblique, sulcate, globose; exostome teeth short, lanceolate, dark brown.

Very common on the slopes of mountains.

Bartramia papillata H.f. et W.

Stems short, closely tufted, seldom exceeding 1 cm. Leaves spreading, narrow-linear, suddenly contracted from a rectangular, expanded, hyaline, sheathing base, 4 mm.; serrate on the margin and nerve, margin incurved; nerve continuous; cells rectangular with small obtuse papillae, basals larger, pellucid. Seta 2 cm.; capsule slightly inclined, globose-pyriform, sulcate; exostome teeth short, lanceolate.

Kingston, Maria Island, Western Tiers, etc.

Bartramia fragilis Mitt.

Stems short, erect, in dense tufts. Leaves erect, imbricate, stiff, linear suddenly contracted from a rectangular pellucid base, 4 mm.; margin spinulose; surface shortly papillose; nerve broad, continuous. Seta 1 cm.; capsule erect, oblong, 1.5 mm. Doubtfully distinct from *B. papillata*.

Western Tiers.

Bartramia strictifolia Tayl.

Small, erect in dense tufts, dark below, the tips pale green, seldom exceeding 1 cm. Leaves erect, closely imbricate when dry, narrow linear-lanceolate from a broad but not defined base, tapering to an acute point, 2.5 mm.; margin spinulose-serrate, nerve continuous; cells regular rectangular. Seta 1 cm.; capsule globose, erect, 1.5 mm.; mouth small; lid short and small. Peristome teeth small, slender, incurved, inserted on a short colourless membrane.

Maria Island, Bruni Island.

BARTRAMIDULA Schimp.

Stems small, erect from a creeping stolon. Leaves ovate, imbricate, the nerve vanishing below the apex. Capsule globose, pendulous or erect; peristome none; lid rather flat with a short obtuse umbo; calyptra small, broadly cucullate.

Distinguished by the small size, creeping habit and gymnostomous capsule.

Bartramidula pusilla (H.f. et W.) Sch.

Small, caespitose, creeping, the branches erect under 1 cm. Leaves small, 0.6 mm., imbricate, narrow ovate, acute, obscurely dentate; cells rectangular, averaging 38 x 14μ Fruiting branch short at the base of innovations. Seta slender, bent or straight at the apex, 1 cm. Capsule globose, pendulous, smooth, 1.5 mm., mouth small, lid minute.

Common in wet open situations.

Var.: *Weymouthi.* Capsule erect, nodulose; mouth broader.

Port Cygnet, Gordon, Margate.

PHILONOTIS Bridel.

Suberect or decumbent, vaguely branched, spreading, branching often dichotomous. Leaves squarrose lanceolate, acute; nerve bold continuous to shortly excurrent; cells rectangular, rarely quadrate, those of the base not conspicuously shorter. Capsule globose or oblong, inclined or pendulous, striate; peristome as in *Bartramia.* Antheridia numerous, forming a relatively broad disk surrounded by an involucre of large leaves.

Distinguished from *Breutelia* by less robust habit and the different leaf structure.

Stems slender; leaves remote.

Leaves prominently papillose	*scabrifolia*
Leaves serrate	*tenuis*
Stems long, simple and slender...	*fertilis*
Stems robust, leaves imbricate	*rigens*

Philonotis scabrifolia H.f. et W.

Syn.: *Ph. remotifolia* H.f. et W.

Slender, pale sage-green, the branches usually fascicled at the ends of the stems. Leaves patent, not crowded, ovate-lanceolate, tapering to an acute point, 0.8 mm.; margin, nerve, and surface strongly scabrid; nerve shortly excurrent; cells quadrate-rotund. Seta 2-3 cm.; capsule inclined ovate-globose, sulcate, 2-2.5 mm., mouth broad; exostome teeth lanceolate; endostome processes slender from a basal membrane.

Colebrook, Mt. Nelson, near Launceston, Western Tiers, etc.

Philonotis tenuis Tayl.

Stems slender, simple or with fascicled branches, usually 2-3 cm. Leaves erecto-patent, not crowded, lanceolate, tapering to a very slender point, 3 mm., margin and nerve serrate; nerve rotund, excurrent in a long point; cells linear-rectangular, transparent. Seta 3-4 cm.; capsule globose, inclined 2.5 mm., striate. Exostome teeth lanceolate, rather short; endostome with a membranous base and short irregular processes.

Slopes of Mt. Wellington, Mt. Nelson, Mt. Roland, etc.

1913.

Philonotis fertilis Mitt.

Stems very slender, suberect, numerous in dense masses, 4-8 cm., usually with a fascicle of branches at the apex. Leaves patent, ovate-lanceolate, tapering to a slender apex, 3 mm.; nerve bold, continuous; margin slightly thickened, boldly serrate, surface obscurely papillate; cells broadly linear. Rest not seen. Growing in very damp places and probably only a form of *Ph. tenuis* Tayl.

Ben Lomond, Recherche.

Philonotis rigens Broth.

Stems numerous, erect, simple or with terminal fascicles of branches, covered below with dark brown radicles. Leaves erecto-patent, closely overlapping, of rather firm texture, ovate-lanceolate, tapering to a rather slender apex, 2 mm.; nerve bold, continuous, margin and nerve sharply serrate, surface papillate, cells rectangular, shorter towards the base.

In appearance resembling *Breutelia affinis*, but the cell structure quite distinct from that of a *Breutelia*.

Near Sorell.

BREUTELIA Schimp.

Robust and coarse, branches long, spreading, copiously covered with purple or brown radicles. Leaves squarrose, lanceolate from a broad base, tapering to an acute apex, usually with three or four deep plaits on each side; nerve excurrent; cells narrow oblong to linear above, long linear below, with a band of quadrate cells at the basal margin sometimes not well developed. Capsule pendulous, ovate or oblong, sulcate when dry; mouth constricted; peristome as in *Bartramia*. Antheridia numerous in a broad terminal disk surrounded by an involucre of larger leaves.

Medium sized. Leaves with obscure or no plaits.
  Band of marginal quadrate cells distinct.
    Leaves imbricate when dry ... ... *affinis*
    Leaves not imbricate ... ... *commutata*
  Band of few broader cells or none.
    Upper cells short ... ... *pendula*
    Upper cells linear ... ... *Sieberi*
Robust. Leaves with deep longitudinal plaits.
  Base of leaf contracted ... ... *divaricata*
  Base of leaf geniculate sheathing.
    Border of oblong colourless cells . *comosa*
    Border of quadrate brown cells ... *crassa*

Breutelia affinis H.f. et W.

Medium sized, procumbent in rather dense mats, the stems covered with brown radicles except at the tips, fasciculately branched above, usually 3-5 cm. Leaves squarrose, ovate-lanceolate, tapering to a slender apex, imbricate when dry, plaits shallow, only towards the base, 3-5 mm., surface rather roughly papillate; margin revolute, serrulate to serrate above, rough from the papillae below; nerve slender excurrent; cells shortly linear above, longer towards the base, with a broad band of quadrates on the lower margin. Seta 2-3 cm.; capsule broadly oblong, pendulous, 2 mm.

Very common on ground.

Breutelia commutata Hpe.

Habit of *B. affinis*, but usually smaller, seldom exceeding 2.5 cm. Leaves patent, only slightly imbricate when dry, ovate-lanceolate, with a slender apex, 2 mm., roughly papillate, margin recurved, serrate above; nerve long excurrent; cells oblong above, linear below, a well marked band of broad quadrate cells on the lower margin. Seta pale 2 cm.; capsule oblong, pendulous.

Very close to *B. affinis* and not differing materially in any detail. Doubtful species.

Very common on ground.

Breutelia pendula Hook.

Decumbent, vaguely branched, mostly 3-5 cm., clothed with brown radicles. Leaves patent, ovate-lanceolate, tapering to a very slender apex, 3-4 mm.; margin recurved, serrate, surface rather roughly papillate; nerve slender, excurrent in a rather long point; cells linear to oblong above, longer below, those of the lower margin rectangular to quadrate, but these characters vary much in degree in different specimens. Seta slender, capsule narrow-oblong, pendulous.

The spreading leaves, less pronounced border of quadrate cells and longer upper cells depart from the structure of *B. commutata*, and approach in some specimens very close to *B. Sieberi*.

Kingston, Knocklofty, slopes of Mt. Wellington.

Breutelia Sieberi Hornsch.

Decumbent, about 3 cm., with few dichotomous branches, covered, except the apex, with black radicles. Leaves squarrose, yellow, glossy, usually secund, not imbricating when dry, ovate-lanceolate, with a slender acute apex, 2.5 mm., not plicate, papillae few and small; nerve serrate, excurrent; margin acutely serrate above; cells linear, only a few broad ones at the angles. Seta 1-2 cm.; capsule rather small inclined, broadly oblong furrowed.

On wet ground, Longley.

Breutelia divaricata Mitt.

Robust, 5-8 cm., with few irregular branches, not densely clothed with radicles, pale olive green. Leaves ovate-lanceolate, narrowing at the base, tapering to a slender apex 2.5 mm., strongly plicate; nerve slender, excurrent to lost in the apex; margin serrate, external surface minutely papillose; cells irregular from oblong-quadrate to rectangular above, linear below, with an ill-defined band of broader cells on the lower margin. When growing in water the stems are slender, very long, the leaves divaricate, dark green, with a broad base and a very excurrent nerve. Rest not seen.

Cheshunt, Maria Island, Mt. Wellington.

Breutelia comosa Mitt.

Robust, with suberect dichotomous or fasciculate branches, 6-12 cm., usually covered for the greater portion with brown radicles. Leaves squarrose, yellowish, glossy, 4-5 mm. plicate, lanceolate from a broad geniculate, sheathing base, tapering to a slender apex, surface minutely papillose; margin serrate; nerve slender, continuous; cells rectangular above, linear below, the sheath bordered by 4-6 series of large delicate, colourless cells. Seta 3 cm.; capsule pendulous, oblong, furrowed.

Common Mt. Wellington, Western Tiers, etc.

Breutelia crassa H.f. et W.

Robust, elongating to 15 cm., suberect with few branches. Leaves squarrose, yellowish, glossy, lanceolate from a broadly sheathing geniculate base, plicate, tapering to a slender apex, 5 mm., papillate; margin serrate; nerve slender, shortly excurrent; cells narrow rectangular to linear above, long linear below, the border of the sheath of 4-6 series of enlarged, quadrate, brown rather incrassate cells. Seta 5 cm.; capsule inclined, narrow-oblong, furrowed.

Probably only a robust condition of *B. comosa* with more rigid leaves, papillae larger, border cells brown, and more incrassate.

Mt. Wellington.

CONOSTOMUM Swartz.

Small, erect in dense tufts. Leaves lanceolate, keeled, imbricate; nerve excurrent; margin serrate; cells rectangular. Capsule broadly obovate, striate, inclined, on a long seta; lid small with an oblique rostrum, calyptra large for the family, cucullate; peristome teeth linear-lanceolate, connivent in a cone and adhering together at the apex.

Conostomum pusillum H.f et W.

Small, tufted, erect, yellowish-green with erect innovations from below the fertile apex. Leaves erect, imbricate, lanceolate, very acute, 1-2 mm.; nerve bold slightly to much excurrent. Seta yellow, slender, 2-3 cm.; capsule broadly ovate or nearly globose, inclined striate when dry, 2 mm.

Common on mountain plateaux and occasionally at a low elevation.

Conostomum australe Swartz.

In dense bright green tufts of similar habit to the last but larger. Leaves narrow lanceolate, erect, imbricate with a long hair point, 2-3 mm. inclusive, external surface, except at the base coarsely papillose; nerve bold, long, excurrent. Seta 3-4 cm.; capsule erect or nearly so, globose, shining, striate when dry, 3 mm.

Mt. Wellington, Mt. Field, Western Tiers.

Fam. 9—SPLACHNACEAE.

Erect, clustered, with few short dichotomous branches. Leaves broad, membranous and flaccid, nerve slender, smooth; cells large, thin walled, rhombic or pentagonal. Capsule erect on a long seta, small and cylindric upon an apophysis often large or exceeding the capsule; lid very small, convex or conic; calyptra small conic or cleft on one side; peristome of 16 geminate or 8 bigeminate narrow-lanceolate teeth, sharply reflexed when dry.

A well defined family readily distinguished by the peculiar capsule.

TAYLORIA. Apophysis long, cylindric, but little broader than the spore-case.

TETRAPLODON. Apophysis spherical, much broader than the spore-case.

TAYLORIA Hook.

Medium sized, sometimes elongating. Leaves large celled, of delicate texture, spathulate. Seta bold, capsule erect, spore case short narrow cylindric with a longer cylindric apophysis at the base little or not at all broader than the spore-case; peristome teeth short, sharply recurved. Leaf acute, nerve excurrent.

Margin plain ... ... *octoblephara*
Margin dentate ... ... *callophylla*
Leaf obtuse, nerve vanishing ... ... *obtusissima*

Tayloria octoblephara (Hook) Mitt.

Syn.: *Splachnum octoblephorum* Hook.

Stems numerous, erect, forming dense cushions. Leaves pale green or tinged with red, ovate-spathulate with a filiform apex, 2-4 mm., but variable, sometimes oblong, at others the apex reduced. Margin plain to obscurely serrate; nerve slender excurrent in perfect leaves, but on rapidly growing shoots often vanishing even below the middle. Seta erect, usually about 1 cm.; capsule broadly cylindric, dark, about 1 mm., at its base a cylindric apophysis longer and generally narrower; lid nearly flat, obtusely mamillate; calyptra small cucullate; teeth of peristome short, lanceolate, geminate, sharply recurved when dry.

Very common at all altitudes and correspondingly variable. Some specimens with leaves more serrate than usual approach *T. callophylla*.

Tayloria callophylla (C.M.) Mitt.

Stems elongated, 5-10 cm., simple or with few branches, clothed nearly to the apex with purple radicles. Leaves delicate yellow-green, squarrose, narrow spathulate with a slender apex, 3 mm.; margin prominently dentate; nerve slender excurrent in a cuspidate piliferous tip. Seta bold, 1-1.5 cm.; capsule cylindric, 2 mm., with a tapering apophysis of same length.

Said to have been gathered on slopes of Mt. Wellington, but the only specimen in the collections is from New Zealand.

Very near forms of *T. octoblephara*.

Tayloria obtusissima Broth.

Stems long, decumbent, 5-7 cm. Leaves yellow-green, squarrose, obovate-spathulate, obtuse, 3 mm.; margin plain or irregular from the turgid cells; nerve very slender, vanishing some distance below the apex; cells quadrate or hexagonal above, long-rectangular towards the base. Rest not seen.

Southern side of Mt. Wellington.

TETRAPLODON Br. Schim.

Rather small, densely caespitose, capsule broadly oblong with a narrow mouth and an inflated apophysis; peristome teeth bigeminate.

Nerve excurrent ... ... *tasmanicum*
Nerve lost above ... ... *Gunnianum*

Tetraplodon tasmanicum Hpe.

Erect in dense tufts, simple, 1 cm. Leaves yellow-green, patent, 2 mm., obovate-lanceolate; margin entire, undulate above; nerve fairly broad, yellow, excurrent. Seta stout, brown, 5 mm.; capsule inclusive of apophysis about 1 mm.; apophysis globose with a white zone round the upper half; peristome teeth recurved when dry, bigeminate.

Mt. Zeehan, Adamson Peak, La Perouse.

Tetraplodon Gunnianum (Hk.)

Syn.: *Splachnum Gunnii* Hk.

Habit of *T. tasmanicum*, only rather larger. Leaves obovate, squarrose, 2 mm.; margin sub-dentate, nerve slender, vanishing above the middle. Seta short, stout, 2-3 mm.; capsule as in the last species, but the apophysis, larger, more discoid; peristome erect when dry.

West Coast. On Tree ferns.

Fam. 10—FUNARIACEAE.

Small or medium size, soft, in tufts, or dispersed, erect, simple or with few branches. Leaves few, ovate-lanceolate, with a thin nerve, smooth; cells large, hexagonal to rhomboid. Capsule spherical, oval or pyriform, erect or cernuous on a long seta; lid short, convex; calyptra with a long beak and inflated base, cleft on one side or many lobed; peristome of 16 lanceolate teeth usually twisted or sometimes short and straight or absent; endostome when present of 16 short lanceolate teeth.

A well-defined group with laxly-constructed leaves. The capsule larger than the barren base. The peristome when perfect is double, but the endostome is never well developed; the exostome in the most advanced forms has incurving teeth which are attached to a cribiform disk.

GIGASPERMUM. Creeping, with sessile capsules.

PHYSCOMITRIUM. Capsule obconic, with a broad mouth; calyptra small mitriform.

FUNARIA. Capsule pyriform; calyptra oblique with an inflated cucullate base.

GIGASPERMUM Lindb.

Small, creeping, with short erect branches. Leaves broad, imbricate, nerveless, of delicate texture, the cells large rhomboid and thin walled. Capsule hemispheric on a very short seta immersed in the terminal leaves; mouth very broad, lid flat, calyptra broad and short, peristome none.

Gigaspermum repens (Hook) Lindb.

Syn: *Leptangium repens* Mitt.

Erect, leafy branches budlike, 2 mm. Leaves pale imbricate, the upper ones broadly ovate, with a long slender apex, 1-1.5 mm.; margin subserrulate.

On the ground, Bellerive; Cataract Hill, Launceston.

PHYSCOMITRIUM Brid.

Small, erect. Leaves oblong, nerve slender, lost below the apex. Capsule obconic; lid shortly convex, abruptly rostrate or apiculate; calyptra with a short inflated cleft base; peristome, none.

The genus is close to *Funaria*, but has a different modification of the base of the calyptra.

Physcomitrium conicum Mitt.

Small, erect, simple, mostly about 5 mm. Leaves oblong, acuminate. 2 mm.; margin of one series of longer cells, serrate above; nerve slender, lost in or below the apex. Seta 5 mm.; capsule obconic, with a broad mouth, 1.5 mm.

Leith's Creek.

Physcomitrium laxum H.f. et W.

In loose tufts, 1 cm. Leaves dispersed along the stems, narrow to broadly oblong, acuminate, 2.5 mm.; margin plain; nerve vanishing below the apex to rather low down on the leaf. Capsule as in *Ph. conicum.*

Probably a shade form of the last.

Upper Meander River.

FUNARIA Schreb.

Small, simple, erect. Leaves ovate to lanceolate; cells large, lax, rhomboid. Capsule on a rather or very long seta, pyriform, oblique, and inclined, sometimes nearly erect; lid short and convex; calyptra with a large inflated base split on one side; exostome when well developed of 16 slender lanceolate teeth, twisted and attached at the apex to a cribiform disk, from this a series of reductions till the cycle may be quite absent; endostome a short basal membrane and 16 slender processes.

The genus may be readily divided into two sub-genera.

Entosthodon. Capsule erect, with a fairly distinct neck; peristome none, or of short incurved teeth.

Peristome none.
 Leaves broadly ovate ... ... *apophysata*
 Leaves lanceolate... ... ... *producta*
Peristome present.
 Nerve lost below the apiculus . ... *gracile*
 Nerve excurrent ... ... *cuspidata*

Eufunaria. Capsule inclined; peristome double.

Capsule smooth.
 Mouth broad.
  Leaves not crisping when dry ... *glabra*
  Leaves crisping when dry ... ... *crispula*
 Mouth rather narrow ... ... *tasmanica*
Capsule furrowed; seta curved ... ... *hygrometrica*

Funaria apophysata (Tayl.)

Very small, simple, 1-2 mm. Leaves in a terminal tuft, patent, imbricate, broadly ovate, acuminate, 0.5 mm.; margin plain; nerve slender excurrent in a fine point. Seta seldom much longer than the capsule; capsule linear-pyriform, 2 mm., half of which is barren neck, slightly constricted below the mouth; annulus thin dark red; peristome none.

Macquarie Plains, Kingston.

Funaria producta (Mitt.)

Very small, 1 mm. Leaves erect in a cluster, lanceolate, base broad but much attenuated above, very acute, 1 mm.; margin plain; nerve excurrent. Seta 5 mm.; capsule from nearly globose with a short neck to more slender with a long tapering neck, 1 mm.; mouth slightly constricted; peristome none.

Blackman's Bay, East Coast, Western Tiers, Mt. Nelson, etc.

Funaria gracile H.f. et W.

Stems very short. Leaves ovate-acuminate, sometimes with a strong apiculus, 1 mm.; nerve red usually lost in or below the apex, but in lower leaves often continuous, or again in some specimens dissolves just below the apex, the apiculus again indurated. Seta slender, 1-2 cm.; capsule pyriform, neck short, 1 mm., dark red; peristome of short dark teeth.

Blackman's Bay, Kingston, etc.

Funaria cuspidata H.f. et W.

Stem very short. Leaves broadly ovate, acuminate, 1 mm.: nerve red, bold, excurrent in an acute point; capsule clavate-pyriform, tapering into a short neck, 1 mm.; peristome teeth short, incurved, with a broad base and slender point.

Continuous with *F. gracile*.

Carlton.

Funaria glabra Tayl.

Small, about 3 mm., simple. Leaves clustered, imbricate when dry, readily restoring, broadly ovate-spathulate, apiculate, 1.5 mm.; margin subserrulate, the marginal cells rectangular, incrassate; nerve slender, vanishing below the apex. Seta 1 cm.; capsule broadly pyriform, inclined, bent, unequal, 2 mm.; neck short, mouth broad; exostome teeth lanceolate with slender tips twisted when young, erect when old, only slightly barred; endostome processes similar and nearly as long, adhering to the exostome below.

Very common.

Funaria crispula H.f. et W.

Small, erect, 2.3 mm. Leaves in a terminal cluster of rather more delicate texture than in *F. glabra*, crisping when dry and not readily restoring, obovate-spathulate, apiculate, 2 mm., margin serrulate with one row of rectangular incrassate cells; nerve slender, red, vanishing in the upper portion. Seta slender, 1 cm.; capsule pyriform, inclined, bent, pale, 1 mm., mouth rather broad; peristome as in *F. glabra*, from which it differs only in texture of leaves, and that is due probably to growing in intense shade. The recorded difference in capsule and peristome not consistent.

Huon, Meander River, etc.

Funaria tasmanica Hpe.

Short and simple, seldom exceeding 5 mm. Leaves in a terminal tuft, broadly ovate-spathulate, apiculate, 2-3 mm., margin regularly serrulate, the marginal cells not elongated nor incrassate; nerve slender, vanishing in the upper third. Seta slender, 2 cm., straight or nearly so, capsule inclined, linear-pyriform, slightly oblique, smooth, 3 mm.; mouth rather constricted, ring not developed, neck very tapering · exostome twisted, the teeth long slender with filiform colourless points, bars distant and not bold; endostome processes similar and half as long, pruinose, adhering at the base to the peristome.

Rhyndaston.

Funaria hygrometrica (L.) Sibth.

Erect, simple or with few branches, usually under 1 cm., but much elongating in moist shaded places. Leaves elliptic, apiculate, usually 2-3 mm.; margin plain with one line of linear slightly thickened cells; nerve slender continuous. Seta very long curved towards the apex; capsule pyriform, oblique, bent furrowed, 2-2.5 mm., tapering into a short neck; mouth slightly constricted, very oblique, ring strongly developed, red; exostome teeth twisted, their points attached to a cribiform disk, teeth bold, barred, lanceolate; endostome of 16 pale processes of same length as exostome.

Very common, especially on burnt ground.

Fam. 11—HYPNACEAE.

Habit various, from simple creeping to dendroid, seldom pulvinate. Leaves lanceolate to orbicular, usually smooth; cells usually long, but in one subfamily rotundo-quadrate, small and papillate. Seta arising from a very short branch low down on the stem, never terminal, long and slender; capsule oblong to cylindric, usually curved; lid conic to rostrate; calyptra narrow cucullate; peristome always double and well developed; the exostome of 16 lanceolate teeth with a zig-zag commisural line in the centre externally, and coarsely lamellate on the inner surface; endostome with a deep membranous base and 16 slender perforate or gaping processes; cilia long or short, slender, 3-2-1 or none.

A very large family clearly distinct from the terminal fruiting forms, but passing into *Neckeraceae* insensibly. The seta is always long, the peristome perfect, and, except in the *Leskeas*, the cells are elongated. Many bryologists now split this large family into numerous smaller ones, but this would not carry any advantage in a local flora, though it can with advantage be divided into three subfamilies.

Sub-family.—**Hypneae.** Habit various. Leaves mostly ovate-lanceolate, smooth, nerve well developed, single, rarely reduced or absent.

HYPNUM. Medium sized, decumbent, vaguely branched Leaves patent; nerve lost above the middle.

DREPANOCLADUS. Elongated water moss. Leaves very acute, the terminal ones secund, forming a sickle-like end to the shoot; nerve lost above the middle.

CAMPYLIUM. Slender water moss. Leaves small, strongly divaricate; nerve lost in the apex.

PTYCHOMNION. Robust ground moss. Leaves strongly divaricate, nerveless.

HYPNODENDRON. Dendroid. Leaves ovate, distichous; nerve lost in the apex.

MNIODENDRON. Dendroid. Leaves not distichous; nerve excurrent.

Sub-family.—**Stereodonteae.** Decumbent, vaguely or pinnately branched. Leaves smooth, shining, with a strong tendency to become distichous or secund; nerves 2, very short, obsolete or none.

RHAPHIDOSTEGIUM. Leaves narrow, acute, nerveless, at the basal angles three or four oblong inflated cells. Lid with a long beak.

STEREODON. Leaves generally secund, narrow acute, nerveless or very faint, an irregular patch of quadrate cells at the angles. Lid conic.

ISOPTERYGIUM. Leaves narrow, acute, sub-distichous, no quadrate cells at the angles; no nerve.

PLAGIOTHECIUM. Leaves broad, distichous, obliquely inserted, nerve double or forked.

CATAGONIUM. Leaves distichous, laterals conduplicate, nerveless, apiculus short, recurved.

ACANTHOCLADIUM. Leaves with a distichous tendency, nerveless, oblong concave with a long slender apiculus.

ACROCLADIUM. Leaves nearly orbicular, obtuse with one or two short faint nerves.

Sub-family.—**Leskeae.** Decumbent. Leaves small, cells rotundo-quadrate, papillose.

THUIDIUM. Branching pinnate; stems with paraphyllia.

PSEUDOLESKEA. Branches few irregular, stems without paraphyllia.

HYPNUM Dill.

Plants prostrate, creeping, seldom large or very small, pinnately or vaguely branched. Leaves ovate to lanceolate; nerve single, lost above the middle; cells narrow, linear or vermiform, thin walled, smooth, those towards the base quadrate and larger. Seta long rough with minute tubercles or smooth; capsule narrow to broadly oblong with a bluff base, inclined, curved; lid conic, often with a long beak; peristome double, the exostome teeth narrow lanceolate with an irregular hyaline border; endostome a deep membrane and 16 processes as long or longer than the exostome, cilia 1-3, slender.

The genus is large and the species closely related. In order to reduce the group to more convenient dimensions it is often the custom to divide it into genera founded on unimportant details.

BRACHYTHECIUM. Generally robust. Capsule broadly oblong with a bluff base; lid conic, the rostrum short. Leaves plicate.

Robust. Leaves not secund.

Seta rough throughout ... ... *rutabulum*
Seta rough above, smooth below ... *campestre*
Seta smooth . .. . *salebrosum*

Small. Leaves secund ... ... *paradoxum*

RHYNCHOSTEGIUM. Leaves spreading on all sides from a narrow slightly decurrent base, not plicate, with a strong nerve. Seta smooth; lid with a long slender beak.

Leaves strongly serrate ... ... *aristatum*
Leaves slightly serrulate ... . *tenuifolium*

RHYNCHOSTEGIELLA. Small mosses. Leaves divergent, lanceolate, acuminate, remotely serrulate. Seta rough; capsule tapering at the base; lid with a long nearly straight rostrum.

Leaves obtuse ... ... *convolutifolium*
Leaves very acute ... ... *muriculatum*

OXYRRHYNCHIUM. Medium sized. Leaves broadly oblong acuminate, finely or remotely serrulate. Seta rough; capsule with a long curved beak.

Leaves large, patent ... ... *austrinum*
Leaves small, divaricate, broad ... ... *remotifolium*

Hypnum rutabulum L.

Decumbent, spreading in loose yellowish green mats, irregularly pinnate. Leaves patent, glossy, ovate, with a slender apex to but shortly pointed, apex remotely to closely serrulate; nerve faint, lost in or above the middle, 2.3 mm.; cells narrow-linear, those at the base and angles broader. Seta dark red rough throughout, capsule cylindric, curved, inclined, reddish brown, contracted below the mouth and bluff at the base, lid conic; peristome dark.

Variable in length of leaf point, closeness of serrations and length of nerve.

Very common in damp situations.

Hypnum campestre Bruch.

Decumbent, livid yellow, with irregular branches, 6-10 cm. Leaves erecto-patent, shining, plicate, lanceolate, very acute, 3 mm.; margin shortly revolute, near the apex rather thickened and remotely serrate; nerve very slender vanishing above the middle; cells long linear, those at the base and angles broader and shorter. Seta rough in the upper part, smooth below. capsule cylindric, curved; lid conic; teeth yellow.

Distinguished from *H. rutabulum* by the narrower, more plicate leaves as well as the smooth lower half of the seta.

Deloraine. Longford, slopes of Mt. Wellingtion.

Hypnum salebrosum Br. Sch.

Habit of *H. rutabulum*. Leaves usually narrower and more erect, with a long slender apex, serrulate in the upper portion; nerve more distinct, lost in or above the middle. Seta smooth; lid conic.

Recorded as Tasmania, but not present in any of the available collections.

Hypnum paradoxum H f. et W.

Decumbent, irregularly branched, matted, 3 cm. Leaves yellow, falcate, secund, lanceolate, acute from a broad base, nerved beyond the middle, 1.5 mm.; margin serrulate; cells long linear, shorter and broader at the base, a triangle of many quadrates at the angles. Seta slender, minutely rough, brownish red; capsule short, 1.5 mm., oblong with a very bluff base; lid shortly conic; peristome pale brown.

Resembling a *Stereodon*.

On the ground, Old Beach; Cheshunt.

Hypnum aristatum H.f. et W.

Decumbent, forming pale green mats, pinnately branched, 1-2 cm., much elongating amongst grass. Leaves patent, concave, ovate, acuminate, strongly serrate, 1 mm.; nerve obscure, vanishing about the middle; cells broadly linear. Seta red, smooth; capsule short, oblong; curved; lid with a long, acute rostrum.

Slopes of Mt. Wellington, Cheshunt.

Hypnum tenuifolium Hedw.

Syn.: *H. collatum* H.f. et W.

Decumbent, irregularly branched, 3-6 cm. Leaves patent, concave, shining, ovate, shortly acuminate, 2.2 mm.; margin obscurely serrulate; nerve slender, ill-defined, vanishing above the middle; cells narrow, slightly broader at the base. Seta long, red, smooth; capsule broadly oblong, inclined, curved; lid with a long acute beak.

Slopes of Mt. Wellington, Mt. Nelson, Coal River Tier etc.

Hypnum convolutifolium Hpe.

Small, decumbent, 3-5 cm., with many irregular, erect branches. Leaves patent oblong, convolute when dry, base narrow, apex rather obtuse, 1 mm.; margin obscurely serrulate; nerve slender, vanishing above the middle; cells narrow oblong, shorter near the apex, becoming quadrate towards the base. Seta 1 cm., slender, dark, rough; capsule inclined, oblong, dark, constricted below the mouth, neck swollen, 1.3 mm.

Latrobe.

Hypnum muriculatum H.f. et W.

Rather small, decumbent, branches ascending, 1 cm. Leaves divaricate, narrow ovate with a rather long attenuated apex, 1 mm.; margin serrate, but not closely so; nerve slender, lost above the middle. Seta 1 cm., red, rough; capsule inclined, oblong, tapering at the base, 1 mm., lid rostrate of the same length.

Slopes of Mt. Wellington, Circular Head.

Hypnum austrinum H.f. et W.

Decumbent, widely spreading, with few branches, dull olive green, young shoots pale yellow green, shining, 5-10 cm. Leaves patent, oblong, acute, concave, 2 mm.; margin finely serrate; nerve broad at the base, rapidly narrowing and lost in the middle, cells narrow linear, rather broader towards the base. Seta rough, 2 cm., capsule broadly oblong, inclined, 2 mm., gibbous; lid rostrate, nearly as long.

Guy Fawkes Rivulet, Mt. Wellington; near Frenchman's Cap.

Hypnum remotifolium Mitt.

Syn.: *H. asperipes* Mitt.

Small, decumbent, with few branches, 2-3 cm., bright yellow-green. Leaves divaricate, rather crisped, broadly ovate, nearly orbicular, with a slender apex, 1 mm.; margin closely, acutely serrate; nerve slender. Seta red, 1.5 cm., rough; capsule inclined, arcuate, oblong-cylindric, 1.7 mm., dark, base attenuated, mouth very wide.

St. Crispin's Well, Mt. Wellington; Cheshunt.

DREPANOCLADUS Warnst.

Robust elongating mosses growing in water, branches few and irregular, the leaves secund and curved in a sickle form at the ends of the shoots. Leaves lanceolate with a slender apex, imbricate; nerve vanishing above the middle; cells narrow vermiform, only those at the base rather broader. Seta long; capsule oblong with a tapering neck inclined or rarely erect; lid conic, rather short; peristome as in *Hypnum*.

A small group of water mosses distinguished by their habit and sickle-shaped leaves.

Drepanocladus fluitans (L.) Warnst.

Stems procumbent, often 12 cm. Leaves narrow lanceolate, tapering to a long slender apex, more or less falcate, 2.5 mm.; margin entire.

Common in the bed of creeks.

Drepanocladus brachiatus Mitt.

Very close to *D. fluitans*, but more robust. Leaves falcate, more spreading, lanceolate, acute, up to 5 mm.

In the bed of creeks, often growing with *D. fluitans*.

CAMPYLIUM Sull.

Slender, prostrate, elongating, branches few and irregular. Leaves close set, broad below with a sharply divaricate acute point; nerve single, bold, lost in the apex; cells oblong, longer towards the base. Seta slender; capsule inclined cylindric; lid short, conic; peristome as in *Hypnum*. Living in water or very wet places. Very seldom fruiting.

Branches few ... ... *relaxum*
Branches many.
    Nerve defined ... ... *decussatum*
    Nerve faint ... ... *molle*

Campylium relaxum (H.f. et W.)

Stems simple, often 5-7 cm., dark green. Leaves broadly ovate with an acute acuminate point, 1.3 mm.; margin obscurely subserrulate; nerve bold, lost in the apex; cells irregularly linear-oblong.

Forth River Falls.

Campylium decussatum (H.f. et W.)

Habit of the last, only more branched and with smaller light green leaves. Leaves broadly ovate with an acuminate apex, 1 mm., margin subserrulate, nerve not strong, lost in apex; cells nearly rhomboid, thin-walled.

Recorded from Tasmania, but no specimen in the collections, and possibly an erroneous identification.

Campylium molle Broth.

Slender, decumbent, with numerous, short, lateral branches forming close mats on stones in running water, 3-6 cm. Leaves broadly ovate with a short, sharp, acuminate apex, 1.2 mm.; margin subserrulate; nerve broad but faint, lost in the apex; cells thin walled rectangular to rhomboid. Differing from *C. decussatum* slightly in habit and in the nerve being fainter.

Coal River Tier.

PTYCHOMNION H.f. et W.

Robust, decumbent, with few irregular branches. Leaves in many rows, divaricate, broadly elliptic or ovate from a narrow base apex suddenly narrow, flat and rather long; nerve none; margin subserrate below, spinulose above; cells linear, strongly incrassate, the ends bluff with lateral connections. Seta tall, slender, dark, smooth; capsule broadly cylindric, arcuate, strongly ribbed, with a shortly attenuated neck; lid hemispheric with a subulate rostrum as long as the capsule; calyptra long, cucullate, smooth; exostome teeth cartilaginous, lanceolate, slender, with a very attenuated closely trabeculate apex; endostome membrane deep, the processes perforated, lanceolate from a broad base, usually with two or three short cilia between them.

Ptychomnion aciculare (Brid.) Mitt.

Forming extensive yellow or greenish mats, stem rather slender, red, tough. Leaves 3-4 mm. Seta straight, 2.5-3 cm.; capsule 3 mm.

Very common on the ground and on deadwood.

HYPNODENDRON Mitt.

Stem erect with a fascicle of branches at the top. Leaves of rather soft texture, distichous, thin; margin and nerve armed with single or double spinulose teeth; nerve strong, lost in the apex; cells linear. Seta arising from the base of the branches, slender, long; capsule cylindric, ribbed;

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lid with a rostrum less than half length of capsule; calyptra very narrow; peristome pale yellow, teeth lanceolate, gradually tapering to a very slender apex; endostome membrane deep, processes lanceolate, perforate, cilia 2-3, very long.

Leaves distichous, pale ... . *spininervum*
Leaves dispersed, dark .. .. *Archeri*

Hypnodendron spininervum Hook.

Syn.: *Isothecium spininervum* Hook. *Trachyloma arcuata* Mitt.

Stems about 5 cm. Branch leaves distichous, light green, shining, broadly ovate, acute, 2 mm., equal or slightly oblique, surface minutely papillose, cells narrow linear. Seta 4 cm.; capsule inclined, slightly to much curved, 3.5 mm.: lid conic, rostrate, not half as long.

Slopes of Mt. Wellington, Gordon, Tasman's Peninsula.

Hypnodendron Archeri Mitt

Syn.: *Isothecium Archeri* Mitt.

Habit of the last, but the leaves less distichous and dull, dark green. Leaves oblong-lanceolate, acute, oblique, 1.5 mm., surface smooth; nerve lost in the apex; cells rather broader and thinner walled. Seta 3 cm.; capsule narrow-cylindric, 4 mm.; lid conic.

Not a well-defined species.

Port Arthur, West Coast.

MNIODENDRON Lindb.

Robust, erect, dendroid; stem covered with matted rhizoids, branches fascicled at the apex. Leaves lanceolate from a broad base, very acute, margin slightly thickened; nerve bold, excurrent; cells long, narrow linear. Capsule cylindric furrowed, pendulous on a long seta arising from the base of the branches; lid acutely rostrate; calyptra long, cylindric, cucullate; exostome teeth lanceolate, smooth, closely articled, commisural line very faint; endostome a deep membrane, the processes same length gaping or perforate, cilia three, slender, also same length.

The following forms are very closely related, and it is doubtful to what extent they should be considered specifically distinct.

Branches in a regular fascicle.
Base of leaf broad ... ... *comosum*
Base of leaf narrow ... ... *comatum*
Branches in a dispersed fascicle ... ... *Sieberi*

Mniodendron comosum (Lab.)

Stem erect, about 5 cm., bold, closely covered with brown fibrils and divaricate leaves. Branches 1.5-2 cm. in a defined fasciculus at the top of the stem. Leaves lanceolate from a rather broad base, 4 mm.; margin irregularly serrate above; nerve thick, excurrent in a rather long point; cells very narrow linear, slightly broader at the basal angles, not strongly incrassate. Seta 3 cm., red; capsule cernuous or pendulous, with eight grooves, deep red, neck tapering, black, 3 mm.; lid acutely rostrate, shining, 3 mm.; calyptra short, smooth.

Common in damp forests.

Mniodendron comatum (C.M.)

Syn.: *Isothecium Colensoi* H.f. et W.

Habit of *M. comosum*, only the branches usually longer and dark green, the stem with but little clothing of rhizoids. Leaves lanceolate from a relatively narrow base, 5.5 mm.; margin thickened, rather coarsely spinulose, exserted nerve very long; cells cylindric, not long, more incrassate and regular than in the other species, in the upper part and near the margin short oblong-rhomboid, those of the basal angles quadrate enlarged. Other details as in *M. comosum.*

Slopes of Mt. Wellington.

Mniodendron Sieberi C.M.

Syn.: *Isothecium Sieberi* C.M.

Habit and appearance of *M. comosum* only the branches more dispersed. Leaves divaricate, lanceolate from a broad cordate, sub-auricled base, very acute, margin slightly thickened with few spinulose teeth above, 4 mm.; nerve exserted in a long filiform point; cells very long linear. Other features as in *M. comosum.*

Damp gullies, Mt. Wellington; Ida Bay.

RHAPHIDOSTEGIUM Schimp.

Medium to small mosses with, in most instances, a near resemblance to *Stereodon*, decumbent, elongated, rarely short, pinnate. Leaves small glossy, generally falcate and secund, lanceolate, acute; nerves if present 2, short and faint; cells vermiform with an alar patch of 3-4 large oblong cells. Seta slender; capsule small, oblong, straight, erect or inclined; lid conic with a long slender beak; peristome pale yellow, the exostome teeth broad below with a slender bordered apex; endostome membrane deep, processes very slender and longer than the exostome; cilia none (?).

A natural group, distinguished from *Stereodon* by the long beak to the lid and the peculiar alar patch of inflated cells. Of the following species the first four are very close, and might well be treated as unstable forms of one.

Leaves small, falcate, strongly secund.
  Margin plain or with few serrulations.
    Stems short, vaguely branched ... *calliferum*
    Stems elongated, closely pinnate ... *callidioides*
  Margin distantly serrulate.
    Stems irregularly branched ... ... *tenuirostre*
    Stems long, closely pinnate ... ... *cerviculatum*
  Margin regularly serrulate ... .. *cyparioides*
Leaves larger, slightly secund.
  Margin serrulate, livid or green ... *Joliffii*
  Margin plain, golden brown ... .. *homomallum*
Leaves not secund ... ... *crassiusculum*

Rhaphidostegium calliferum Hpe. et Geh.

Yellow, decumbent, with numerous pinnate short branches, forming close mats. Leaves erecto-patent, secund, base broad, attenuated upwards to a slender recurved apex, 1.7 mm.; margin plain; nerve none; cells long vermiform, two or three at the angles quadrate and inflated. Seta smooth, 1.3 cm.; capsule inclined or pendulous, oblong, pale brown, 1.2 mm.; peristome pale yellow.

Common on deadwood.

Rhaphidostegium callidioides Hpe. et C.M.

Habit and structure almost of *R. cerviculatum*, only less robust. Leaves shining, secund, lanceolate with an attenuated usually serrated apex, 1-2 mm., nerve none; cells long vermiform, three or four at the basal angles large inflated oblong. Seta slender, 1 cm.; capsule cernuous or pendulous, not exceeding 1 mm.; peristome pale yellow.

Near Port Cygnet.

Rhaphidostegium tenuirostre (H.f. et W.)

Syn.: *Hypnum tenuirostre* H.f. et W.

Pale greenish yellow, decumbent, with numerous, irregularly pinnate branches. Leaves shining, patent, secund, falcate, base ovate-oblong, tapering above into an attenuated apex, 1.2 mm.; margin distantly serrulate, nerve none; cells long vermiform with 3 large oblong inflated cells at the angles. Seta red, slender, 2 cm.

Common on deadwood.

Rhaphidostegium cerviculatum (H.f. et W.)
Syn.: *Hypnum cerviculatum* H.f. et W.

Decumbent, livid green, main shoots elongating, closely set with short lateral branches, forming a broad dense mat. Leaves shining, strongly secund, narrow oblong-ovate or lanceolate, gradually narrowing into long attenuated serrated apex, 1.7 mm.; margin subserrulate, nerve none; cells long vermiform, three or four at the angles oblong, very large. Seta slender, red, 1.5 cm.; capsule oblong, cernuous, straight, 1.4 mm.

Common on deadwood and stone.

Rhaphidostegium cyparioides (Brid.)
Syn.: *Hypnum leptorrhynchum* Brid.

Decumbent, stems elongated, bearing few leaves but many small lateral branches, pale greenish yellow. Leaves shining, secund, lanceolate, more gradually tapering into an attenuated point than in adjoining species, 1.5, upper portion acutely serrate; nerve none; cells vermiform, three or four at the angles oblong, inflated, large. Seta very slender, 1.5-2 cm.; capsule pendulous or cernuous, narrow oblong, 1 mm.; peristome pale.

On deadwood, common.

Rhaphidostegium Joliffii (Mitt.)
Syn.: *Hypnum Joliffii* Mitt.

Procumbent, with few long irregular branches, livid yellow. Leaves loosely secund, shining, oblong-ovate with an attenuated apex, 2 mm.; margin usually serrulate towards the apex; nerve none; cells long vermiform, with 4 at the angles large inflated, linear-oblong. Seta 1.5 cm., red, bent at the apex; capsule cernuous, oblong, straight, 1.4 mm.

When growing in water often dark brown, leaves less secund and less attenuated.

Very common on margins of woodland streams.

Rhaphidostegium homomallum (Hpe.)

Coarser than the other members of the genus, chestnut brown or golden, in dense mats, branches many, suberect, short. Leaves slightly secund, ovate-lanceolate with a short, straight, acute point, 1.6 mm.; margin plain; nerve none; cells vermiform, shorter and more incrassate than in other species, about four at the basal angles very large. Seta 1 cm.; capsule erect, slightly curved, narrow oblong, 2 mm.

Pirate's Bay, East Coast; Eaglehawk Neck.

Rhaphidostegium crassiusculum Brid.

Syn.: *Hypnum contiguum* H.f. et W.

Pale greenish yellow, in small mats, branches short, erect. Leaves patent, slightly or not at all secund, lanceolate, acute, 1.6 mm.; margin plain; nerve none; cells vermiform, four at the basal angles very large inflated. Seta 1 cm.; capsule oblong, cernuous or pendulous, 1.2 mm.

Slopes of Mt. Wellington, Bellerive.

STEREODON Mitt.

Stems decumbent, spreading, vaguely or pinnately branched. Leaves ovate, acute, to lanceolate with a tapering apex, usually secund and falcate appearing distichous, base narrow; nerves two, obsolete or none; margin serrate to plain; cells narrow, vermiform, smooth with a more or less defined patch of numerous quadrate cells at the angles. Seta long, smooth; capsule cylindric with a tapering neck, curved; lid conic, acute; exostome teeth narrow lanceolate, bordered: endostome 1-3rd membranous, processes slender usually with pores; cilia usually one.

Distinguished from *Rhaphidostegium* by the short conic lid and the alar patch of quadrates, numerous, but without the few inflated cells.

Without flagellate branches.
- Regularly pinnate.
  - Leaves recurved in the middle ... *cupressiformis*
  - Leaves not recurved ... ... *Mossmanianus*
- Irregularly branched.
  - Leaves secund ... ... *chrysogaster*
  - Leaves imbricate ... ... *cupressiformis*
  - Leaves spreading .. .. *Nelsoni*

With flagellate branches.
- Leaves of flagellum acute ... ... *Walterianus*
- Leaves of flagellum obtuse ... ... *flagelliramus*

Stereodon cupressiformis (L.) Brid.

Shoots long, usually with very numerous, regular, short branches forming dense mats, yellowish or pale green. Leaves usually sharply secund, shining, ovate lanceolate with an attenuated much curved upper portion, recurved in the middle, 1.5 mm.; margin plain below, minutely serrate towards the apex, nerves usually none, in some cases two faint basal nerves may be seen, cells fusiform or short vermiform, at the basal angles a well-defined triangular patch of about twenty enlarged quadrate cells; perichætials oblong, erect, sometimes serrate, with a filiform recurved point. Seta 1.5 cm.; capsule oblong, slightly inclined, slightly bent, pale brown, 1.8 mm.; lid convex with a short acute rostrum, smooth.

Very common on deadwood.

f. *robusta*. Branches few, robust; leaves oblong with a short acuminate point not secund, nerve more apparent. Other details as above. All intermediate stages fairly common.

On the ground amongst grass.

Stereodon Mossmanianus C.M.

Decumbent, elongated, with numerous pinnate lateral branches, pale yellow green. Leaves closely secund, shining, lanceolate not recurved, base not broad, but from there tapering upwards into an attenuated curved point, 1 mm.; margin plain, nerve none; cells vermiform, nine to twelve at the angles irregularly quadrate; perichætials erect sheathing with slender terminations. Seta 2 cm.; capsule nearly erect, slightly bent, oblong, 2.7 mm.; lid with an acute point.

Very close to *S. cupressiformis*. Differing in the non-recurved leaves, smaller alar patch and entire upper margin.

Hobart Rivulet on stones.

Stereodon chrysogaster (C.M.) Mitt.

Syn.: *Hypnum patale* H.f. et W.

Shoots long, irregularly pinnate, branches mostly long forming a loose mat, pale greenish. Leaves rather closely secund, shining, broadly ovate-lanceolate, the attenuated upper portion not long, curved, 1.8 mm.; margin plain or subserrulate; nerve none; cells long fusiform, a small patch of six or eight enlarged cells at the angles, three of which are larger and oblong as in *Rhaphidostegium*; perichætials lanceolate, with erect slender points usually serrulate. Seta 2 cm.; capsule inclined, narrow oblong, slightly bent, 2.2 mm.; lid with a short, acute point.

Habit much less regularly pinnate than in *S. Mossmanianus;* leaves broader and the alars differently constructed.

Common on deadwood.

Stereodon Nelsoni Broth.

Shoots long, slender, with pinnate, not very numerous nor short, lateral branches, pale yellow-green. Leaves equally dispersed, not crowded, nearly squarrose, concave, incurved, ovate, obtuse to slightly acute, 1 mm.; margin serrulate; with two very faint short nerves sometimes obsolete; cells broadly vermiform, the basal series quadrate, but those at the angles not in a defined patch. Rest not seen.

The absence of fruit and the habit make its position in this genus provisional.

Mt. Nelson.

Stereodon Walterianus (Hpe.)

Decumbent, branches pinnate, elongated to slender filiform, flagellate, pale yellow. Leaves of the main branches secund, falcate, broadly ovate, with a short tapering apex, those of the flagellate branches erecto-patent, straight or slightly recurved, narrow ovate-lanceolate tapering to a slender point, 1 mm.; margin entire or obscurely subserrulate; nerve none or in some leaves a faint sign of a single nerve; cells vermiform, in the angles a well defined patch of about ten quadrate cells; perichætials erect, lanceolate with a slender point. Seta 1 cm.; capsule slightly curved, narrow oblong, 1.6 mm.; lid conic, acute.

On branch of tree, Hobart Rivulet.

Stereodon flagelliramus (C.M.) Broth.

Decumbent, elongated with numerous short erect branches; the ends of many of these become flagellate with small closely appressed leaves. Leaves of the normal branches equally dispersed, erecto-patent, broadly oblong from a rather broad base, above rather suddenly contracted to a short narrow apex, 1.8 mm.; margin obtusely serrate; nerve none; cells short vermiform, about twelve enlarged quadrate in a well defined small patch at the angles. Leaves of the flagella narrow oblong, closely appressed, obtuse, serrate, .4 mm.; cells nearly rhomboid.

On deadwood, Hobart Rivulet.

Isopterygium Mitt.

Suberect, small, slender, irregularly branching. Leaves in five irregular rows in typical species, sometimes more numerous, lanceolate from a broad base, thin, smooth, shining; margin plain; nerve none or two very obscure; cells narrow fusiform with very acute ends, thin walled, one row of basal cells shorter and broader. Seta slender, capsule erect or nearly so, oblong, curved; lid conic, short, obtuse; exostome teeth slender, strongly barred; endostome membrane half length, processes as long, slender, cilia usually absent.

Differing from *Stereodon* in the broader base of the leaves, absence of quadrate alars, besides habit.

Leaves secund	*limitum*
Leaves straight	*acuminatum*

Isopterygium limitum (H.f. et W.) Broth.

Syn.: *Stereodon limatus* (H.f. et W.)

Decumbent or suberect, the stem not widely spreading, branches many, vague, erect, equal, incurved at the apex, often decumbent when dry, dull greenish yellow. Leaves secund, shining, lanceolate, from a very broad base tapering nearly equally to the acute apex, concave, incurved, 1.2 mm.; margin plain; nerve none; cells long fusiform, those at the basal angles not distinct; perichætials lanceolate, erect, points slender but not elongated. Seta 2 cm.; capsule erect or slightly inclined, slightly bent, oblong, up to 2.7 mm.; lid conic, obtuse or nearly so. Peristome teeth slender, rather strongly barred; lower half of endostome a membrane, upper half of linear processes sometimes perforated, no cilia.

Very common on deadwood.

Isopterygium acuminatum Bosw.

Small, decumbent. Leaves lanceolate from a broad base tapering into a piliferous apex, inserted irregularly in five series, patent, about 1 mm., margin plain; nerve none; cells very long, delicate, one line of quadrate cells at the base. Rest not seen.

West Coast, Meander at Western Tiers.

Plagiothecium Schimp.

Stems decumbent with few irregular branches, flat. Leaves ovate to lanceolate, oblique, obliquely inserted, upper and lower series erect and appressed, laterals patent, shining, smooth; nerve double, often united below, obsolete or none; cells long, fusiform, thin walled. Seta slender; capsule cylindric with a tapering base, inclined, curved; peristome pale yellow; exostome teeth slender lanceolate, densely articulated; endostome membrane deep, processes long, slender; cilia usually one, sometimes none.

Distinguished by the complanate habit and oblique leaves.

Plagiothecium lamprostachys Hpe.

Pale green, delicate, 2-5 cm. Dorsal and ventral leaves erect, appressed; lateral leaves patent, broadly ovate, acuminate, oblique, 2 mm.; margin plain, entire, sometimes a few serrations close to the apex; nerves two, united at the base, obscure; cells long fusiform. Seta slender, 2 cm.; capsule cylindric, inclined, slightly curved, yellow-brown, neck slender, 1.7 mm.; peristome yellow.

On tree ferns, deadwood and ground Plateau of Mt. Wellington, Western Tiers, Gordon, etc.

CATAGONIUM C.M.

Decumbent, vaguely branched, shoot flattened, the leaves assuming a distichous arrangement. Leaves oblong, apiculate, very concave, nerves 2 faint; cells very long vermiform, with acute ends, but little shorter at the base. Seta slender; capsule slightly inclined cyclindric with a tapering base; lid shortly conic; endostome membrane $\frac{1}{3}$, processes slender; cilia 2-3, unequal.

Catagonium politum (H.f. et W.) Mitt.

Decumbent, flat, shining, usually 4 cm. Leaves concave to conduplicate with a very short recurved apiculus, 2 mm. Capsule about 2 mm.

Common in damp forests.

ACANTHOCLADIUM Mitt.

Procumbent, usually much elongating and regularly pinnate, the tips of the branches slender and acute. Leaves thin, smooth, shining, with a long filiform apiculus: nerve none; cells long vermiform, a defined patch of quadrate and a few inflated oblong cells at the angles. Seta long smooth, flexuose; capsule cernuous, short, broadly oblong, curved, neck tapering; lid broadly conic, umbonate; peristome pale, teeth with a broad base and a rather suddenly attenuate, slender, colourless apex, closely articulate, and very rough on the margin; endostome membrane deep, processes very slender gaping; cilia none.

Acanthocladium extenuatum (Brid.) Mitt.

Syn.: *Hypnum extenuatum* Brid. *H. crinitum* H.f. et. W.

Pale yellowish green, 3-12 cm. or more, subcomplanate. Leaves oblong, from a narrow base, concave, surface minutely papillose. Upper margin and apiculus serrate, suddenly contracted above into a long, slender apiculus, 1.75 mm. Capsule red, 2 mm.

Very common on deadwood.

ACROCLADIUM Mitt.

Stems decumbent, simple or with few irregular branches, the ends bluffly acute. Leaves concave, imbricate, short and very broad, orbicular or with an obtuse apex, with a small auricle at the angle, glossy; nerves two or one, short, faint or obsolete; cells vermiform, usually with forked ends, a well defined patch of numerous thin walled quadrates in or near the auricle. Seta slender, very long, smooth; capsule oblong or cylindric, slightly bent; lid shortly conic; peristome pale, teeth lanceolate; endostome membrane $\frac{1}{3}$ length, cilia unequal.

Acrocladium auriculatum (Mont.) Mitt.

Procumbent, elongating to 10 cm., vaguely branched. Leaves shining, suborbicular, concave, erecto-patent, imbricate, 2 mm.; margin entire; nerve usually single, rarely double or none; cells long and narrow, the patch of lax quadrates placed between the insertion and the auricle. Capsule short, broadly oblong, with a short tapering neck.
Slopes of Mt. Wellington.

Acrocladium chlamydophyllum H.f. et W.

Very similar in habit to *A. auriculatum.* Nerves consistently two; cells shorter and broader, the quadrates very numerous, placed in and occupying the auricle. Capsule cylindric with a tapering base.
Very common on ground.

THUIDIUM Br. Sch.

Decumbent, the main axis elongating and bearing pinnate, bi-, or tri-pinnate branches usually rather regularly arranged, at least the main axis more or less clothed with paraphyllia. Leaves minute, ovate, acuminate; nerve well developed, lost above to excurrent; cells very small, round or quadrate, papillate. Seta long, smooth, arising from the main axis; capsule oblong, curved, inclined; lid rostrate; peristome teeth long, lanceolate; endostome membrane deep, processes slender, cilia 3-4.

Ultimate branches with paraphyllia.
  Branches regularly pectinate ... ... *laeviusculum*
Ultimate branches without paraphyllia.
  Branches rather regular, with flagellate tips ... ... *sparsum*
  Branches irregular.
    Nerve in leaves of ultimate branches lost below apex ... ... *unguiculatum*

Nerve dissolved in apex.
Branching bipinnate ... ... *furfurosum*
Branching pinnate ... ... *Stuartii*

Thuidium laeviusculum (Mitt.) Jaeg.

Primary shoot long, procumbent, with annual elongations, each section with numerous, erect, short, closely pinnate secondary branches; paraphyllia very numerous; leaves broadly cordate with long flagellate, serrate tips. Ultimate branchlets also with paraphyllia; leaves ovate; 0.4 mm.; nerve vanishing below the apex; cells each with a prominent forked papilla; the nerve armed externally with prominent serrations. Seta 3-4 cm.; capsule inclined, larger and more curved than in the other species, 3-4 mm. Rest not seen.

Common in shady woods.

Thuidium sparsum (H.f. et W.) Jaeg.

Habit of *T. furfurosum*, but the secondary branches more numerous and close set with flagellate tips. Leaves of primaries as in *T. furfurosum;* those of secondaries ovate-cordate, margin serrulate, nerve vanishing in or below the apex; cells rotundo-quadrate, with short obtuse papillae. Fruit not present in Tasmanian specimens.

West Coast.

Thuidium unguiculatum (H.f. et W.) Jaeg.

Very similar to *T. furfurosum*, only less robust. Leaves of primaries cordate with an attenuate apex, nerve continuous, under 1 mm. Leaves of secondaries smaller, ovate from a broad base, nerve lost below the apex; cells coarsely nodulose, papillate. Perichætials as in T. *furfurosum*, the vaginule bearing numerous slender paraphysis. Seta slender, 3 cm.; capsule inclined, cylindric, curved, 2 mm.; lid with a slender rostrum as long as the capsule; calyptra clothed with a few long erect hairs at the base.

Very common in damp places.

Very close to *T. furfurosum* and often considered only as a variety. Though the typical plant is distinct there appear to be numerous intervening forms, also with *T. Stuartii.*

Thuidium furfurosum (H.f. et W.) Jaeg.

Procumbent, branches pinnate or irregularly bipinnate. Primaries relatively robust, densely covered with paraphyllia; leaves cordate with a rather long acuminate apex, 1.5 mm.; nerve strong, continuous, but partially dissolved in the upper part; cells irregularly rotundo-quadrate, incrassate, with short simple oblique conical papillae. Leaves of secondaries similar but smaller, attenuate apex shorter, nerve lost in the apex. Perichætials erect, rather long, with attenuate points, nerve continuous, cells elongated, nearly vermiform. Seta slender, 3 cm., capsule inclined, curved, constricted below the mouth, 2.5 mm.; lid rostrate, nearly as long as the capsule.

Very common in shady places.

The plant varies greatly according to conditions under which it is living.

Thuidium Stuartii C.M.

Slender, much spreading, usually with simple, short, or long branches. Leaves of primaries as in *T. furfurosum*. Leaves of secondaries cordate with a rather long tapering point; margin serrulate, nerve dissolving in the apex, cells with a coarse, simple, acute, conic, oblique papilla. Seta 3 cm.; capsule inclined, curved, 2 mm.; lid with an acute rostrum nearly as long; calyptra often with a few long hairs.

Common in woods. Mostly in dry situations.

Often included with *T. furfurosum*.

PSEUDOLESKEA Schimp.

Small, decumbent, with few vague decumbent branches, with clusters of radicles at intervals, without paraphyllia. Leaves opaque, small, lanceolate from a broad base; nerve well developed; cells rotund, nodulose-papillate. Seta rather long, capsule cylindric, erect, slightly oblique; lid shortly conic; exostome teeth lanceolate, endostome with a deep membrane and lanceolate processes, usually with one short cilium.

Differs from *Thuidium* in the absence of copious regular branching as well as absence of paraphyllia.

Pseudoleskea imbricata (H.f. et W.) Broth.

Decumbent, with few vague branches, often rooting from the lower surface, 2-4 cm., yellow. Leaves ovate lanceolate, acute, patent, 1.5 mm.; margin revolute except towards the apex; nerve lost below the apex; cells rotundo-quadrate, papillae prominent, nodulose. Rest not seen.

Knocklofty, Hobart; Mt. Nelson, Colebrook.

FAM. 12.—NECKERACEAE.

Habit very varied, generally robust, seldom in dense cushions. Leaves plurifarious but often complanate, usually thin and smooth; nerve sometimes well developed, often obsolete, and then sometimes double. Cells in most cases short, small and incrassate; in other species much elongated. Fruit lateral except in *Hedwigia* and *Hedwigidium* where it is terminal or apparently so; seta usually short, sometimes nearly absent, rarely long; capsule small, oblong and operculate except in *Pleurophascum* where it is large, globose and astomous; lid conic or shortly rostrate; calyptra cucullate or mitriform; peristome double the exostome of 16 lanceolate teeth; endostome with a basal membrane and 16 slender processes, cilia usually absent; from this condition the development is reduced in genera till the peristome is quite absent.

The family is not a natural one. It is made up of divers forms that do not fit in well with the other Pleuracarpi. They may be conveniently grouped in five sub-families.

Sub-family. **Spiridentaceae.** Leaves very narrow, the upper portion consisting of the excurrent nerve; cells rotundo-quadrate.

ECHINODIUM. Branches few, long; seta long.

CYRTOPUS. Branches few, short; seta short.

Sub-family. **Lembophyllaceae.** Dendroid to long and pendulous sometimes with equal branches, rarely pinnate. Leaves concave, broad, of thin texture, nerve generally obsolete or double and obscure, when more developed vanishing above the middle; cells from oblong to vermiform. Seta short, sigmoid.

THAMNIUM. Small, vaguely branched, cells ovate, nerve lost above the middle.

LEMBOPHYLLUM. Medium size; branching pinnate or vague; nerve obsolete or broad and dissolving, cells oblong or fusiform, rarely linear.

WEYMOUTHIA. Elongated with long branches; nerves two, short and very faint; cells vermiform or linear, often oblong at apex.

CAMPTOCHAETE. Dendroid. Leaves rather complanate; nerves 2, obsolete; cells vermiform.

PAPILLARIA. Elongated, pendulous; nerve single vanishing above the middle, surface more or less papillose; cells oblong to fusiform.

Sub-family. **Cryphaeaceae.** Habit more or less dendroid;

in most genera the leaves and branches are strongly complanate; nerve may be well developed to obsolete; the cells short oblong to vermiform. In most genera the capsule is nearly sessile; endostome with filiform processes.

Capsule sessile.

DENDROCRYPHAEA. Nerve lost below apex; cells small rhomboid; branches very short.

CRYPHAEA. Nerve lost below apex; cells small, rhomboid; branches elongating.

RHABDODONTIUM. Nerveless; cells broadly linear; branches very short.

NECKERA. Nerves faint or none; cells oval to rhomboid; leaves with undulating surface.

Seta long.

HOMALIA. Leaves unsymmetric; nerves obsolete; cells rhomboid.

TRACHYLOMA. Leaves symmetric; nerve obsolete; cells vermiform.

Sub family. **Leucodontaceae.** Medium sized mosses of rather soft texture, pale; leaves imbricate, not complanate, nerveless or nerve obsolete; cells rhomboid to vermiform, seta never very short; peristome imperfect, in one species astomous.

LEPYRODON. Leaves obtuse with a hair-like apiculus, cells vermiform.

GLYPTOTHECIUM. Leaves ovate-lanceolate acute; cells fusiform with a broad band of oblong cells on the margin.

PLEUROPHASCUM. Leaves obovate with a flagellate apiculus; cells large, rhomboid. Capsule large, globose, astomous.

Sub-family. **Hedwigiaceae.** Medium sized mosses of dark colour or dingy green. Leaves plurifarious, tough, imbricate, nerveless; cells quadrate to linear. Capsule on a seta terminating a short lateral branch or sessile and terminal; peristome none.

RHACOCARPUS. Seta not very long placed below the branches. Leaves with long apiculus; cells linear.

HEDWIGIDIUM. Capsule sessile. Leaves dingy green; cells quadrate.

HEDWIGIA. Capsule sessile. Leaves with white tips; cells quadrate.

Echinodium Jur

Habit elongated, simple, or with few branches, flaccid. Leaves plurifarious, linear-lanceolate or filiform, rather long, the greater length made up of the broad excurrent nerve; cells small, irregularly rotundo-quadrate, smooth, rather incrassate. Seta medium length, smooth, curved above; capsule short; broadly oblong, inclined, equal; lid rostrate; exostome teeth lanceolate, slender, bordered by a thin membrane; endostome membrane half as deep as the exostome, processes lanceolate, perforated, two or three irregular cilia between each pair.

The genus may be quite as well referred to *Hypnaceae*, but its affinity to *Cyrtopus* justifies its position in this family.

Echinodium hispidum (H.f. et W.) Jur.

Syn: *Hypnum hispidum*, H.f. et W.

Branches long, often 15 cm., sometimes with slender flagellate tips, dark green, flaccid, simple or nearly so. Leaves patent, filiform from a broader base, 4.5 mm., margin plain, nerve flat, broad, forming the upper two-thirds of the leaf. Seta 1.5 cm.; capsule very broad, 1.8 mm.

Very common on banks of streams in shady mountain slopes.

Cyrtopus Hook.

Rather robust, erect from a creeping rhizome usually with a few irregular branches above. Leaves close set, the base short, oblong, erect, then very slender recurved to a filiform apex; margin plain below, spinulose above; nerve slender, excurrent; cells oblong to fusiform, strongly incrassate. Fertile branches very short, lateral. Seta slender short; capsule erect, oblong; calyptra short cucullate; lid obliquely conic-rostrate; peristome double, erect; exostome teeth narrow lanceolate; endostome membrane short, processes subulate rather shorter than the exostome.

Cyrtopus setosus (Hedw.) Hook.

Often 5-8 cm. Leaves 5 mm.; perichaetials not differing. Seta 4 mm.; capsule narrow oblong 2 mm.

Reported from Tasmania but no Tasmanian specimen in the collections. Very possibly an error.

Thamnium Schimp.

Erect or suberect, dendroid from a creeping rhizome, irregularly branched from the base. Leaves complanate, ovate; nerve single, flat, lost above the middle; cells ovate-hexagonal. Seta short or long arising from the main stem; capsule inclined, equal, oblong; lid rostrate; exostome teeth long, slender, endostome membrane rather deep, processes long slender, gaping below; cilia usually 2 slender.

Thamnium pumilum (H.f. et W.).

Syn: *Isothecium pumilum* H.f. et W., *Neckera rivalis* Mitt.
Stems numerous erect dendroid, branches few, irregular, equal or nearly so, about 1.5-2 cm. Leaves of branches in three rows, complanate, elliptic, acute 0.7 mm.; margin irregularly serrate; nerve single vanishing about or above the middle.

On stones in streams. Slopes of Mt. Wellington. North West Coast, etc.

LEMBOPHYLLUM Lindb.

Rather robust, pinnately branched, but the branches in some species long, irregular, vague. Leaves orbicular concave, nerve indistinct or absent, cells usually oblong or fusiform, rarely linear. Seta rather long smooth; capsule oblong; lid conic. Exostome teeth lanceolate acute but without filiform tips, bordered by a thin delicate membrane; endostome a short membranous base, processes perforate not exceeding the exostome, cilia usually two.

Nerve none or very obscure.
Cells linear ... ... *cochlearifolium.*
Cells fusiform ... ... *clandestinum.*
Nerve broad, cells oblong ... ... *divulsum.*

Lembophyllum cochlearifolium Schw.

Stems suberect from a creeping rhizome, sub-dendroid or vague, branches elongating 6-10 cm. complanate. Leaves patent, not strongly imbricate, concave, very broadly ovate with a very short, subacute, acuminate apex, 2 mm.; margin subserrate; nerves 2, obsolete; cells all shortly linear with obtuse ends, a small patch of brown cells at the angles.

The specimen in Gunn's collection, identified by Mitten, has no locality attached. It appears to be not at all common, but confusion has arisen through other mosses being identified as this. *Acrocladium chlamydophyllum*, *Weymouthia molle* and *Lembophyllum clandestinum* all appear in collections under this name.

Lembophyllum clandestinum (H.f. et W) Lindb.

Stems decumbent, elongated, branches erect simple or divided rarely pinnate. Leaves nearly orbicular, very concave, obtuse, patent imbricate, 1 mm.; margin closely serrulate above; nerve none; cells short, fusiform, shorter above, longer below, very long in the middle of the lower half. Seta 1.5 cm.; curved above; capsule pendulous, oblong 1.6 mm.

Common in damp woods.

Lembophyllum divulsum (H.f. et W) Lindb.

Decumbent, vaguely branched, branches mostly erect. Leaves orbicular, very concave, divaricate 0.8 mm.; margin subserrulate to acutely serrate; nerve broad, ill-defined, vanishing about the middle; cells shortly oblong, strongly incrassate. Seta 1.3 cm.; capsule inclined, oblong, 1.7 mm.; lid convex with a short, sharp point.

Near Launceston. Slopes of Mt. Wellington, Mt. Nelson, Kingston, etc.

WEYMOUTHIA Broth.

Long, pendulous, vaguely branched, hanging from boughs of trees. Leaves semipellucid, smooth, of thin texture, concave, obtuse; nerves two, unequal, obscure; cells long, vermiform, incrassate, those at the basal angles usually quadrate. Seta lateral, rather short, smooth, flexed; capsule small, oblong to subglobose, inclined; lid convex, mamillate, shining, peristome double; exostome teeth yellow, long slender, commisural line faint; endostome 1-3 membrane, processes slender perforate as long as exostome, cilia none.

Leaves oblong patent ... ... *molle*.
Leaves subrotund divaricate ... ... *Billardieri*.

Weymouthia molle (Hedw.) Broth.

Syn: *Pilotrichella molle* Hampe, *Meteorium molle* (Hedw.).

Slender with short distant branches. Leaves broadly oblong, concave, patent, 1.8 mm.; margin faintly subserrulate; apex very obtuse or retuse, the cells at the tip oblong and a well-defined patch of roughly quadrate cells at the angles. Nerves two, short, unequal, faint, or none. Perichaetials narrow sheathing nearly as long as the seta. Seta 4-5 mm., capsule inclined tapering at the neck, 1 mm.

St. Helens, Uxbridge, Bismarck, etc.

Weymouthia Billardieri (Hpe.) Broth.

Syn: *Pilotrichella Billardieri* Hpe.

When growing on tree trunks elongated pinnate with short rather regular branches, on tree branches it assumes a pendulous habit, on the ground it is more vaguely branched, generally terminating with slender flagella. Leaves divaricate, broadly oblong or subrotund, very obtuse, 2.2 mm.; margin subserrulate; nerves two very faint; cells linear, towards the apex oblong, a patch of ill-defined oblong cells at the angles. Perichaetials sheating, only a little longer than the other leaves. Seta 1 cm., curved, capsule 1.2 mm. oblong.

George River, Gordon, Sandfly.

CAMPTOCHAETE Reichardt.

Stems erect from a creeping rhizome with irregular simple or pinnate branches, commonly dendroid. Leaves patent, or more or less complanate, concave, smooth, glossy, not plicate, with 2 obsolete nerves or nerveless, cells vermiform, those at the extreme base shorter, without enlarged cells at the angles. Seta not long, with a sygmoid curvature. Capsule cernuous, smooth, oblong-cylindric, tapering at the neck; calyptra long, slender, cucullate; lid broad, shortly conic, apiculate; exostome pale, teeth lanceolate connected at the base; endostome rather longer, with a connecting membrane for nearly half the length, cilia small or none.

Leaves orbicular ... ... *arbuscula.*
Leaves ovate, acuminate.
  Leaves patent ... ... *ramulosa.*
  Leaves complanate ... ... *deflexa*
Leaves ovate, subobtuse.
  Leaves erecto-patent ... ... *gracile.*
  Leaves squarrose ... ... *tasmanica.*

Camptochaete arbuscula (Sm.) Reich.
Syn: *Isothecium arbuscula* Hook.

Stems erect, dendroid, usually 10-15 cm., branching pinnate simple but with some of the lateral branches sometimes bold and also pinnate. Leaves nearly orbicular, apiculate, margin entire or obscurely dentate, with two short, very faint nerves, 1.7 mm. long; perichaetials sheathing, longer and acute. Capsule oblong to cylindric 2 mm.

Common in damp shaded woods.

Camptochaete ramulosa (Mitt.) Reich.
Syn: *Porotrichum ramulosum* Mitt.

Stems erect or suberect, dendroid, copiously and irregularly branched above, 8-10 cm. Leaves sub-complanate when dry, equally placed when moist, ovate, acuminate, serrulate, nerves faint or none, 1.5 mm. long; perichaetials longer, sheathing, with a slender apex. Capsule arcuate, 2 mm., oblong-cyclindric.

Gullies on lower slopes of Mt. Wellington.

Camptochaete deflexa (Mitt.) Reich.

Syn: *Porotrichum deflexum* Mitt.

Stems dendroid, erect, irregularly branched, above, 7 cm. Leaves complanate, ovate, acuminate, subserrulate above; nerves faint or none 1-1.4 mm. Perichaetials longer with a more acute apex. Capsule bent 1.7 mm.

Very close to *C. ramulosa*, but leaves more complanate and smaller. Some forms appear intermediate.

Common in damp gullies.

Camptochaete gracile (H.f. et W.) Reich.

Syn: *Porotrichum gracile* Mitt.,

Isothecium gracile H.f. et W.

Small, suberect or decumbent, matted 3 cm., the simple branches irregularly inserted. Leaves erecto-patent, oblong, surface smooth, base narrow, apex obtuse or subacute, margin serrulate; nerves very faint or none, 0.8 mm. Perichaetials sheathing rather longer, subacute. Capsule bent, 1.3 mm.

Camptochaete tasmanica Broth.

Decumbent, elongated and irregularly branched very slender 2-5 cm. Leaves squarrose, minutely papillose on the external surface, oblong, concave, subobtuse, 0.8 mm., serrulate above; nerves two, faint. Rest not seen.

Distinguished from *C. gracile* by looser habit and squarrose leaves.

In water, Western Tiers.

PAPILLARIA C.M.

Elongating pendulous, on branches. Branching irregular. Leaves plurifarious, closely set, imbricate, acute; nerve single vanishing above the middle; cells oblong to fusiform, surface of the greater portion of the leaf more or less papillate. Seta from the base of the lateral branches, about 1 cm.; capsule small, broadly oblong, erect; lid obliquely conic; calyptra very short cucullate, clothed with a few erect hairs; peristome double, exostome teeth papillose, lanceolate, rather obtuse; endostome membrane shallow, processes papillose, filiform, imperforate; cilia none. Leaves with very large auricles.

Branches robust with flagellate tips; papillae nodulose ... ... *flavo-limbata*.

Branches slender; papillae minute and few ... *intricata.*
Leaves with small auricles.
Auricles dentate ... ... *kermandecensis.*
Auricles obtusely papillate ... ... *filipendula.*

Papillaria flavo-limbata (Hpe. et C.M.) Par.
Syn: *Meteorium cerinum* H.f. et W.

Branches rather robust with closely overlapping yellowish leaves, often ending in filiform flagella. Leaves of main branches broadly ovate-lanceolate from a broad cordate or auricled base, acute, 2 mm.; margin irregularly serrate along the auricle, entire or nodulose above; nerve rather bold, lost in the upper third, surface smooth at the base and partially so towards the margin, elsewhere the cells with 4 or 5 closely nodulose papillae; cells oblong, rather longer below.

George River, Upper Meander River.

Papillaria intricata (Mitt.) Jaeg.

Slender, with rather numerous short cuspidate branches, usually brownish-yellow. Leaves erecto-patent, imbricate, with a very broadly auricled base and tapering acute apex, 1.5 mm.; margin irregularly toothed on the auricles, more obscurely so above; nerve faint vanishing in the upper third; cells fusiform; surface with few very minute nodules on the cells in the middle of the leaf.

East Tamar.

Papillaria Kermadecensis C.M.

Slender, very long, filiform with short branches at intervals. Leaves erecto-patent, imbricate, broadly ovate-lanceolate, the base rather cordate or auricled, apex of lower leaves with a subacute to acute flexed tip, upper leaves obtuse, 1.5 mm.; margin dentate below nearly plain above; nerve well-defined, canaliculate, lost below the apex; cells irregularly oblong, those of the auricles smooth, smaller and rounder; most of the leaf closely covered with minute nodulose papillae.

West Tamar.

Papillaria filipendula (H.f. et W.) Jaeg.
Syn: *Meteorium filipendulum* H.f. et W.,
M. flexicaule. Mitt.

Long, slender, with distant, filiform branches. Leaves erecto-patent, imbricate ovate-lanceolate, base not broadly auricled, apex subobtuse, 0.8 mm.; margin with minute obtuse papillae; nerve slender, faint, lost above the middle; cells oblong, rather longer towards the base; surface of the middle of the leaf covered with very minute nodules.

East Tamar, Gould's Country.

DENDROCRYPHAEA Par. et Schimp.

Suberect, simple, or with few, very short, barren branches. Leaves oblong or ovate, plurifarious, patent, imbricate, subacute; nerve lost below the apex, cells rather small, rhomboid, incrassate, becoming longer towards the base. Perichaetials long, acute. Fertile branches usually numerous, short, lateral; capsule sessile, immersed in the perichaetials, oblong with a narrow base, wide mouth and thick ring; calyptra small, mitriform; lid conic; peristome double, exostome teeth erect, narrow lanceolate subobtuse, smooth, articulations distant; endostome membrane very short, processes filiform exceeding the exostome.

Dendrocryphaea tasmanica (Mitt).
Syn: *Cryphaea tasmanica* Mitt.

Growing in masses on occasionally submerged rocks in streams Stems suberect, 3-8 cm., lateral branches very short. Leaves very broadly ovate from a rather narrow base, margin subserrulate; apex subacute, imbricate 2 mm.; perchaetials 3-4 mm., linear, acute. Capsule dark red 0.7 mm.

Upper reaches of the Meander.

CRYPHAEA Mohr.

Suberect, slender, with many simple, lateral branches. Leaves ovate from a narrow base, apex slender acuminate, nerve slender, lost above the middle; cells small rhomboid. Perichaetials long and slender. Fertile branches lateral, very short; capsule sessile immersed in the perichaetium, narrow oblong; calyptra short mitriform; lid erect, conic; peristome double, exostome teeth slender papillose, endostome membrane very short, processes filiform papillose, shorter than the exostome, cilia none.

Cryphaea parvula Mitt.

Stem very slender 2-3 cm., branches many. Leaves ovate with a very acute apex, 1.2 mm.; margin plain; nerve narrow, lost in the attenuated apex. Perichaetials slender 3 mm.; capsule broadly cylindric 2 mm.

On branches of shrubs, slopes of Mt. Wellington; Coal River Tier.

Rhabdodontium Broth.

Habit elongated, procumbent, growing on the branches of trees, with few irregular or many short branches. Leaves imbricate, broad, nerveless, concave, smooth, cells broadly linear. Capsule sessile or nearly so, on short lateral branches, enclosed in perichaetial leaves. Exostome teeth lanceolate; endostome rudimentary; lid conic; calyptra very short, mitriform.

Rhabdodontium Buftoni Broth. et Geh.

Stems bare below, densely covered with dark green foliage above, about 10 cm. long with numerous short branches. Leaves erecto-patent, imbricate, broadly ovate, shortly acuminate, 1.3 mm., basal cells brown, margin entire. Capsule oblong 2 mm., lid short, rostrate. Perichaetial leaves pale, narrow, ovate-acuminate 2.5 mm.

Port Davey, Hartz Mountains.

Neckera Hedw.

Stem creeping, the branches ascending or pendulous, pinnate, often elongated. Leaves in many rows but complanate, unequal, unsymmetric, ovate-lanceolate; cells small, oval to rhomboid, linear below. Capsule usually immersed in the perichaetial leaves; calyptra very short split on one side; lid with a short oblique rostrum; peristome inserted deeply inside the ring; exostome teeth lanceolate, rather long, partially bifid at the apex; endostome membrane short, the processes nearly filiform; cilia none.

Neckera hymenodonta C.M.

Stems flaccid or pendulous, branching pinnate or bipinnate, rather irregular, complanate, sometimes elongated into slender, flagellate, small leaved ends. Leaves in many rows, equal or nearly so, complanate, lateral spreading, surface with transverse, broad undulations, ovate-oblong rather oblique, slightly to very acute, 2.5-3 mm.; margin serrate above; nerves two short faint or none. Perichaetials closely enclosing the capsule, lanceolate, very acute, 4 mm. Seta under 1 mm.; capsule oblong, erect, 1.9 mm.; lid conic, oblique, rather short; calyptra short, cucullate; peristome erect, conical, teeth long linear, tapering, smooth with rather distant articulations partially split in the medium line; endostome a short membrane and very long, filiform processes; no cilia.

1913.

On tree trunks in damp gullies.

Near Launceston, New Town Creek, Mt. Wellington.

HOMALIA Brid.

Small, decumbent and stoloniferous, stem quite prostrate or suberect, pinnately branched, complanate. Leaves imbricate, inserted 8-fariously but flattened in one plane, the lateral leaves oblique, unequal sided, inflexed at the base on one side; nerve short or none; cells small, rhomboid. Seta long, slender, curved at the top; capsule ovoid, drooping; lid rostrate; calyptra cucullate; peristome double; exostome teeth narrow lanceolate; endostome membrane $\frac{1}{3}$, processes subulate; cilia rudimentary or none.

Homalia falcifolia Hook.

Branches broad 3 mm. across. Leaves pale green, glossy, crowded, oblong, with a broad, flat, falcate, obtuse apex; margin entire; nerve none. Perichaetials long, erect, narrow. Seta very slender 1.5-2 cm. arched at the top, smooth. Capsule oblong horizontal or nodding; lid short, conic.

Recorded as Tasmanian, but no Tasmanian specimen in any of the collections.

TRACHYLOMA Bridel.

Erect, pinnately branched, dendroid. Leaves complanate ovate, acute, shining; nerves one or two, short, obsolete; cells long vermiform with acute ends. Seta long slender arising from the main stem; capsule fusiform, suberect; lid long-conic; exostome teeth rather long, slender; endostome membrane very short, the processes long and slender; no cilia.

Trachyloma planifolia Bridel.

Syn: *Neckera planifolia* Hook.

Stems from a creeping base, erect, dendroid, 6-10 cm.; branches many, complanate, irregularly pinnate. Leaves bright green, shining, complanate, in six rows, the two dorsals and ventrals erect appressed, laterals patent, all about equal, ovate, lanceolate, acute, 2.5-3 mm.; margin serrate, spinulose above; nerve one or two short, obsolete. Columba Falls, George River.

LEPYRODON Hpe.

Medium, soft, with numerous erect simple stems, the lower portions of which are densely clothed with dark radicles, forming dense cushions. Leaves crowded, soft, transparent, **oblong**; nerve obsolete, single or double, rather variable even on the same stem, but always obscure and vanishing below the middle; cells long vermiform, incrassate, broader at the base. Seta inserted below the green portion of the shoot, erect, rather long; capsule narrow, oblong, smooth, erect; lid rostrate nearly as long as the capsule; calyptra longer cucullate; exostome absent; endostome membrane short, processes rather long, lanceolate, perforate, cilia none.

Lepyrodon lagurus (Hook.) Hpe.

Syn: *Leucodon lagurus* Hook.

Pale green in soft dense cushions. Leaves delicate, broadly oblong, concave, obtuse, but with a hairlike dentate apiculus, erect, densely imbricate, shining, 3 mm.; margin obscurely serrate. Seta red, 2.5 cm.; capsule oblong, pale yellow, 3 mm.

Near summit of Mount Wellington.

GLYPTOTHECIUM Hmpe.

Medium-sized mosses, stems simple or nearly so, erect from a creeping base forming small tufts on dead wood. Leaves delicate, transparent, ovate, lanceolate acute, with two obsolete nerves or nerveless; calls fusiform incrassate, a broad band of short oblong cells on the margin from the base for some distance upwards. Seta lateral rather short; capsule erect, obovate-oblong, smooth, mouth narrow; lid rostrate; calyptra cucullate, slender; exostome teeth incurved, rather long, slender lanceolate, pale, smooth, transversely delicately striate, endostome a shallow erose membrane.

Glyptothecium sciuroides (Hook.) Hpe.

Syn: *Cladomnion sciuroides*, H.f. et W.

Stems erect usually 3-5 cm., generally simple, yellowish. Leaves ovate-lanceolate, acute, patent 2.5 mm.; margin irregularly dentate; nerves just visible. Seta 5 mm.; capsule 1.6 mm.; lid in some specimens shortly rostrate, in others half as long as the capsule.

Slopes of Mt. Wellington, Bellerive.

PLEUROPHASCUM Lindbg.

Habit erect simple or with few erect branches, solitary or gregarious. Leaves thin, broad, concave, nerveless; cells large, incrassate, the walls with prominent pores and nodular on the internal surface, rhomboid above, nearly linear below, lax. Seta long, terminal; capsule large, spherical, without mouth but with a short apiculus at the apex.

The genus consists of the one rare species endemic in Tasmania. Brotherus places it close to *Lepyrodon*, but it appears to have at least equal affinity with the *Funariaceae*.

Pleurophascum grandiglobum Lindb.

Stems 2-3 cm., pale. Leaves patent, broadly obovate, concave, tipped with a flagellate apiculus, 3 mm. Seta erect 2 cm.; capsule yellow, globose 3 mm. diameter.

On Mountains towards the west; Mt. Field.

Rhacocarpus Lindb.

Dark brown, of rather tough consistency, depressed, forming procumbent mats on rocks. Leaves oblong, plurifarious, opaque, rather harsh, brittle, nerveless, surface minutely granular; cells linear. Seta slender, erect, from the base of branches; capsule erect, nearly globose, smooth, grooved when dry, mouth thin; lid with a long oblique rostrum; calyptra cucullate; peristome none.

Rhacocarpus australis Hpe.

Syn: *Braunia Humboldtii* Schimp.

Forming extensive patches, the stems copiously branched, usually in fascicles. Leaves oblong, concave, acuminate, tipped by a long, coloured, wavy hair, 1.2 mm. exclusive of hair point; margin with small serrations, usually incurved towards the base. Seta 1.2 cm.; capsule 2 mm.

Knocklofty, Hobart, Mt. Field, Mt. Wellington.

Hedwigidium Br. Sch.

Decumbent, nearly black except the livid green tips, elongating, with few irregular, short lateral branches. Leaves erect imbricate, oblong, acuminate, acute; margin revolute; nerve none; cells small oblong, strongly incrassate, convex. Perichaetials long acute; capsule terminal, often thrust aside by growing innovations, on a very short slender seta, immersed in the perichaetials, oblong with a slightly constricted mouth, margin thin, grooved when dry, 2 mm. lid nearly flat; calyptra conic.

Hedwigidium imberbis (Sm).

Stems long, nearly simple, forming loose, livid green and black mats. Leaves oblong, subacute, without colourless tips, 1.3 mm.: margin revolute; surface obtusely papillose; perichaetials long, oblong, thin plicate.

Common on rocks, Mt. Wellington, Mt. Nelson, etc.

Hedwigia Ehrh.

Stems dichotomous or irregularly branched. Leaves plurifarious, imbricate, harsh, brittle, hyaline at the tip; both surfaces closely nodulose-papillose; nerve none; cells small, oblong or quadrate, strongly incrassate, becoming linear in the centre towards the base; perichaetials longer, narrower, softer, inner ones tipped with long woolly hairs. Capsule immersed or shortly exserted on a very short terminal seta, globose to oblong; lid nearly flat; calyptra minute conic; peristome none.

Of similar habit to some *Grimmias* but without a nerve.

Hedwigia albicans (Web.) Lindb.

Stems rather wiry, depressed, forming loose mats, nearly black with livid green tips, hoary from the white leaf tips, with few vague branches. Leaves patent ovate-oblong with an acute, white apex, 1.8 mm.; margin plain serrate towards the apex. Capsule enclosed in the perichaetium, turbinate, pale brown, mouth wide, with a red annulus, 1 mm.

Common on rocks, Slopes of Mt. Wellington, Mt. Nelson, etc.

Fam. 13.—LOPHIDIACEAE.

Habit various, erect to decumbent, simple to pinnately branched. Leaves in three rows, two of which are lateral and complanate, the third row smaller, median, dorsal or ventral according to the habit of the species; nerve from obsolete to excurrent; cells rotund to oblong, medium sized. Seta long or short placed in the axil of a median leaf; lid short conic or rostrate; calyptra small mitriform rarely cucullate; peristome double; exostome of 16 slender lanceolate teeth; endostome of 16 slender processes from a basal membrane; cilia generally absent. In *Catharomnion* the exostome is absent.

A group of plants intermediate between *Neckeraceae* and *Pterygophyllaceae* best distinguished by the peculiar leafage.

Rhacopilum. Slender, decumbent; seta long.

Lophidium. Erect, copiously pinnate, complanate.

Catharomnion. Pinnate, complanate, leaves with long cilia.

HYPOPTERYGIUM. Erect, branches in a terminal fascicle or approximating to it.

CYATHOPHORUM. Normally simple, erect, leaves broadly spreading.

RHACOPILUM Palisot.

Slender, elongating with few vague branches, decumbent closely attached to the ground by bunches of purple rhizoids. Lateral leaves oblong with an obtuse to acuminate apex; nerve excurrent as a slender hair point; median leaves dorsal, zig-zag, lanceolate from a broad base, nerve long excurrent; cells irregular, quadrate to oblong. Seta long, smooth; capsule inclined, curved, cylindric, furrowed, mouth wide, oblique; lid rostrate, oblique; calyptra narrow, cucullate, smooth or hairy; exostome teeth lanceolate, with long filiform ends; endostome shorter, processes short from a deep basal membrane, imperforate, cilia none.

The long seta and cucullate calyptra are suggestive of *Hypnaceae*. The phyllotaxis and cells are the only claims for its inclusion in this family.

Rhacopilum cristatum H.f. et W.

Branches often 6-10 cm. long. Lateral leaves ovate-oblong, oblique, surface very obtusely papillose. 1 mm.; apex from obtuse to shortly acuminate; margin serrulate above; cells small irregularly quadrate. Seta slender 2 cm.; capsule pale, 2.3 mm.; calyptra with a few hairs or smooth.

Very common in woods.

Rhacopilum strumiferum C.M.

Syn: *Rhacopilum australe* H.f. et W.

Similar to the last. Leaves distant, ovate-oblong, oblique, shortly acuminate, 0.7 mm.; margin serrulate above; cells oblong-hexagonal, thin walled. Seta 1.5 cm., rather stout; calyptra clothed with erect hairs.

Slopes of Mt. Wellington, Cheshunt.

LOPHIDIUM Bridel

Tall, erect, dendroid from a creeping base, outline ovate, branches from the base complanate. Leaves of the branches trifarious, two lateral rows distichously arranged, the ventral row smaller, appressed; cells rotund, rather lax. Seta arising indifferently anywhere along the stem or on a branch, rather short, capsule oblong, erect; lid rostrate; calyptra long mitriform; exostome pale, 16 teeth, lanceolate, acute, closely trabeculate on the inner surface;

endostome 16 rather bold acute processes arising from a short-base, as long as the exostome.

Often treated as a sub-genus of *Hypopterygium.*

Lophidium pallens H.f. et W.

Stems erect copiously branched, 10-12 cm., branches and lateral leaves complanate. Lateral leaves ovate-oblong, apiculate, 1.8 mm.; margin bordered, serrate in the upper part; nerve vanishing at the apiculus; ventral leaves much shorter, ovate nerve running through the longer apiculus. Seta straight or curved 5 mm.; capsule 1.8 mm., lid nearly as long.

Common on bark of trees in forests.

Mt. Wellington, Tasman's Peninsula, Maria Island.

HYPOPTERYGIUM Brid.

Stems erect, short, dendroid, branches in an irregular terminal fascicle. Leaves trifarious, those on the stem equal, on the branches complanate; two lateral rows distichous; nerve vanishing above the middle; cells rather large rotund; ventral row smaller, appressed. Seta erect, arising just above or about the lower branches; capsule pendulous, pyriform with a constricted neck or broadly oblong; mouth broad; peristome of 16 bold lanceolate teeth; endostome same length, lower third membranous with 16 perforated processes. Lid rostrate. Calyptra long with a short mitriform base.

Hypopterygium novae-zelandiae C.M.

Stem 2 cm.; branches 1-1.5 cm., yellow green. Lateral leaves patent, distichous, ovate acute, 0.8 mm.; margin bordered, acutely serrate above; ventral leaves rotund, much smaller, the nerve excurrent. Seta 1 cm.; capsule broadly oblong, pale brown, granular, 2 mm.; lid very long, curved usually exceeding the capsule.

Slopes of Mt. Wellington, Gordon, Interlaken, etc.

CATHAROMNION H.f. et. W.

Erect or depressed; stems elongated, bristly, pinnately branched or the branches falsely fasciculate. Lateral leaves oblong, complanate, bordered with long cilia; nerve slender vanishing above the middle; cells regularly hexagonal to rhomboid; ventrals very small. Seta rather short; capsule oblong, suberect; lid rostrate; calyptra mitriform, inflexed and laciniate at the base. Exostome absent; endostome processes subulate, papillose connected at the base by a very short membrane.

Close to *Hypopterygium.*

Catharomnion ciliatum (Hedw.) H.f. et W.

Stem 2-3 cm. radiculose below, pinnately branched above, branches crowded. Leaves pale green, mixed with bristles, distichous, orbicular, ovate-acuminate; ventrals much smaller ovate-lanceolate acuminate.

Not present in any available collection; possibly recorded in error. The above description constructed from Hooker's Handbook and Brotherus in Pflanzenfamilien.

CYATHOPHORUM Brid.

Stems erect from a creeping rhizome, normally simple and quite unbranched. Lateral leaves complanate, widely spreading, nerve obsolete; ventrals small orbicular closely appressed; cells rhomboid lax; perichaetials small, narrow, few. Seta short, stout; capsule broadly oblong, erect; lid convex with an acutely sharp rostrum; calyptra short, mitriform; peristome double, pale; exostome teeth lanceolate broad, not very slender, closely trabeculate; endostome membrane short, processes lanceolate, cilia usually 3.

Cyathophorum bulbosum (Hedw.) C.M.

Syn: *Cyathophorum pennatum*, Brid.

Stems robust, often 10 cm. or more; sometimes only 3 cm., rarely bearing a few lateral branches. Lateral leaves broadly spreading, ovate-oblong acute, 7 mm.; margin plain below, spinulose above; nerve rather obscure, vanishing below the middle, cells lax averaging 120 x 30μ. Ventrals orbicular or oblong, apiculate. Perichaetials few, lanceolate, acute. Seta 3 mm.; capsule brown 2 mm.

Very common in damp forests.

Cyathophorum densirete Broth.

Closely resembling the small forms of *C. bulbosum*, only the foliage stiffer and less transparent. Lateral leaves ovate, more acute, 4 mm.; margin spinulose above; nerve shorter and fainter; cells shortly rhomboid about 100 x 27μ. Perichaetials rather longer. Fruit not differing.

Slopes of Mt. Wellington, Southport, Mt. Bischoff, etc.

Fam. 14—PTERYGOPHYLLACEAE.

Small to medium sized mosses, decumbent to erect, with few vague branches. Leaves usually in 8 rows with a strong tendency to become complanate, generally broad and soft, smooth, nerved or not; cells generally rotund to hexagonal, rarely fusiform. Seta lateral, long, capsule inclined oblong to pyriform; lid rostrate; calyptra mitriform; peristome double, the exostome teeth 16, the two legs cartilaginous, only connected by a thin membrane; endostome membrane deep, processes lanceolate acute about the same length. Cilia none.

A natural group chiefly distinguished by the leaf texture and habit. It has affinity with *Lophidiaceae* and more distantly with *Mniaceae*.

SAULOMA. Leaves lanceolate shining; cells fusiform. Calyptra with a torn base.

DALTONIA. Leaves lanceolate; cells narrow rhomboid. Calyptra with a fringed base.

ERIOPUS. Leaves broad; cells rotund. Seta rough or strigose. Calyptra fringed.

DISTICHOPHYLLUM. Leaves broad; cells rotund. Seta smooth. Calyptra fringed or not.

PTERYGOPHYLLUM. Leaves broad, not bordered, acutely toothed, cells large, nerve forked. Calyptra with a plain base.

SAULOMA H.f. et W.

Small, depressed or erect in dense cushions. Leaves lanceolate, acute, plurifarious, margin revolute; nerve none; cells lax, fusiform, a few at the extreme base quadrate. Seta slender smooth; capsule small ovoid; lid rostrate; calyptra large smooth, regular or torn at the base, not fimbriated; peristome typical.

Sauloma tenella H.f. et W.

Syn: *Hookeria tenella* H.f. et W.

Depressed or suberect, green or yellow, stems about 1 cm. Leaves erect, imbricate, broadly lanceolate, acute, shining, 2 mm. Seta 1 cm.; capsule erect, oblong 1.2 mm.

Slopes of Mt. Wellington, Geeveston, Coal River Tier, etc.

DALTONIA H.f. et Tayl.

Very small, erect, tufted. Leaves lanceolate; nerve vanishing above; cells linear-rhomboid. Seta slender, often papillose, capsule erect, oblong; lid conic-rostrate; calyptra copiously hairy; exostome teeth very slender, finely papillose; endostome base very short, the processes long, slender, papillose converging in a cone when dry.

Daltonia pusilla H.f. et W.

Stem seldom exceedng 5 mm. Leaves erect, acute, 2 mm.; margin with a narrow thickened border, involute; nerve canaliculate, vanishing at a distance from the apex.

Seta slender; capsule oblong, 1 mm.; lid acute, as long as the capsule.

On twigs and fern leaves in damp gullies. Slopes of Mt. Wellington, Gordon, etc.

ERIOPUS Mitt.

Small, tufted with few simple branches. Leaves in five rows, complanate; the two dorsals, and one ventral rather smaller than the lateral rows, broadly elliptic to orbicular, apiculate, broadly bordered by a band of 4-5 linear incrassate cells; margin entire or serrate; nerves 2, faint or obsolete, very short; cells large hexagonal. Seta rather stout, flexed, clothed with delicate hairs, strigose or almost smooth; capsule small, oblong, mouth not much contracted, rim thick, base tapering; lid conic acute, nearly as long; calyptra acute densely fimbriated, short; peristome typical.

Eriopus apiculatus H.f. et W.

Pale livid green. 2-3 cm. Leaves nearly orbicular, laterals about 2.5 mm.; margin entire, obtusely serrulate or a few serrations on the upper ones; border very broad; cells nearly equal 33 x 30μ. Seta shortly strigose, 1 cm.; capsule inclined, neck very tapering.

Circular Head, Slopes of Mt. Wellington, Cape Frederick Henry, etc.

Eriopus tasmanicus Broth.

Very close to the last; bright green. Leaves broadly obovate, 1.8-2.4 mm., margin with a narrower border, sharply dentate; cells more oblong. Seta coarsely strigose, 1-1.5 cm.; capsule broadly oblong, less tapering; calyptra more hairy.

Wet gullies Mt. Wellington.

DISTICHOPHYLLUM Doz. et Molk.

Densely tufted; stems flat, decumbent, with few vague branches. Leaves in eight rows partially complanate, the dorsal and ventral leaves little smaller, oblong spathulate, usually with a border of few linear incrassate cells; nerve single, slender, vanishing above the middle; cells small quadrate or hexagonal mostly 12-20μ, lower ones longer. Seta long, smooth; capsule oblong, inclined, with a small distinct globose apophysis; lid conic to rostrate; calyptra long mitriform with a fringed base except in *D. microcarpum*. Peristome typical except that the endostome membrane is short.

The genus contains two groups.

DISCOPHYLLUM. Leaves bordered, crisped when dry. Calyptra with a fringed base.
Apex apiculate.
Margin serrate ... ... *rotundifolium.*
Margin distantly serrulate ... ... *crispulum.*
Margin plain ... ... *pulchellum.*
Apex obtuse ... ... *amblyophyllum.*
MNIADELPHUS. Leaves not bordered; not crisped when dry. Base of calyptra not fringed ... ... *microcarpum.*

Distichophyllum rotundifolium (H.f. et W.).

Small, seldom exceeding 3 cm., freely branched. Leaves complanate, patent, broadly oblong-spathulate, rather crisped when dry, 1.2 mm.; margin serrate; apex with a small apiculus which is continuous with the border. Seta 1 cm.; capsule narrow oblong, 1 mm.; apophysis half as long; calyptra deepily fringed at the base and with a few erect hairs at the apex.

Damp gullies, Mt. Wellington, Zeehan.

Distichophyllum crispulum (H.f. et W.).

Small, decumbent, stems about 2 cm. Leaves oblong from a narrow base, 2 mm., apex apiculate, border very narrow, lost below the apiculus; margin sinuate, distantly serrulate above. Seta very slender, 5 mm.; capsule inclined cylindric, 1 mm.; lid conic, half as long.

Mt. Wellington, Leith's Creek.

Distichophyllum pulchellum (H.f. et W.)

Stems usually under 1 cm. Leaves crowded, broadly obovate-spathulate of firmer texture than other species, little crisped when dry, 1.2 mm.; margin plain, bordered, apex with a short acute apiculus. Seta 7 mm.; capsule suberect, broadly oblong, 1 mm.

Upper reaches of Meander River.

Distichophyllum amblyophyllum (H.f. et W.).

Stems elongated, often 5 cm., with few vague branches. Leaves pale green, becoming livid, oblong-spathulate, imbricate, much crisped when dry, 2 mm.; margin plain, undulate, bordered; apex very obtuse, rarely apiculate. Seta 4 cm.; capsule broadly oblong, 1.4 mm.; apophysis half as long.

D. sinuosum, H.f. et W., is simply a form of this with leaves more crowded and slightly unequal. It differs in no anatomical detail.

1913.

D. subsinuosum, C.M., is only a slightly more robust form due to favourable conditions.

Slopes of Mt. Wellington, West Coast, etc.

Distichophyllum microcarpum (Hedw.).

Livid green in mats or pendulous; stems flat, thick, fleshy 3 cm., but on dripping rocks elongating to 15 cm. Leaves oblong-obovate, very obtuse, 2-3 mm. more complanate than in the other species and not crisped when dry; margin plain unbordered, marked by collapsed cells when dry; nerve vanishing above the middle, upper cells 12μ Seta slender dark 1 cm.; capsule inclined, ovate with a thickened neck, 1 mm.; lid conic, shorter than capsule; calyptra rather long, rough, base torn not fimbriated. Intermediate between *Distichophyllum* and *Pterygophyllum*.

Geheeb described a robust specimen as *D. Levieri.*

Mt. Wellington, Ida Bay, Grass Tree Hill, etc.

PTERYGOPHYLLUM Brid.

Decumbent or ascending, simple or with few vague branches, of more tender consistency than most mosses, becoming very distorted when dry. Leaves in five rows or fewer, all strongly complanate, the laterals patent, the dorsals and ventrals smaller and closely appressed or sometimes all nearly equal, broad, not bordered, margin dentate; nerve short, forked; cells large rotund to hexagonal, larger towards the base. Seta smooth; capsule usually pendulous, oblong to pyriform; lid with a long rostrum; calyptra constricted at the base, plain, often irregularly split. Peristome typical.

The species are variable and the division is arbitrary.

Robust. Lateral leaves 5 mm. or more ... ... *Hookeri.*

Less robust. Lateral leaves smaller.

Cells hexagonal ... ... *denticulatum.*

Cells rotund ... ... *nigellum.*

Pterygophyllum Hookeri Jaeg.

Robust, stems fleshy, flat, often 5 cm. dark green. Lateral leaves oblong-obovate, of thin texture, 5 mm., margin coarsely toothed; nerve rather bold brown, forked, vanishing above the middle; cells hexagonal about 66μ. Seta 3-5 cm., capsule inclined or pendulous, oblong or pyriform with a rather abrupt neck 1.5 mm.; lid as long as the capsule; calyptra longer, irregularly torn at the base.

Common in damp gullies.

Pterygophyllum denticulatum (H.f. et W.) Mitt.

Suberect, 3 cm. dark green. Lateral leaves obovate from a narrow base, 3 mm.; margin strongly dentate; nerve bold, brown forked, vanishing about the middle; cells hexagonal, about 54μ. Seta rather slender, 1 cm.; capsule broadly oblong to nearly globose, pendulous, 1.2 mm., neck abrupt; lid conic, half as long as the capsule.

In damp gullies. Common.

Pterygophyllum nigellum (H.f. et W.) Jaeg.

Slender, often elongated. Leaves distant, usually in three rows, nearly equal, dark green, drying black, obovate from a narrow base to nearly orbicular, 2-3 mm.; margin coarsely dentate above; nerve forked, vanishing in the middle; cells rotund, 40-50μ. Seta 1.5 cm.; capsule oblong-pyriform, pendulous; apophysis obconic, curved, length without the apophysis 1.2 mm.; lid as long as the capsule.

Restoring very poorly after being dried.

Very common in damp gullies.

Fam. 15—POLYTRICHACEAE.

Erect, usually simple, the stem strong and hard. Leaves usually very firm and rigid, narrow; nerve bold, often broad; upper surface bearing few or many longitudinal lamellae. Fruit terminal on a long seta; capsule round, flat on one side, or four angled; lid conic or rostrate; calyptra narrow cucullate, sometimes copiously covered with long hairs, giving it a mitriform appearance. Peristome of 32 or 64 very short simple teeth not divided by cellular partitions and joined above to a membranous disc except in *Dawsonia* where the numerous teeth are slender long and free. Androecia in a terminal disc.

A well-defined group not bearing apparent affinity with any other family.

CATHARINEA. Leaves soft with few lamellae on the upper surface, crisping when dry.

PSILOPILUM. Leaves rigid, lanceolate; capsule oblong smooth; calyptra bare or nearly so. Peristome teeth 32.

POGONATUM. Leaves rigid, lanceolate; capsule oblong, smooth; calyptra clothed with long hairs. Peristome teeth 32.

POLYTRICHADELPHUS. Leaves very narrow, acute; capsule flat on one side, smooth; calyptra bare. Peristome teeth 64.

Polytrichum. Leaves very narrow, acute; capsule four angled or smooth; calyptra densely hairy. Peristome teeth 64.

Dawsonia. Habit of *Polytrichum*, but seta short, and peristome a brush of long hair-like teeth.

Catharinea Ehrh.

Stems erect from a creeping rhizome. Leaves ligulate or oblong, softer than in most of the genera, bordered and serrate at the margin, bearing few lamellae on the upper surface. Capsule narrow oblong or cylindric, slightly bent; lid with a long beak; calyptra narrow, spinulose only at the apex; peristome teeth 32, ligulate, rigid, attached by the apex to a discoid expansion arising from the columella.

Distinguished from the rest of the family by the less rigid leaves.

Catharinea Muelleri Hpe. et C.M.

Syn: *Polytrichum angustatum*, Hook.

Stems 2-3 cm. Leaves pale green, ligulate, spreading, about 8 mm., plain but much crisped when dry; margin limbate, strongly serrate; apex sub-acute; nerve slender serrate beneath, bearing three or four lamellae above, vanishing at the apex. Seta slender, sometimes more than one together at the apex of a shoot; capsule cylindric erect or inclined, 5mm. Lid with a slender beak nearly as long as the capsule.

Very common on clay banks, chiefly on hill sides.

Psilopilum Brid.

Small, erect. Leaves rigid, lanceolate; nerve not very broad; upper surface with dense short lamellae. Capsule oblong, mouth constricted; lid rostrate; calyptra smooth or nearly so; peristome 32 short teeth attached above to a disc.

Leaf margin plain ... ... *australe*.
Leaf margin dentate ... ... *crispulum*.

Psilopilum australe (H.f. et W.) Jaeg.

Syn: *Polytrichum australe* H.f. et W.

Erect 2-3 cm. Leaves erecto-patent, short, rigid, broadly lanceolate from a broad sheathing hyaline base, subacute 3-4 mm. inclusive of base; margin plain; nerve not very broad, upper surface densely lamellated. Seta 4 cm., capsule inclined, oblong, smooth, mouth constricted 3-4 mm.;

lid with a slender rostrum; calyptra bare except a few short hairs at the apex.

Summit Mt. Wellington, Western Tiers.

Psilopilum crispulum (H.f. et W.) Jaeg.

Syn: *Polytrichum crispulum* H.f. et W.

Erect, usually under 2 cm. Leaves erecto-patent, short, rigid, lanceolate from a sheathing hyaline base, not as broad as in *P. australe*, 3 mm., acute; margin dentate; nerve not very broad; upper surface lamellate but not as strongly so as in *P. australe*. Seta 2 cm.; capsule broadly oblong, mouth constricted 2.5-3 mm.

Western Tiers.

POGONATUM Beauv.

Erect, rigid. Leaves lanceolate, sub-acute, not very rigid; nerve not broad, upper surface covered with numerous lamellae. Capsule erect or inclined oblong, mouth not constricted, round in section; lid beaked; calyptra densely covered with long silky hairs which descend and completely enclose the capsule; peristome teeth 32.

Pogonatum australasicum, Hpe. et C.M.

Stems 3-6 cm. Leaves lanceolate, subacute not very rigid, upper surface except the base and a narrow margin densely covered with lamellae, 5 mm., margin strongly serrate; nerve not broad vanishing in the apex. Capsule oblong, inclined, smooth, 3 mm., lid with a bold rostrum, 1 mm.; calyptra brown above, pale in the lower part.

In Australian records often referred to *P. tortile*, Palis.

Very common on hillsides.

POLYTRICHADELPHUS Mitt.

Stems erect, seldom branched, rigid. Leaves with a very short sheathing, broad, hyaline base and a rigid divaricate lamina; nerve very broad densely covered on the upper surface with lamellae. Seta long; capsule oblong, inclined, flattened on the upper surface; peristome of 64 short teeth; lid beaked, calyptra nearly hairless.

Polytrichadelphus Magellanicus (Hedw.) Mitt.

Syn: *Polytrichum Magellanicum* Hedw.

Erect, simple, rigid, 3-5 cm. Leaves rigid, patent, 5 mm., the lamina except a narrow margin composed entirely of thickened nerve; margin strongly serrate; apex acute. Capsule inclined broadly oblong, flattened above, gibbous beneath, 3 mm.; lid with a rather slender beak, 2 mm.; calpytra long, base broad, apex with short erect hairs otherwise smooth.

Very common in shady places.

POLYTRICHUM Dill.

Robust, rigid, erect, tall and usually unbranched. Leaves rigid, the base thin and stem-clasping, lamina slender, acute; nerve very broad, densely lamellated on the upper surface. Capsule broad, in typical forms four angled and carrying a discoid apophysis at the base; lid rostrate; calyptra densely clothed with descending hairs; peristome of 64 very short teeth.

Capsule angled; apophysis present.
- Margins of leaves sharply incurved ... ... *juniperinum*
- Margins serrate not incurved ... ... *commune*

Capsule round; no apophysis ... ... *alpinum*

Polytrichum juniperinum Willd.

Leaves with a sheathing rather broad base and divaricate slender lamina with a narrow smooth sharply incurved margin, apex very slender, 6 mm., with few serrations or plain. Capsule prominently four-angled 4 mm.

Very common in all situations.

Polytrichum commune L.

Stems 6-10 cm. Leaves slender 5 mm. tapering to an acute apex, lamina composed almost entirely of the broad nerve; margin serrate not incurved. Capsule oblong, boldly four-angled; lid with a very short rostrum.

Latrobe, Zeehan, Adamson Peak.

Polytrichum alpinum L.

Erect, simple, generally 5-6 cm., the lower portion bare. Leaves with a short broad hyaline base and divaricate subulate lamina up to 10 mm., apex very acute, nerve composing nearly the whole breadth densely lamellate on the upper, spinulose on the lower surface; margin coarsely dentate. Seta 4-6 cm.; capsule inclined, ovate-cylindric, about 4 mm.; smooth; lid with a slender rostrum nearly as long as the capsule; calyptra short, copiously hairy; peristome of 64 very minute teeth.

Intermediate between *Polytrichum* and *Pogonatum*.

High altitudes Western Mountains.

DAWSONIA R. Br.

Erect, rigid, robust, simple or rarely branched. Leaves rigid, narrow, with a short, broad, sheathing base, nerve broad; upper surface densely covered with short erect lamellae. Capsule flattened on the upper surface, mouth small, bearing a peristome of numerous long erect simple hairs free at the apex.

Dawsonia superba Grev.

Very tall, 20 cm. Leaves lanceolate, patent, 20 mm., acute, margin with spinulose teeth. Seta stout shorter than the terminal leaves. Capsule obovate, inclined, flattened on the upper surface, 8 mm., mouth 1.3 mm., peristome pale, 3.5 mm.

Near Ulverstone, North West Coast.

Fam. 16—BUXBAUMIACEAE.

The plants are very small, stems very short and leaves rudimentary. Capsule on a relatively stout, erect seta, oblique, flattened on the upper surface, gibbous on the lower; calyptra minute conic; lid minute, conic; peristome of one or several series of small, linear teeth; endostome of a 32-plicate membrane in form of a twisted truncate cone.

The family consists of but one genus and that of but three or four species. They are rare and sporadic in their appearance, their small size greatly assisting their escape from observation. The peristome teeth being without cross septa appears to indicate relationship to *Polytrichaceae*, otherwise they seem to have no close affinity to other mosses. Probably of reduced form in response to a saprophytic habit.

Buxbaumia Haller.

Very small, erect, scattered. Leaves extremely minute, broadly ovate or oblong, coarsely serrated, or laciniate, colourless; cells large, oblong. Male plants very minute, few leaved and with one or two subglobose antheridia. Female plants very small with 10-12 bract leaves.

Buxbaumia tasmanica Mitt.

Probably not distinct from *B. indusiata*, Brid., but no specimen is present in any available collection. It was gathered by Mr. Archer at Cheshunt in the middle of last century.

Fam. 17—ANDREACEAE.

Small dark (red, brown, black, rarely greenish) mosses growing in dense cushions. Stems short to medium and slender, branches few, vague. Leaves small, more or less imbricate, in most instances cartilaginous; nerved or nerveless; margin entire; surface papillose or smooth; cells small rotundo-quadrate, strongly incrassate, those at the base rectangular to linear. Sporogonium terminal, subsessile on an elongated peduncular extension of the axis, lidless and opening by splitting from the apex to the base into four or more sections; calyptra small mitriform.

The family has no close affinity to any other group. The leaf tissue is rather similar to *Hedwigia* and allies. The elongation of the axis to function as a seta is only met with otherwise in *Sphagnaceae*. The splitting of the capsule to allow exit of spores is found in no other moss but is usual amongst Hepatics to which the family has no relationship.

ANDREAEA Ehrh.

This, the only genus, is sufficiently defined in the description of the family. The species are mostly found on rocks at a considerable altitude. All the Tasmanian forms have enlarged perichaetial leaves, the capsule has four incisions but the segments then formed do not separate at the apex.

The species vary considerably and it is simply a matter of opinion into how many species the forms should be grouped.

Leaves ovate-lanceolate, obtuse to acute, margin involute, nerveless, coarsely papillose externally. (**Petrophila** group.)
- Leaves ovate-lanceolate, patulous, base sheathing, upper leaves often longer and falcate ... ... *petrophila.*
- Leaves broadly ovate, acuminate, geniculate from a broad sheathing base ... ... *acuminata.*
- Slender with many branches. Leaves narrow acute, squarrose ... ... *tenera.*
- Leaves narrow, dark, clustered at apex, thin texture, coarsely papillose ... ... *eximia.*
- Leaves concave, incurved, obtuse, lower leaves small, very obtuse ... ... *amblyophylla.*

Leaves more or less shining. Nerveless.
- Leaves with a short acuminate apex ... ... *montana.*
- Leaves obtuse ... ... *nitida.*

Leaves long narrow with a bold nerve ... ... *subulatissima.*

Andreaea petrophila Ehrh.

Syn: *Andreaea julicaulis* C.M.

Tall, red, few branched, to short and pulvinate. Leaves ovate-lanceolate from a sheathing base, geniculate, subacute 0.7 mm., in some forms the upper leaves longer and falcate, external surface strongly papillose, cells rotund strongly incrassate 6μ, nerveless. Perichaetials much longer. Capsule exserted, with a broad pale band at the base.

Very common on mountains.

Andreaea acuminata Mitt.

Syn: *Andreaea erubescens* C.M.

Red-brown in dense cushions. Stems 1 cm. in dry, to 3 cm. in shaded places. Leaves crowded, base broad, sheathing, colourless, lamina geniculate at the base; patent, incurved above, ovate, acuminate, concave 0.5-0.7 mm. the wings at junction of base and lamina crenate and much incurved, external surface bearing short obtuse papillae; nerveless; cells rotund, strongly incrassate 5-6μ Perichaetials much longer. Capsule immersed.

Differs from *A. petrophila* in the broader leaf.

Common on mountains.

Andreaea tenera C.M.

Stems very slender with many branches in the upper part or in dry situations shorter and pulvinate, greenish-brown, at least towards the apex. Leaves patent, geniculate from a sheathing base, incurved towards the apex, narrow lanceolate, acute, margin involute, 0.7 mm., nerveless, external surface obtusely papillose; cells some rotund others oblong, 8—8 x 16μ, long rectangular in the centre base. Perichaetials slender 1.5-2.5 mm. Capsule included or exserted with a broad white base.

Besides habit the leaf-structure is very distinct.

Summit of Mt. Wellington.

Andreaea eximia C.M.

Stems short, black, the lower part nearly bare, the leaves clustered at the apex. Leaves linear from a narrow sheathing base, acute or with a colourless apex, 1-1.5 mm.; cells rotund, translucent, the papillae bold. Perichaetials not much longer with a very broad base and a short acuminate apex. Capsule small, with a broad pale base shortly or not at all exserted.

The narrow nearly flat dark leaves clustered at the top of the short stem sufficiently distinguishes the species.

Very common at a high altitude.

Andreaea amblyophylla C.M.

Stems short, dichotomously branched, seldom exceeding 1 cm., dark red, but the tips usually red or yellowish-brown.

Leaves on the lower part and some branches very small oblong, obtuse, concave, erect; upper leaves on the principal branches erecto-patent, oblong-lanceolate, broad at the base but without a defined sheath, concave, rather obtuse, incurved above, papillose externally, nerveless, 0.7 mm.; cells rotund, strongly incrassate, mostly 7-8μ, the lower ones linear. Perichaetials larger but similar in shape.

Knocklofty, Mt. Wellington, Western Tiers.

Var: *attenuata*. (*A. attenuata* C.M.) Stems short in dense cushions, nearly black. Leaves narrower and more acute, less papillose, lower elongated cells fewer and shorter.

Mt. Wellington, Western Tiers.

Var: *bullata*. Stems very short. Larger leaves yellowish, broadly ovate, shortly acuminate clustered at the ends of the shoots.

Mt. Wellington.

Andreaea montana Mitt.

Decumbent or ascending, on dry rocks forming rather dense mats, where protected elongating 3-4 cm., branches few; red-brown to dark. Leaves erecto-patent to divaricate, broadly oblong with an acuminate apex, stem clasping below but without a distinct sheath, lower margin serrulate, nerveless, surface smooth slightly shining, 1 mm.; cells oblong, very incrassate, irregular but mostly 6 x 9μ. Perichaetials twice as large and in moist places usually numerous and extending some distance down the shoot. Peduncle very short, capsule just exserted.

Western Tiers, Ben Lomond, Mt. Wellington, Hartz, etc.

Andreaea nitida H.f. et W.

Robust for the genus, forming loose mats in or about running water, black or dark livid green, lower parts denuded. Leaves broadly oblong, obtuse or with a small apiculus, patulous, concave, smooth and polished, 1-1.5 mm.; cells small, irregularly rotund, mostly 6-7μ, strongly incrassate, rather larger towards the base, those in the middle linear and forming an indistinct simple or forked nerve. Perichaetials rather larger nerveless. Peduncle stout, capsule oblong with a pale base, split into four valves.

Western Tiers, Head of Meander River.

Andreaea subulatissima C.M.

Reddish or black in rather loose cushions, stems usually 2-3 cm.; with few irregular branches. Upper leaves with a short broad sheathing base and subulate lamina, patent, at the apex curved to form a sickle shaped point, 2 mm. papillose on the external surface; nerve broad, occupying nearly the whole lamina. Perichaetials longer, erect. Capsule shortly exserted.

Common on sub-alpine rocks in wet places.

Fam. 18—SPHAGNACEAE.

Large gregarious mosses forming dense masses in moist situations or submerged in ponds. Perennial, the central stem elongating at the apex, the branches usually in fascicles and always of limited growth, some of the branches of each fascicle are relatively robust, divergent to suberect, while others are slender and pendulous, lying close to the stem. Leaves nerveless, thin, of a single cell layer, composed of two forms of cells, namely, large thin-walled tracheids strengthened with annular or spiral fibres and usually pierced with few large pores, contained in a reticulation of linear, chlorophyllous cells. Rarely the development of the tracheids is arrested and all the cells remain similar and chlorophyllous. Antheridia globose, stalked, solitary in the axil of a bract and clustered in lateral rather dense strobili. Archegonia solitary or few at the apex of a branch, concealed by relatively long leaves. Capsule globose, with a minute lid, without annulus or peristome; not developing a seta but bearing only a short foot inserted on the apex of a peduncle which is a leafless prolongation of the parent branch. Protonema a flat expansion of a single cell thickness.

The family contains but one genus, *Sphagnum*, specialised to suit peculiar conditions and not continuous with any other group. In many text-books the spores are stated to be of two forms, large and small, and efforts have been made to prove sexual distinctness of these, but Campbell states that Nawaschin has conclusively shown that the so-called microspores are the spores of a parasitic fungus. The peduncular elongation of the axis is similar to the condition found in *Andreaea*, and the structure of the leaves roughly recalls the tissue of *Leucobryum*, but in each it is a case of similar adaptation and does not imply relationship.

Sphagnum (Dill.) Ehrh.

The character is sufficiently indicated in the description of the Family. The species are variable and difficult to diagnose, and are constantly being re-arranged by specialists working at the group. The following is near the latest scheme according to Dr. Warnstorf except that varieties and forms are not included:—

Tasmanian forms belong to four sub-sections of the genus, namely, *Cymbifolia*, *Rigida*, *Cuspidata* and *Subsecunda*.

Sub-section **Cymbifolia**. Robust; leaves concave, obtuse, dentate at the back of the apex, tracheids about 40-60μ in diameter; cortex of the branches, and sometimes the outer series of the stem cortex bearing spiral fibres. Chlorophyllous cells narrow, small, elliptic, generally central.

Stem cortex with fibre ... ... *cymbifolium*.
Stem cortex without fibre.
  Stem leaves with fibres, branches long, slender ... ... *maximum*.
  Stem leaves without fibres, branches short, rigid ... ... *subbicolor*.

Sphagnum cymbifolium Ehrh.

Robust, the divergent branches about 3 cm., tapering to slender tips. Stem cortex broad in 3-4 series, superficial cells with fibres and round pores, sclerotic ring brown, thin, pith broad. Stem leaves ligulate, very obtuse, 2.7 mm. Lower leaves of divergents broadly ovate, obtuse, concave, apex incurved dentate on the dorsal surface, 2.5 mm., border very narrow, tracheids short and broad, those towards the apex and margin with many large oblong pores; cells narrow elliptic, the wall exposed on the upper surface, enclosed on the lower; upper leaves longer. Branch cortex cells very inflated, copiously fibred.

Kingston, Near Lake Sorell, Western Tiers.

Sphagnum maximum Warnst.

Pale, slender, long, the divergent branches spreading, tapering 2-3 cm. Stems cortex broad 3-4 cells, without fibres, sclerotic ring brown, thin, pith broad. Stem leaves broadly ligulate, very obtuse, 1.5 mm., tracheids with spiral fibres. Branch cortex inflated, fibred. Branch leaves very broadly ovate, concave, obtuse, 3 mm., border very narrow, apex cuspidate on the back, tracheids short and broad, pores large oblong, numerous, irregularly disposed, upper leaves narrower and longer; cells very small, narrow elliptic, central. Very close in structure to *S. subbicolor*.

Native of New Zealand. Recorded also as Tasmanian because found as packing in an apple case said to have come from Tasmania. No locality known.

Sphagnum subbicolor Hampe.

Syn: *Sphagnum centrale* Jens.

Robust, long in favourable sites, in other places rather short. Divergents short, often all under 1 cm., occasionally longer with tapering ends. Stem cortex broad of four series of cells without fibres; sclerotic ring brown, narrow, pith broad. Stem leaves 2 mm., broadly ligulate, very obtuse, tracheids without fibres. Cortex of branch inflated, fibred. Leaves of divergents very broadly oblong, very obtuse, concave, cuspidate on dorsal surface of apex, 2 mm. border very narrow, tracheids broad, short, pores oblong, large, numerous along both borders; cells narrow elliptic, nearly central, enclosed.

Variable in habit according to local conditions from short and dense to very long and slender, but the branches always relatively short.

Mr. Field, Blue Tier, Western Tiers, Cradle Mt., etc.

Sub-section **Rigida.** Robust; leaves concave, more or less geniculate, apex obtuse, minutely cuspidate; tracheids broad 40-50μ diameter; branch cortex without fibre, stem cortex of 3-4 series of medium-sized cells. Chlorophyllous cells elliptic, small or medium sized, central.

Usually robust; stem leaves oblong ... ... *antarcticum.*
Slender; stem leaves ovate ... ... *Weymouthii.*

Sphagnum antarcticum Mitt.

Robust with rather long tapering branches, 3-4 cm. Stem cortex narrow in 3-4 series of small cells without fibres, wood cylinder broad, the sclerotic portion gradually passing into the small celled pith. Stem leaves broadly oblong, obtuse, 1.5 mm. Branch cortex cells long inflated, each with a sessile pore at the upper external surface. Lower leaves of divergents broadly ovate, slightly geniculate, concave, 2.2 mm., apex rather obtuse, minutely cuspidate, border narrow, tracheids broad, pores small, few chiefly at the angles, upper leaves narrower, longer, obtuse; cells elliptic, small, central.

Very common in numerous localities. Variable, the best marked forms being:

Var: *australe* (*S. australe* Mitt). Divergent branches more numerous, less tapering, more erect, tracheids larger.

Var: *macrocephalum*, Warnst. Divergents short, massed in a dense head at the apex of the stem.

Var: *densissimum*, Warnst. Short. Branches short, densely packed on the stem.

Var: *subsquarroscum*, Warnst. Elongated, slender, depauperated.

Sphagnum Weymouthii Warnst.

Not robust, seldom exceeding 10 cm., the divergent branches tapering, about 3 cm. Stem cortex medium breadth of three series of cells. Stem leaves ovate, obtuse 2.2 mm., border well defined of 4 cells, tracheids copiously fibred, pores few placed at angles. Branch cortex of large inflated short cells apparently without pores. Branch leaves broadly ovate, geniculate, concave, with an obtuse cuspidate apex 3 mm., border narrow, 2-3 cells; tracheids broad; pores few, very small, mostly at the angles; cells elliptic, not very small, central.

Mt. Macmichael, Blue Tier.

Sub-section **Cuspidata.** Slender, the pendant branches not always very distinct from the divergents; leaves narrow ovate to linear, apex truncate cuspidate at least in the lower leaves; stem cortex of 1-2, rarely 3 series of narrow cells, the woody cylinder indistinct; tracheids narrow, mostly 10-25μ broad. Chlorophyllous cells usually wedge-shaped, broadly exposed on the external surface.

Leaf margin plain ... ... *cuspidatum.*
Leaf margin cuspidate.
  Branches straight or flaccid.
    Tracheids with few or no fibres ... ... *trichophyllum.*
    Tracheids copiously fibred ... ... *Brotherusii.*
  Branches falcate.
    Lower leaves linear ... ... *drepanocladum.*
    Lower leaves ovate-lanceolate ... ... *Rodwayi.*
Leaves with few or no tracheids, all cells chlorophyllous ... ... *serrulatum.*

Sphagnum cuspidatum Ehrh.

Slender, fascicles distant, branches usually 4-5, the pendants with very narrow leaves but not appressed to the stem. Stem cortex 1-2 series of cells, wood cylinder not distinct. Stem leaves ovate-oblong 1.5 mm., very obtuse, apex truncate, cuspidate, border broad, lower tracheids without fibre, cells as broad as tracheids. Branch leaves oblong-lanceolate, the middle ones 3 mm., basal ones shorter and broader, terminal ones longer, attenuated; margin with a border of 5-7 linear cells, incurved, entire or with very small distant serrulations, apex truncate, cuspidate; tracheids short in lower to very long in upper leaves, 17-25μ diameter; pores small circular, few to many along both margins 6μ; in transverse section cells half as large as tracheids obtusely wedge shaped, the convex base free on the external surface.

Macquarie Harbour, Mt. Wellington.

Sphagnum trichophyllum Warnst.

Medium sized, generally submerged, densely fascicled, with rather long flaccid branches. Stem cortex 1-2 series of small cells, wood cylinder ill-defined, stem leaves triangular, 1.3 mm., apex sub-acute, obscurely cuspidate, border broad but the linear cells not much altered from the tracheids, cells as broad as the tracheids, lower tracheids narrow without fibres; branch leaves linear elongated to a slender truncate cuspidate or acute apex often 6 mm. long, margin with a border of 3 linear not much narrowed cells, margin cuspidate, tracheids with few or no fibres or pores, mostly under 10μ diameter. In transverse section the cells nearly as broad as the tracheids and nearly round.

Common in water.

Sphagnum Brotherusii Warnst.

Slender, fascicles not very distant 4-5 branched, the divergents not distinct from the pendants, 3-4 cm., slender and tapering. Stem cortex of 2-3 series of small thin walled cells, woody cylinder distinct; stem leaves narrow triangular, 2.3 mm., border broad below, narrow and indistinct above, apex small truncate, cuspidate; tracheids long, lower ones without fibres; cells nearly as wide as the tracheids. Branch cortex a single series of but slightly inflated cells; branch leaves linear with a slender apex about 4 mm., border of 2 series of linear cells, margin cuspidate, apex in the lower leaves truncate cuspidate, in the upper leaves acute; tracheids long, broad, usually 25-30μ diameter, freely fibred, pores very few, rather large at the lateral angles or none, cells one-third as large as tracheids, wedge shaped with obtuse apex and convex base, base freely exposed on external surface.

Very similar in appearance to *S. trichophyllum.*

Table Cape.

Sphagnum drepanocladum Warnst.

Slender, tall, divergent branches 3-4 slender falcate. Stem cortex one celled, woody cylinder very indistinct; stem leaves concave, ovate-triangular from a broad base, 1.5 mm., apex slightly truncate cuspidate, lower tracheids without fibres. Branch leaves linear tapering to a slender apex, the middle ones about 4 mm., margin with a narrow 3 celled border, remotely cuspidate, apex truncate cuspidate or in upper leaves acute; tracheids long about 20μ diameter; closely fibred; pores small, few along the margin or absent. In transverse section the cells are small, broadly wedge-shaped with convex walls and obtuse apex, base not broad, freely exposed on the external surface.

Blue Tier, Alma Tier, Cradoc.

Sphagnum Rodwayi Warnst.

Tall and very slender. Fascicles distant, branches 3-5 slender tapering 2-3 cm., unequal, pendants with narrower leaves, but little distinct. Stem cortex of one or two series of slightly enlarged cells, wood cylinder ill-defined. Stem leaves ovate 1.6 mm., border broad well defined, apex obtuse, cuspidate, but not distinctly truncate. Branch cortex with inflated retort cells, the mouth nearly sessile; branch leaves narrow ovate-lanceolate, 2-3 mm., upper leaves rather longer and much narrower, border well-defined, 3-4 series, margin with few distant small serrations, apex minutely truncate, cuspidate; tracheids not very long, copiously fibred, about 16μ diameter; pores circular about 5μ few along the side of the upper tracheids. Cells in transverse section small wedge shaped with convex walls, the base freely exposed on the external surface.

Strickland.

Sphagnum serrulatum Warnst.

Slender, dark green, branch fascicles rather distant. Stem tissues not clearly marked off from one another, the woody cells slightly thickened and not dark, the cortex of one or two layers not differing except by the walls being thinner; stem leaves ovate-triangular, 1.8 mm.; apex minutely truncate cuspidate, marginal cells not much narrowed, chlorophyllous cells as broad as the tracheids which are without fibres or pores. Branches usually four in each fasciculus, long, slender and flaccid, leaves lanceolate tapering to a slender but obtuse dentate apex, 5-6 mm., margin cuspidate, all the cells chlorophyllose and without fibres or pores, the upper ones rhomboid.

In a ditch near Strahan.

Sub-section **Subsecunda.** Slender to rather robust; leaves ovate, ovate-lanceolate or oblong, apex truncate cuspidate; stem cortex of 1 rarely 2 series of slightly enlarged cells, wood cylinder well developed. Tracheids mostly 17-30μ diameter. Chlorophyllous cells elliptic central rarely partly exposed on the ventral surface.

Pores small, oblong closely appressed to and ringed by the wall. Cell in section elliptic and approaching or exposed on the ventral surface.

Leaves obtusely ovate ... ... *submolliculum.*

Leaves acuminate ... ... *Moorei.*

Pores not small, free from the wall. Cell elliptic, small, central.

Robust, leaves ovate-lanceolate ... ... *cymbifolioides.*

Leaves ovate-acuminate ... ... *pseudorufescens.*

Pores minute round, strongly ringed but removed from the wall.

Cell rather large, barrel-shaped central, exposed on both surfaces ... ... *molliculum.*

Sphagnum submolliculum Warnst.

Fairly robust, stems often reaching 18 cm., coma usually golden yellow, divergent branches generally two, short, divaricate to patent, 1-1.5 cm., pendants rather closely appressed. Stem cortex of one row of small cells, wood cylinder thick; stem leaves broadly ligulate, very obtuse, 2 mm., border well-defined 4-5 series, upper tracheids copiously fibred, pores ringed, very numerous along both margins, usually one in each space between fibres, ring continuous with cell-wall. Branch leaves ovate, rather obtuse, 2 mm., border well-defined, narrow, 2-3 celled, apex truncate 6-7 cusped; tracheids 16-20μ diameter, pores small, ringed, very numerous along both margins included in cell-wall; cells in section small, elliptic approaching the ventral surface but not free.

Recherche, Mt. Wellington, Alma Tier.

Sphagnum Moorei Warnst.

Slender, flaccid, fascicles not crowded. Stem cortex 1 rarely 2 series; stem leaves broadly ovate, 1.2 mm., obtuse or obscurely cuspidate at the apex, tracheids copiously fibred, pores small few along both margins ringed by and included in the wall; border 2-3 cells. Branches usually 4 long flaccid tapering, the pendants not very distinct from the divergents; leaves ovate, very acuminate, 1.5 mm., apex abruptly truncate, cuspidate; border three-celled, tracheids 16-20μ diameter, strongly fibred, pores not numerous, small, placed along both margins and included in the wall; cells in section narrow oblong slightly exposed on ventral surface.

Kelly's Basin, Macquarie Harbour.

Sphagnum cymbifolioides C.M.

Syn: *Sphagnum cymbophyllum* F.v.M.

Robust, tall in favourable situations, the fascicles not crowded. Stem cortex of 1 rarely 2 series; leaves ovate-oblong, 2.5 mm., apex minutely truncate cuspidate, border 4-5 celled, tracheids copiously fibred with few rather large pores. Branches usually five, three divergents slender, tapering, flaccid, not differing greatly from the two pendants; leaves narrow ovate or ovate-lanceolate 3 mm., apex truncate, cuspidate, border 2-3 celled, tracheids copiously fibred with generally a single small oblong pore at each lateral angle; cell small, narrow-elliptic, central.

Port Esperance, Kingston, Strickland, etc.

Sphagnum pseudorufescens Warnst.

Medium sized, usually submerged and tinged with red. Stem cortex 1-2 series of small cells, wood cylinder broad, leaves ovate-oblong 2.2 mm., apex very obtuse, border broad 4-5 celled, tracheids fibred with many large, plain pores. Branches 4-5 in fascicle 1 cm. tapering, not very distinct, usually crowded along the stem, leaves ovate-acuminate, apex truncate-cuspidate, border 3-4 celled, tracheids about 30μ diameter copiously fibred, pores rather large not ringed, numerous mostly along one margin; cells small, narrow-elliptic, central.

Oyster Cove, Mt. Wellington Summit, Western Tiers, Alma Tiers.

Sphagnum molliculum Mitt.

Rather flaccid, but not slender, 10-12 cm. Branches not regularly fascicled, about 1 cm., and all similar. Stem cortex of one series of slightly inflated cells, wood cylinder thick; stem leaves numerous, ligulate, very obtuse, apex cuspidate, 2.5 mm., border very distinct 4-5 celled, tracheids narrow, copiously fibred, pores very small ringed, numerous along the margins. Branch leaves ovate-oblong, very obtuse, 3 mm., apex broadly convex, 6 cuspidate, border 3 celled, tracheids about 17μ copiously fibred, pores minute numerous along the margins, ringed but standing out freely from the wall, cells rather large in section barrel-shaped and generally exposed on both surfaces; the leaves of the coma usually much larger, broader and more obtuse.

Western Tiers.

ADDITIONS AND CORRECTIONS.

Leptodontium papillatum (H.f. et W.) is referred in the Pflanzenfamilien to the genus *Triquetrella* C.M..

Streptopogon crispatus (Hpe.) is there referred to *Calyptopogon* Mitt. Also for this Salmon contends that Schwaegraeger's specific name *mnioides* has prior claim.

The moss here described as *Dicranum robustum* H.f. et W. is identified by Dr. Brotherus as *Dicranum* (*Dicranoloma*) *subsetosum* C.M.

The species described as *Orthotrichum Lawrencei* Mitt. has since the publication been found close to the Organ Pipes, Mt. Wellington, and identified by Dr. Brotherus as identical with *O. rupestre*, Schl.

Sclerodontium pallidum (Hook.) Mitt. has also been gathered on the eastern slopes of Mt. Wellington.

Ephemerum cristatum H.f. et W. has been gathered by Weymouth on the ground at Bellerive.

In description of *Lophidiaceae* (*P. and P.*, 1912, p. 10; p. 8 of separate issue), for "Calyptra cucullate" read "Calyptra mytriform rarely cucullate."

Since publication of the earlier portion of the paper the following new species have been described:—

Campylopus Rodwayi Broth.

Depressed forming loose mats, pale yellowish-green, the ends of the branches readily separating as buds with a few long twisted leaves. Leaves narrow linear, tapering from the base to the filiform not hyaline apex, 9 mm., margin entire except at the apex which is cuspidate; nerve broad and flat occupying the whole of the upper portion, the wing elsewhere very narrow; cells of wing irregularly oblong, smooth, incrassate; alars numerous, brown, inflated, forming prominent auricles. Rest not seen.

Summit Mt. Wellington, Ironstone Mt.

Zygodon Rodwayi Broth.

Erect in dense mats, stems slender, about 1 cm. Leaves erecto-patent, ovate-acuminate, rather acute, 0.3 mm.; nerve broad canaliculate, lost below the apex; cells irregularly rotund, smooth. Seta slender about 1 cm.; capsule erect, narrow oblong, 1.1 mm., mouth little constricted, furrowed when dry; lid with a rather long oblique rostrum; peristome double, exostome of 8 short broad geminate teeth, endostome of 8 incurved cilia. Leaves much

1913.

smaller than in *Z. Menziesii* and not crisped when dry as in that species. Leaves smaller than in *Z. minutus* and nerve much broader and lost below the apex.

Forth River near Sheffield.

Bartramia erecta (Hampe)

Syn: *Glyphocarpa erecta* Hpe., *Bartramidula Hampeana* Mitt.

Stems short, erect, clustered in tufts, usually under 1 cm. Leaves spreading, concave, narrow linear, tapering from a narrow hyaline, sheathing base, 2.5 mm., apex acute; margin rather coarsely serrate; nerve broad continuous, surface obtusely papillate; cells rectangular, those of the base much larger. Seta 1 cm., capsule inclined, nearly globose, sulcate, 1.2 mm., mouth broad, peristome none.

With the spreading leaves of *B. papillata* it has the narrow leaf base of *B. strictifolia*, and differs from either in the absence of a peristome.

Waterworks, Hobart, Bismarck Road.

Index of Genera.

Synonyms in *italics*.

Pp. 3-24 (Part I.) and 87-138 (Part II.) are in *P. and P.* 1912; pp. 177-261 (Part III.) in this volume.

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NEW AUSTRALIAN *ASILIDÆ (DIPTERA)*.

By Arthur White.

(Read 13th October, 1913.)

The present paper describes seventeen new species of *Asilidæ* ("Robber Flies"), eight of these being from Western Australia, and nine from Tasmania. The West Australian species were collected by Mr. G. H. Hardy, of the Tasmanian Museum, the Tasmanian species by myself. New genera are also proposed for two previously undescribed species.

Leptogaster, Meig.

Of this genus five Australian species have been previously described; four new species are now added, three of these being from Tasmania, and one from Western Australia. As the species belonging to this genus are somewhat difficult to determine, I am giving a table showing the distinguishing characters of all the Australian species.

Table of the Australian Species of Leptogaster.

1. Posterior legs partly or wholly black. 2
   Posterior legs yellow or brown. 3
2. Abdomen black. *bancrofti*, Ricardo.
   Abdomen yellow at base. *dissimilis*, Ricardo.
3. Second submarginal (cubital or cubital fork) cell contracted at the wing margin. 4
   Second submarginal cell not contracted at the wing margin. 5
4. Cross-vein closing second basal cell joins the corner of fourth posterior cell. Large species. *antipoda*, Bigot.
   Cross-vein closing second basal cell joins peduncle of fourth posterior cell at about its middle. Small species. *occidentalis*, Sp. nov.
5. Wings smoky. Thorax with three dark stripes; hind femora very dark brown; large robust species. *fumipennis*, Sp. nov.
   Wings clear.
   Thorax reddish brown, with one median black stripe; hind femora reddish-yellow. *australis*, Ricardo.
   Thorax black; hind femora brown. *geniculata*, Macq.
   Thorax brown (with three dark stripes in male); hind femora brown; very small species. *vernalis*, Sp. nov.

Thorax olive; hind femora orange. *æstiva*, Sp. nov.

Of these species, *L. bancrofti*, *dissimilis*, and *australis* are from Queensland, *geniculata* from Queensland, New South Wales, and Tasmania, *occidentalis* from Western Australia, and *antipoda*, *fumipennis*, *vernalis*, and *æstiva* from Tasmania.

Leptogaster vernalis, Sp. nov.

A very small delicate species. Thorax brown, with three broad, dark brown, longitudinal stripes in the male, which occupy the greater part of the dorsal surface; in the female thorax lighter, and practically unstriped; abdomen black (male), or dark brown (female); legs brown, with base of posterior femora and tibiæ whitish.

Length. Male, 7·5-8 mm; female, 10·5 mm.

Locality. Bagdad Valley, Tasmania.

Male. Face and moustache white; front pale yellowish. Antennæ black. Thorax brownish, with one median and two lateral broad brown stripes, that occupy the greater part of the dorsal surface; sides and scutellum pale grey. Abdomen black, with segmentations very indistinctly paler; the first segment with a few white bristles on either side. Legs brown, with knees darker; posterior femora and tibiæ whitish at the base, the latter with white bristles; tarsi with basal half of first joint white, remainder brown. Wings clear, veins black; cross-vein closing second basal cell joins the peduncle of fourth posterior cell at about two-thirds of its length.

Female. Much larger than the male. Thorax brown, indistinctly striped. Abdomen dark olive brown. Legs as in the male, except that the knees are barely darkened, and first joint of tarsi is two-thirds whitish.

This species can only be confused with *L. geniculata* and *L. æstiva.* From the former it may be distinguished by the colouring of the thorax and its smaller size, also by its occurring in the early instead of the late summer; from the latter species by its brown legs with barely contrasted knees, instead of orange legs with conspicuously contrasted black knees, and also by its smaller size.

This species is on the wing from early in November to the middle of January. It may be swept from long grass on high ground.

Leptogaster æstiva, Sp. nov.

A medium-sized species. Thorax and abdomen olive, the former indistinctly striped; all femora bright orange, with black knees.

Length. Male, 10·5 mm; female, 13·5 mm.

Locality. Bagdad Valley, Tasmania.

Male. Face white; front pale yellowish; moustache white, scanty. Antennæ black. Thorax olive, faintly striped, with the sides pale grey. Abdomen olive; first segment with a few white bristles on either side. Legs with all femora orange, the posterior pair whitish at base; anterior and middle tibiæ orange below, brownish above; posterior tibiæ brown, pale at the base, and becoming gradually darker towards the apex, with a few white bristles; tarsi black, with the exception of the first joint, which is three-fourths white. Wings clear, veins black; the cross-vein closing the second basal cell joins the peduncle of fourth posterior cell at about two-thirds of its length.

Female resembles the male, but is larger; the abdomen has sides and segmentations grey, the grey colour encroach-conspicuously on the second and third segments, in which the olive colour is reduced to a dorsal stripe, narrow above and broader below.

This species can only be confused with *L. geniculata* and *L. vernalis*, from both of which it may be distinguished by its bright orange femora.

This species may be found amongst long grass on the hills, in company with *L. vernalis*; I have only met with it during the month of January.

Leptogaster fumipennis, Sp. nov.

A large robust species. Thorax brown, with three broad brown longitudinal stripes; abdomen dorsally black, sides and segmentations grey; femora very dark brown; wings with veins very conspicuous, and suffused with brown round the discal cross-vein

Length Female, 14·5-15 mm.

Locality. Bagdad Valley, Tasmania.

Female. Face yellow or yellowish white; moustache white; back of head with a row of stiff black bristles. Antennæ black. Thorax brown, with three very broad, shining, longitudinal, dark brown stripes; sides grey; scutellum covered with grey tomentum. Abdomen unusually robust, dorsally olive-black, with sides, shoulders of segments, and segmentations (to a varying degree) grey; first segment posteriorly with (usually) four black bristles on each side and a few white hairs. Legs dark brown, with knees black; posterior tibiæ whitish at base, with black and white bristles, which vary considerably in different individuals tarsi black, except three-fourths of the first joint, which is yellowish. Wings large, veins very conspicuous, the region surrounding the discal cross-vein suffused with brown.

This species seems to be subject to considerable variation; one of my specimens has the face black, and the thorax only indistinctly striped. It can, however, in any case be easily recognised by its large size and unusually robust abdomen, in conjunction with its dark legs, and wings suffused centrally with brown.

This species is fairly common in the bush in the Bagdad Valley, Tasmania ; it seems to have a fondness for settling on dead twigs and undergrowth. It occurs during the month of December.

Leptogaster occidentalis, Sp. nov.

A small species having the second submarginal cell considerably narrowed on the wing margin, owing to the bending upwards of the lower branch of the cubital fork ; thorax greenish-black, indistinctly striped ; abdomen black, with segmentations grey ; anterior and middle legs bright orange, posterior pair darker.

Length. Male, 8 mm.

Locality. Perth, Western Australia.

Male. Face and moustache, which is very scanty, white, Antennæ black. Thorax greenish-black, with indistinct traces of median stripes; sides dusted with grey. Abdomen black. with the segmentations indistinctly marked with grey. Legs: Anterior and middle femora and tibiæ bright orange, with knees brown ; posterior femora orange brown, indistinctly banded with darker across the middle, base white, and knees black ; posterior tibiæ brown, with basal half whitish; all tarsi with first joint white, excepting the extreme end, which, with the remaining joints, is brown, with segmentations darker; claws black. Wings short, the second submarginal (or cubital) cell considerably narrowed on the wing margin, owing to the upward bend of the lower branch of the cubital fork; the veinlet closing the second basal cell meets the peduncle of the fourth posterior cell at about its middle.

This species can be distinguished from all other Australian species of the genus, except *L. antipoda*, by the contracted second submarginal cell; from *L. antipoda*, which is a Tasmanian species, it can be distinguished by its smaller size, stouter build, much shorter wings, more brightly coloured legs, and the position of the veinlet closing the second basal cell, which, in this species, joins the peduncle of the fourth posterior cell at about its middle, instead of, as in *L. antipoda*, joining the fourth posterior cell itself.

No other species of this genus is at present known to occur in Western Australia.

Chrysopogon, Röder.

Of this genus, distinguished by the stout spine on each side of the thorax, front tibiæ with a terminal claw, and antennæ without any distinct style, there are two undescribed species from Western Australia in Mr. G. H. Hardy's collection.

Chrysopogon rufulus, Sp. nov.

Thorax black; abdomen dorsally black, sides and apex red, with white lateral spots; legs red; antennæ with first two joints red, third black.

Length. Female, 12 mm.

Locality. Perth, Western Australia.

Female. Face bright yellow; front black; moustache of white bristles, with a few smaller black ones at sides, small, directed forwards, fanlike. Antennæ with the first two joints reddish-yellow, third reddish-black, the actual base of first joint being also black. Thorax dull black, dusted with yellow tomentum, which is thicker on the sides; scutellum shining black, slightly reddish at the tip. Abdomen shining black, minutely punctate, the sides and apex red, with a white spot on each side of the second, third, and fourth segments posteriorly; first segment with a stiff spine-like bristle on either side. Legs with all femora and tibiæ bright yellowish-red, with black bristles; tarsi with the first joint reddish, remainder black. Wings brownish, the first and fourth posterior cells both widely open.

The only other species of the genus to which this species bears any resemblance are *C. punctulus (Ricardo)*, and *C. nigricans* (next to be described), from both of which it may be distinguished by its red, instead of black, legs.

Chrysopogon nigricans, Sp. nov.

Thorax black; abdomen black with red sides and apex, and white lateral spots; legs black; antennæ with first joint, except extreme tip, black, second red, third black.

Length. Female, 12-14 mm.

Locality. Perth, Western Australia.

Female. Face silvery white; front black; moustache small, composed of white bristles, projecting forwards, fan-like; back of head with black bristles. Antennæ with basal three-fourths of first joint deep black, apex and second joint red, third black. Thorax dull black, with silvery tomentum on shoulders and at sides, and a little white pubescence; scutellum shining black. Abdomen shining black, minutely punctate, with sides and apex red, and a white spot on each side of the second, third, and fourth segments posteriorly; first segment with a stiff spine-like bristle on either side. Legs black, with black bristles; posterior tibiæ with long whitish pubescence beneath. Wings brown, the first posterior cell widely open, but the fourth conspicuously contracted on the wing margin.

This species can be distinguished from *C. punctulatus* by the red sides and apex of abdomen; from *C. rufulus* by its black legs; to the other species of the genus it bears no resemblance.

OPSEOSTLENGIS,* Gen. nov.

This genus is proposed for an undescribed West Australian species in the collection of Mr. G. H. Hardy. It resembles *Chrysopogon*, but is distinguished by the antennæ, which have the third joint considerably broadened, and provided with a short pointed style, by the convex face, and by the curious comb-like moustache, described below.

Face convex, the moustache arising from the middle of the face (instead of the lower part of the face, as in *Chrysopogon*); the moustache composed of a single row of about eighteen long, parallel, very stiff bristles, which first project slightly forwards, and then descend almost vertically, reaching far below the face, the length of the moustache being about the length of the face from the vertex to the oral margin, and presenting the stiff appearance of a comb. Antennæ shorter than in *Chrysopogon*, the first and second joints of almost equal length, the third as long as the first two together, considerably broadened, and provided with a short pointed style. Thorax with a stout spine on each side, as in *Chrysopogon*. Abdomen broad, and becoming gradually broader towards the apex, the fifth segment being broader than the second. Legs with bristles. Wings with the first and fourth posterior cells wide open, the anal cell barely closed on the wing margin.

Opseostlengis insignis, Sp. nov.

Thorax, abdomen, and legs black, the latter having the

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* ὄψεως στλεγγίς, face comb.

knees pale yellow; abdomen coarsely punctate; wings dark brown, with a hyaline spot at base of first posterior cell.

Length. Female, 17 mm.

Locality. Perth, Western Australia.

Female. Face white; front black; moustache composed of very long, stiff, white bristles. Antennæ with the first and second joints dark reddish, the third black, paler at the base, the style small and pointed. Thorax and scutellum greenish-black, with grey tomentum, with a stout spine and a few short black bristles at sides. Abdomen blue-black, coarsely punctate; the first segment with a stiff, spine-like bristle, and long white hairs, on either side. Legs deep black with the knees pale yellow; femora and tibiæ with black bristles and black pubescence. Wings brown, very dark on costa towards the base, with a pale spot at base of first posterior cell; first and fourth posterior cells widely open.

Erythropogon,* Gen. nov.

This genus is proposed for an undescribed Tasmanian species. It is most nearly allied to *Brachyrrhopala*, but is at once distinguished from that genus by the extremely long antennæ. The abdomen is an elongated club-shape, with a long narrow stalk, a feature that, in conjunction with the long antennæ, gives it a close resemblance to one of the hymenoptera.

Face long and flat, descending in a straight line from the antennæ to the moustache; the latter very small, and confined to the oral margin. Antennæ are placed extremely high, and project horizontally forwards in a line with the vertex; they are four times the length of the head, the first joint twice as long as the second, the third three times the length of the first and second together, much broader than either of them, and terminated by a rounded tip, that seems somewhat separated from the rest of the joint, although it does not form a distinct style. Thorax has the shoulders produced into prominent tubercles. Abdomen long and club-shaped, much constricted towards the base, and more petiolate than in *Brachyrrhopala*. Legs: Front tibiæ with a small and inconspicuous apical curved spine; femora practically bare; tibiæ with a few bristles. Wings large, with all the posterior cells open.

Erythropogon ichneumoniformis, Sp. nov.

Thorax black; abdomen with basal half red, apical half

* ἐρυθρὸς πώγων, red beard.

reddish-black, fourth segment with a white tomentose spot on either side; legs yellowish-red; antennæ with two first joints red, third black.

Length. Male, 15 mm; female, 13-17 mm.

Locality. Bagdad Valley, Tasmania.

Male. Face red-brown, with a few scattered white hairs; moustache composed of a few pale golden bristles; front, which owing to the height of the antennæ is very small, black. Antennæ with the two first joints red, the third, which is about three times the length of the first and second together, black and strap-like. Thorax black, without bristles, but with a little white pubescence at sides, more particularly towards the rear; scutellum red-brown, without bristles or pubescence. Abdomen with the three first joints red, the remainder reddish-black. Legs: Anterior and middle pairs yellowish-red, posterior pair somewhat darker; the tarsi similarly coloured to the femora and tibiæ and not darkened; hind tibiæ with white bristles. Wings yellow-brown, with all posterior cells open, though the fourth is slightly, and the anal cell considerably, contracted on the wing margin.

Female resembles the male very closely, but the thorax is slightly browner, and the fourth abdominal segment bears a white tomentose spot on each side, which are not discernable in my single specimen of the male.

This species is subject to variation, both as regards size and depth of colouration. It occurs somewhat sparingly in the bush at Bagdad, Tasmania, during the month of February, and the first few days of March. It may usually be met with resting on low vegetation.

Saropogon, Loew.

This genus contains five Australian species. The species are small; antennæ with a distinct terminal style; scutellum with marginal bristles; and front tibiæ with a terminal claw.

Saropogon rubescens, Sp. nov.

Thorax black; abdomen red, with base and apex black; legs reddish-yellow; antennæ reddish-yellow, with black bristles.

Length. Female, 14 mm.

Locality. Perth, Western Australia.

Female. Face covered with golden-yellow tomentum, which extends slightly above the antennæ; vertex black; moustache yellow, very scanty. Antennæ reddish-yellow, with black bristles. Thorax black, shoulders red-brown, bordered below with yellow tomentum, posterior margins with whitish tomentum; scutellum pale grey, with two black marginal bristles. Abdomen with first segment black, with red side-margins; second red, suffused with black in centre; third, fourth, and fifth red; apex suffused with black. Legs reddish-yellow, posterior pair redder than the others; posterior knees, and tips of tarsal joints, black; tibiæ with black bristles. Wings tinged with brown; first posterior cell wide open; fourth very slightly contracted; anal cell almost closed on the wing-margin.

This species seems to be nearly allied to *S. sergius*, *Walk*, but may be distinguished by the colouring of the thorax and abdomen, and by the antennæ bearing black instead of yellow bristles.

Bathypogon, Loew.

This genus is distinguished by having the vein closing the fourth posterior cell almost in a line with that closing the discal cell, also by the short wings. It is allied to *Stenopogon*, but the face is much broader than in that genus. The Australian species are nearly allied; they are best distinguished by the colour of the legs and bristles.

Bathypogon tristis, Sp. nov.

Thorax and abdomen black, both with black bristles; legs altogether black, without a trace of red bristles on legs black, with the exception of a single white bristle on each of the posterior femora; moustache yellow.

Length. Male, 16 mm.

Locality. Perth, Western Australia.

Male. Face reddish; front black; moustache yellow, with a few white hairs below; beard white. Antennæ with two basal joints red. Thorax black, indistinctly striped in centre, with black bristles, and short black pubescence; sides of thorax with white tomentum; scutellum blackish, with white tomentum, which is not confined to the outer margin, and four black bristles. Abdomen black; first segment with black bristles, bordered on outer margins with white bristles; second segment with five black bristles on each side posteriorly; remaining segments with smaller black bristles; all segments with a little white pubescence. Legs entirely black, with short white pubescence; bristles black, with the exception of a single white bristle on each of the posterior femora. Wings brown, with the apex somewhat darker.

This species can be distinguished easily from all the described Australian species with the exception of *B. nigrinus*. From *B. aoris* it is distinguished by the bristles on legs and thorax being black instead of white (*B. aoris*, too, is a stouter and more robust species) ; from *B. pedanus* by the black instead of pale reddish tibiæ; from *B. brachypterus*, which is a much more brightly coloured species, and from *B. nigrinus*, by its black instead of red and black femora. From *B. nigrinus*, however, to which it bears a close resemblance, a few further distinctions seem to be desirable. *B. nigrinus* was described by Miss Ricardo from Queensland specimens. I have not any of these for comparison, but possess a Tasmanian specimen that seems to belong to the same species. On comparing this with *B. tristis* I find the following distinctions:—

B. tristis, Sp. nov.	*B. nigrinus*, Ricardo.
Moustache yellow.	Moustache black and white.
Abdomen with conspicuous black bristles.	Abdomen practically without bristles, the few on first segment white.
Femora black.	Femora red and black.
Posterior femora with one white bristle.	Posterior femora with bristles entirely black.
Bristles on fore tarsi black.	Bristles on fore tarsi white.
Wings brown.	Wings hyaline, with tips shaded.

Laphria, Meig.

In Mr. G. H. Hardy's collection are two females of an undescribed species of *Laphria*. It is not quite a typical *Laphria*, as the antennæ are club-shaped, and the abdomen bears lateral bristles, but as the remaining characters are normal, it seems unnecessary to place it in a distinct genus, more especially as the shape of the antennæ varies in other Australian species.

Laphria clavata, Sp. nov.

Thorax dull black ; abdomen violet with white lateral spots, and black lateral bristles ; legs entirely black ; wings grey-brown.

Length. Female, 15 mm.

Locality. Perth, Western Australia.

Female. Head greatly excised behind; face silvery-grey; moustache large and bushy, composed of long black and white hairs; beard long, white. Antennæ rather short, the third joint club-shape and about the same same length as the first two joints together; all joints black, the second with long black bristles at apex. Thorax dull black, indistinctly striped in front, with a few black bristles on posterior margin; scutellum black, with two or four marginal black bristles. Abdomen violet, with lateral white spots on second, third, and fourth segments; each segment with a black bristle on either side, and white pubescence. Legs entirely black; middle and posterior femora with a few black bristles; posterior tibiæ with many black bristles; pubescence of legs black and white. Wings brown or dark grey; first posterior cell widely open; fourth closed a considerable distance above the wing margin; anal cell closed.

The only other Australian species of *Laphria* with entirely black legs is *L. ornatipennis* from Queensland, a species with parti-coloured wings (yellowish with brown markings), and bluish-black abdomen.

NEOITAMUS, Ost-sack.

In this genus the ovipositor is very long, laterally compressed, and apparently including the sixth and seventh abdominal segments; pubescence on thorax short from anterior margin to centre of dorsum, and long from that point to the scutellum; legs with the tibiæ (usually) red, yellow, or yellow-brown.

Table of Australian Species of Neoitamus.

1. Wings spotted or irregularly suffused or shaded. 2
   Wings hyaline or unicolourous. 3
2. Wings grey round posterior border and at apex. *fraternus*, Macq.
   Wings slightly suffused with brown at apex of second basal cell, at discal cross-vein, and at base of cubital fork. *caliginosus*, Sp. nov.
   Wings distinctly spotted. *maculatus*, Sp. nov.
3. Legs jet-black.
   Abdominal segmentations yellow. *flavicinctus*, Sp. nov.
   Legs always partly yellow or red.
   Medium-sized black and grey species femora entirely black. 4
   Small brownish species; femora red or light brown beneath. 5
4. Thorax with one broad median stripe; scutellum with four bristles, usually yellow. *hyalipennis*, Ricardo.
   Thorax with two narrow median stripes; scutellum with two long black bristles. *vulgatus*, Sp. nov.

5. Thorax with one broad median stripe; posterior thoracic bristles white. *graminis*, Sp. nov.
Thorax with two median stripes; posterior thoracic bristles black.
Scutellar bristles, and hairs fringing first abdominal segment, black. *brunneus*, Sp. nov.
Scutellar bristles, and hairs fringing first abdominal segment, yellow. *mistipes*, Macq.

Of these species *N. mistipes* occurs in South Australia, *N. maculatus* in Western Australia, *N. hyalipennis* in Victoria and Tasmania, and *N. fraternus*, *caliginosus*, *flavicinctus*, *vulgatus*, *graminis*, and *brunneus* in Tasmania.

An additional species, *N. planiceps*, was described by Schiner, the locality being given as "Australia," but its position is doubtful, and it may not be identifiable. *N. varius* and *N. bulbus* are New Zealand species, and, therefore, are not included in the foregoing table, but Miss Ricardo is of opinion that *N. varius* may be identical with *N. fraternus*. I might mention that although *N. fraternus* was described by Macquart from Tasmania, I have not so far met with any species that agrees with his description.

The Australian species belonging to this genus seem to be confined to the southern half of the continent; they appear to reach their maximum development in Tasmania.

Neoitamus flavicinctus, Sp. nov.

Thorax black with yellow stripes; abdomen black, with segmentations yellow, more distinct in female than in the male; legs jet-black; posterior tibiæ and first joint of posterior tarsi with short, thick, ruddy pubescence on their inner sides; wings tinged with brown, darker towards the tips.

Length. Male, 13·5 mm.; female (including ovipositor), 15 mm.

Locality. Bagdad Valley, Tasmania.

Male. Face covered with golden tomentum; front black; moustache large and bushy, black. Antennæ black; first two joints with black bristles, the third scarcely longer than the first and second together. Thorax with two black median stripes, divided by a thin yellow line, and bordered outwardly with yellow; sides of dorsum broadly black, bordered with yellow below; scutellum yellowish, with numerous long, marginal, black and yellow hairs. Abdomen black, with segmentations yellow, and yellow hairs and pubescence; genitalia large and prominent with black pubescence. Legs jet-black, with abundant black bristles, hairs, and pubescence;

posterior tibiæ and first joint of posterior tarsi, with, in addition, short, dense, ruddy pubescence, which is especially conspicuous on the inner sides of the tibiæ. Wings brownish, darker towards the tips.

Female resembles the male, but the abdomen is broader, and the yellow segmentations more distinct; ovipositor long and narrow.

This species is very distinct from any other Australian member of the genus; it can be recognised at once by its black and yellow colouring, and black legs.

This seems to be a somewhat scarce species. I have only met with it near the tops of the lofty, bush-covered hills that bound the Bagdad Valley on its eastern side. Time of occurrence, January.

Neoitamus vulgatus, Sp. nov.

Thorax black and grey or black and yellowish; scutellum with two long, black, terminal bristles; abdomen black, with segmentations indistinctly grey; femora black; tibiæ with basal half, or two-thirds, dark red; wings brownish.

Length. Male, 14 mm.; female (including ovipositor), 15·5 mm.

Locality. Tasmania.

Male. Face covered with yellowish-grey tomentum; front black, with a little light tomentum; moustache black above, white beneath. Thorax with two black median stripes, divided by a yellowish line, bordered outwardly with yellowish-grey, and with two broad lateral black stripes, which are broken up by light cross-lines into four distinct patches, in this respect differing from *N. hyalipennis*, which has the side-stripes almost entire; bristles black; scutellum grey, with two long, black, terminal bristles. Abdomen black, with segmentations grey, the latter frequently indistinct. Legs: femora black; anterior and middle tibiæ with basal two-thirds dark red, apex black; posterior tibiæ with basal half dark red, and apical half black; anterior and middle tarsi with first joint two-thirds red, posterior first tarsal joint red only at base; remaining joints black, but reddish at base; legs with black and a few white bristles, and a little black pubescence; hind tibiæ and first joint of hind tarsi with yellowish pubescence. Wings tinged evenly with brown.

Female, except for the broader abdomen, and long, laterally compressed ovipositor, resembles the male in all respects.

This species bears a close resemblance to both *N. caliginosus* (next to be described) and *N. hyalipennis*, *Ricardo*. From the former it can be at once distinguished by the absence of any suffused patches on the wings; from the latter by its smaller size, thorax with two narrow instead of one broad median stripe, scutellum with two black instead of (usually) four yellow bristles, and by the coloured portions of the tibiæ being dark red instead of pale yellowish-red. With reference to *N. hyalipennis*, described by Miss Ricardo from Victoria, it may be as well to mention that Tasmanian specimens show a certain amount of variation; two of my specimens have the wings perfectly hyaline, but in two others they are distinctly tinged with brown, whilst one specimen has the weak scutellar bristles black instead of yellow, although it does not show any other variation from the type.

N. vulgatus is a common Tasmanian species. It may be found settled on logs or fallen branches in the bush. It appears on the wing about the beginning of December, and may be found throughout the summer.

Neoitamus caliginosus, Sp. nov.

Thorax black and brown; scutellum with two long terminal bristles, one white and one black; abdomen black, with well-marked white segmentations; femora black; tibiæ red, with apices black; wings hyaline, suffused with brown at apex of second basal cell, at discal cross-vein, and at base of cubital fork.

Length. Female, 12-14 mm.

Locality. Bagdad Valley, Tasmania.

Female. Face covered with grey tomentum; moustache white, with a few black hairs intermixed; front black. Antennæ black, the first two joints with long black hairs. Thorax with two median, narrowly-divided, brownish-black stripes, and two broad lateral stripes; sides of thorax light brown; bristles black; scutellum brownish-grey, with two long, terminal bristles, one white and one black. Abdomen black, with segmentations conspicuously white; black bristles at sides, and a little short, white pubescence on dorsum. Legs with femora black; tibiæ red, with apex black, the hind pair darker than the others; first joint of tarsi and base of other joints red, remainder black. Wings hyaline, with the apex of second basal cell, the discal cross-vein, and base of the cubital fork (also sometimes base of second posterior cell) suffused with brown. To the naked eye this merely gives the impression of the veins being darkened in the areas specified, but examination with a low-power pocket lens shows the presence of suffused portions of the wings.

This species bears a close resemblance to *N. vulgatus*, but may be distinguished by the irregularly suffused wings, by the abdomen bearing black instead of white bristles, and by the moustache being almost wholly white, instead of half black and half white.

This species frequents tree trunks in the bush, where it occurs somewhat sparingly during January and February.

Neoitamus maculatus, Sp. nov.

Thorax black, indistinctly striped; abdomen black, with segmentations white; femora black; tibiæ uniformly reddish-black; wings with four brown spots.

Length. Female, 11-13 mm.

Locality. Western Australia.

Female. Face and front black; moustache black, with a few white hairs below; beard white. Thorax black, very indistinctly striped, and grey on posterior margin, with black hairs and bristles; scutellum black, with two long, black, terminal bristles, and black hairs. Abdomen black, with segmentations white; marginal bristles white. Legs with the femora black; the tibiæ and tarsi uniformly reddish-black; the middle and posterior femora, and all the tibiæ, with black bristles; pubescence black and white, especially long on the anterior femora. Wings brown, with four brown spots, which are situated at apex of second basal cell, at the discal cross-vein, base of the cubital fork, and base of the secund posterior cell; there is also a small hyaline spot inside, and near the base of, the cubital fork.

This species can only be confused with *N. caliginosus*, from which it is distinguished by having the wings boldly spotted instead of faintly suffused, by the black instead of white moustache, by the thorax being black instead of brownish, by the abdominal bristles being white instead of black, and by the darker tibiæ.

Neoitamus graminis, Sp. nov.

(This, and the following species, differ from those already described by being brown instead of black, by their small size, and by their femora being not wholly black.)

Thorax yellow-brown, with one broad dorsal and two lateral brownish-black stripes; abdomen brownish-black, with conspicuous light yellow-brown segmentations; femora black above and red beneath; tibiæ light yellow-brown, with apex black; thoracic bristles white.

Length. Male, 11·5 mm; female, 12·5 mm.

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Locality. Bagdad Valley, Tasmania.

Male. Face and front covered with pale yellow tomentum; moustache pale yellow, scanty, without any black bristles. Thorax yellow-brown, with a broad median and two lateral brownish-black stripes; sides bright yellow brown; bristles white; scutellum covered with yellow-brown tomentum, with two weak yellow bristles. Abdomen brownish-black with conspicuous light yellow-brown segmentations, and yellow bristles at sides; genitalia prominent. Legs with the femora broadly black above, red beneath; anterior and middle tibiæ red, with black bristles, posterior tibiæ yellow-brown, with white bristles; apices of tibiæ and tarsi black. Wings tinged with brown.

Female resembles the male, but the legs are lighter, the tibiæ being all pale yellow-brown, with apices black, and the wings are hyaline.

This species can be easily distinguished from both *N. mistipes*, *Macq.* and *N. brunneus*, Sp. nov. (the only nearly allied species) by the bristles on the thorax being white instead of black, and by the thorax bearing one broad, instead of two narrow, median stripes.

N. graminis occurs on high open ground, where it may be found during January and February, resting on the stems of long grass.

Neoitamus brunneus, Sp. nov.

Thorax light brown, with two dark median stripes, and black bristles; abdomen brown, with segmentations indistinctly paler; legs light brown; femora black above.

Length. Male, 12 mm; female, 11 mm.

Locality. Mangalore, Tasmania.

Male. Face covered with yellowish-white tomentum; moustache pale yellow, with a few black hairs above. Antennæ with the first joint red, remainder black. Thorax light brown, with two dark brown median stripes, and three brown, suffused spots on either side; bristles black; scutellum grey-brown, with two long, marginal, black bristles. Abdomen brown, with segmentations paler; first segment with a row of black bristles on posterior margin, second with a long white bristle on each side; dorsum of abdomen with black, and sides with white, short stiff pubescence. Legs light brown, with upper surface of femora black, and apices of tibiæ and last four joints of tarsi darkened; posterior femora with one long and about three short black bristles; all tibiæ with white and black bristles. Wings very slightly tinged with brown; anterior veins brown, posterior veins black.

Female resembles the male very closely, but the thorax is somewhat lighter, and less distinctly marked.

This species bears some resemblance to *N. graminis*, but can be easily distinguished by the thoracic bristles being black instead of white, by its lighter colouring, moustache with black hairs above, instead of being entirely yellow, and thorax with two instead of one median stripe. From *N. mistipes*, *Macq.*, a South Australian species, it may be distinguished by its smaller size, lighter coloured legs, and by the scutellar bristles, and bristles fringing first abdominal segment, being black instead of yellow.

N. brunneus may be met with somewhat sparingly settled on the surface of roads, especially in the neighbourhood of the bush. I have only met with it during the month of January.

In addition to the above, there is another undescribed species of *Neoitamus*, from Western Australia, in Mr. G. H. Hardy's collection, but as it is a single female, with no very marked characteristics, I refrain from describing it until further material is available.

ABSTRACT OF PROCEEDINGS,

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18th March, 1913.

The Annual General Meeting was held at the Museum at 8 p.m., Dr. Fritz Noetling in the chair.

The Secretary read the annual report (printed in the *Papers and Proceedings* for 1912), which was adopted on the motion of Mr. T. Stephens, seconded by Mr. A. O. Green.

The Honorary Treasurer (Mr. E. L. Piesse) presented the balance-sheet, which was adopted on the motion of Mr. A. O. Green.

The following nine gentlemen, having been duly nominated, and there being no other nominations, were declared elected as members of the Council for 1913:—Dr. G. H. Butler, Dr. A. H. Clarke, Mr. Samuel Clemes, Mr. J. A. Johnson. Dr. Fritz Noetling, Mr. E. L. Piesse, Dr. J. S. Purdy, Mr. Leonard Rodway, and Dr. Gregory Sprott.

Mr. H. W. W. Echlin was appointed Auditor for 1913.

The following were elected members:—Mr. C. H. D. Chepmell, Dr. J L. Glasson, D.Sc., Mr. G. H. Hurlstone Hardy, Mr. P. H. Mitchell, M.A., and Mr. Walter Wright.

A special general meeting was held at the conclusion of the annual meeting.

Mr. E. L. Piesse moved the adoption of the following new rule:—"The Council may authorise persons not members of the Society to be present at any meeting without introduction by a member, and (notwithstanding Rule 45) to take part in the discussion of any papers."

After some discussion, it was decided to refer the rule back to the Council for re-drafting in the direction of limiting the meetings at which visitors might be asked to take part.

Monday, 14th April, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Dr. A. H. Clarke (Acting Chairman of the Council) in the chair.

Officers.

The Chairman announced that the Council at its last meeting had elected Dr. G. H. Butler to be Chairman during the current year, and had appointed himself to be Acting Chairman during the absence of Dr. Butler in Europe; and had appointed the following officers for the current year:—Mr. E. L. Piesse to be Honorary Acting Secretary, Mr. L. Rodway to be Honorary Treasurer, and Mr. J. Moore Robinson to be Honorary Librarian.

The Australasian Antarctic Expedition.

The Chairman announced that Captain J. K. Davis and Dr. Whetter, of the Australasian Antarctic Expedition, and Mr. Van der Gracht, who went to the Antarctic in the Aurora, had been invited to be present that evening, but they had been unable to remain in Hobart. Mr. C. T. Harrisson, the Tasmanian representative in the expedition, was present, however. They had heard a good deal of the risks and dangers which were incurred in the various sledging and other expeditions, and the continual risks and hardships undergone by those who were taking scientific observations. They were glad that Mr. Harrisson had returned safely, and on behalf of the Society he tendered Mr. Harrisson a hearty welcome.

Colonel Legge, as a member for Tasmania of the organising committee of the Expedition, welcomed Mr. Harrisson, and spoke of the hardihood and pluck of those who composed the Australian Expedition, and the good work they had done. Some were doubtful at the start whether Australian-born men, not accustomed to extreme cold, could stand the Antarctic climate, but they had proved that they could do so. They must give the members the highest credit for the good work they had done, but at the same time they must remember the sad deaths of those who had lost their lives in the pursuit of science. When they came to think of a young nation like Australia planning and sending out such an expedition, that alone was a wonderful thing, and a thing which had never been done before by any nation of the same age. Australia ought to be proud of what had been done. If nothing had been done but establishing a wireless station in the Antarctic, it would have gone a long way towards making the expedition a success. When the expedition was in its initial stages it was hard to get up any interest in it

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in Tasmania, but he was glad to say that after it left the sum of £500 had been voted, which had removed from the State the disgrace of not assisting the expedition. When its history was written, this expedition would stand as one of the most memorable ever undertaken to the Antarctic. He was familiar with the work of the German, French, Belgian, and English expeditions, but in no expedition, at any rate in the South, had he ever heard of such a feat being performed as that of Dr. Mawson. The loss of his two companions was bad enough for a man's nerves, but in spite of that, with a temperature 30 or 40 degrees below zero, and with winds which occasionally reached 90 miles an hour, he found his way back to his base with a sledge and two or three dogs, after 21 days over heavy and broken ice. It was one of the most wonderful feats ever done in Arctic or Antarctic exploration.

Mr. C. T. Harrisson, who was received with loud applause, returned thanks for the kindness which had been shown him, and said that he appreciated the honour of having been a representative of Tasmania in this expedition. Of the work done, he could only say that they were ambitious of carrying out more than they effected. The biological work was very disappointing, and they were six months before they saw a stone or a rock of any description, except some pebbles from the stomach of a penguin. They afterwards found that the nearest rock was 35 miles to the south-east, while in the other direction it was 60 miles away in a straight line. He could endorse all that Colonel Legge had said about the leader of the expedition, Dr. Mawson, and his organisation. They could not have had better men than Dr. Mawson, Captain Davis, and Mr. Wild, and the organisation was splendid. The food and the clothing were not only abundant, but they were the best of their kind. There was hardly a thing spoiled when the cases were opened. In regard to the ability of Australians to stand the cold, he said that two members of the expedition came from Queensland, one being from Rockhampton, and they not only stood the cold, but returned stouter and better men than when they left their homes run down by the heat.

Election of Members.

Mr. E. Morris Miller, M.A., Mr. P. R. Seager, LL.B, Mr. Hector Ross, Mr. G. M. Johnstone, LL.M., Mr. Edward Hawson, Mr. R. C. Stephens, B.A., Mr. W. Ashton Jones, Mr. L. F. Piesse, Professor J. H. Mackay, M.C.E., Mr. J. W. Green, Mr. Gordon Wood, Mr. C. E. Lord, Mr. J. C. E. Knight, and Mr. A. W. Adams, were elected members.

Exhibits.

Mr. L. Rodway exhibited a specimen of a stunted eucalyptus found by Mr. E. P. Harrison at the foot of Brown Mountain, at the entrance to Port Arthur. It is apparently a form of *Euc. globulus* Lab., rather close to the condition of that species as found in Gippsland, and differs from the type in the smaller, less falcate, leaves, the flowers smaller and in threes, and the fruit smaller, less rugose, with a rather sunk capsule. The tree appears to be rather close to the form recently described by R. T. Baker as *Euc. unialata*, but it may for the present very well be referred to as *Euc. globulus* var. *Harrisoni*. Some Eucalypts respond in a remarkable manner to change of environment, and it will be very interesting to note the result of growing this tree from seed on good garden soil.

Mr. Rodway also exhibited a specimen of bluegum timber, which had been taken from a beam in the old Barracks at Hobart, and had done duty for nearly a hundred years, and yet was perfectly sound and fresh.

A pair of large tumors from the stem of a small sassafras were also shown by Mr. Rodway. The cause of the enlargement in each case was a stump of dead branch about an inch long. Sassafras has the peculiar habit of shedding its dead branches with a clear line of demarcation, leaving a concave smooth scar, which readily becomes covered with advancing tissue. In these instances the branches appear to have been broken off at an inch from the base, and the stumps were not rejected. New tissues covering them were stimulated in some manner to excessive growth, with the result that these large galls were produced. The tissue of the galls was normal zylem.

Mr. C. T. Harrisson exhibited some sketches made in the Antarctic.

Papers.

The following papers were read:—

"A Rectification in the Cartography of North-East Tasmania." By Colonel W. V. Legge, F.R.G S.

"The Height of Ben Lomond." By L. F. Giblin, B.A., E. L. Piesse, B.Sc., LL.B., and H. R. Hutchison, authorised surveyor.

1913.

"On the Relation between the Loss of Energy of Cathode Rays and the Ionisation produced by them." By J. L. Glasson, B.A., D.Sc.

In introducing his paper, Dr. Glasson said that Tasmania exported last season between one and two hundred million apples. The number seemed enormous, but spread them uniformly over the whole of Tasmania, and they would be 50ft. apart. Now, imagine the whole of Tasmania covered with apples packed as tightly as they could be packed. Imagine, not a single layer only, but a pile a million miles high. If she exported a million cases a day all the year round, it would take her at least a hundred thousand years to get rid of them all. The number would be represented by a figure with sixteen noughts at the end of it. This is approximately the number of atoms there are in a pin's head. And yet we have not reached the limit of smallness. Each of these tiny atoms has a structure as complex as the solar system. Inside it there are still smaller bodies, known as electrons, whirling round in their orbits at inconceivable speed. If we could enlarge the atom to the size of a cathedral the electrons would be represented by a few particles the size of an ordinary full stop. So that the atom is really a very empty thing, and the idea suggests itself that by suitable means it should be possible to penetrate right through it. This has actually been accomplished. The discovery of radium has furnished us with a projectile which can actually pass through solid matter without making a hole. The alpha rays of radium consist of very fast moving atoms of a gas known as helium. These can actually pass through a sheet of paper, say, just as one solar system might be imagined to sweep through another such system without a single planet suffering a collision. Dr. Glasson then went on to explain that occasionally collisions do occur between atoms, and an electron is knocked off one of them, just as we can imagine a body coming from outside the solar system and knocking the earth right out of the system into free space. This process is known as ionisation. The rays shot out by radium are moving with such great velocity that they can penetrate a great distance through a gas, occasionally colliding with the atoms which they pass through. If the collisions are sufficiently severe, there is a large amount of heat and light developed. So that in a gas we can trace the path of one of these ionising rays by the trail of glowing, mangled atoms which are left behind, something like the trail of a shooting star.

19th May, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Mr. L. Rodway in the chair.

Election of Members.

The following were elected members:—Mr. J. H. Butters, Mr. H. D. Erwin, M.A., Mr. A. D. Harrison, Mr. J. F. Mather, Mrs. A. J. Moore-Robinson, Mr. A. C. Officer, Mr. T. C. Simpson, Mr. John Smithies, Mrs. Sorell, Mr. E. C. Tregear, Mr. John Wardman, Mr. J. Newham Waterworth, Miss Lucy Wayn.

Papers.

The following papers were read:—

"Notes on Hymenophyllum peltatum in Tasmania." By L. Rodway.

"A Bibliography of Proportional Representation in Tasmania." By E. L. Piesse.

"The Theory of the Quota in Proportional Representation." By E. L. Piesse.

A discussion followed the reading of Mr. Piesse's papers, in which Mr. L. F. Giblin, M.H.A., Mr. E. Morris Miller, and Dr. W. E. Bottrill took part. During the discussion Mr. Giblin suggested that the method of the uniform quota, described in the third paper as one of the party-list systems, could be used with the single transferable vote system in Tasmania.

10th June, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., His Excellency the President, Sir William Ellison-Macartney, P.C., K.C.M.G., in the chair.

Welcome to the President.

Dr. A. H. Clarke, Acting Chairman of the Council, announced that Sir William Ellison-Macartney, Governor of Tasmania, had accepted the Presidency of the Society. On behalf of the Society, Dr. Clarke welcomed His Excellency.

His Excellency said: I desire to express my grateful thanks to the members of the Royal Society for their election of me to the office of President, an office which, I believe, has been almost invariably held by my predecessors. It is therefore my duty, as well as my pleasure, to come to this meeting, and so follow their excellent example. I had the pleasure of meeting Bishop Montgomery, who was a well-known member of your Society, shortly before I left London, and he told me something about the Royal Society. I am glad that it was within my power, in these early days of my residence within the State, to come to the Society, and I hope that I shall often be able to do so. I trust also that Lady Macartney will be able to accompany me, and share the benefits and good work of the Society. I thank you all most heartily for your kind welcome.

Election of Members.

The following were elected members:—Dr. W. E. Bottrill, LL.D., Mr. R. L. Richmond, Mr. Maurice Susman, Mr. W. J. P. Burton.

Exhibits.

Mr. J. W. Beattie exhibited a Tasmanian aboriginal skull found on Tasman Island by the lighthouse-keeper, and presented to the Tasmanian Museum by the Master Warden of the Marine Board of Hobart. The skull was probably that of a woman of about 50 years, and was remarkable for an almost complete set of teeth.

Paper.

The following paper was read:—"A List of Native Words of the Oyster Bay Tribe, Van Diemen's Land." By J. W. Beattie.

Dredging in the Aurora.

Professor T. Thomson Flynn gave an account, illustrated by lantern views, of five weeks' dredging in the Aurora, of the Australasian Antarctic Expedition, in November and December, 1912.

14th July, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Mr. L. Rodway in the chair.

Assistance to Scientific Research.

The Honorary Acting Secretary drew attention to a circular which had been received from the Royal Society of South Australia, stating that it had funds available for scientific research, and inviting applications from persons requiring assistance for that object.

Exhibit.

Mr. Rodway showed some specimens of *Cyttaria gunnii*, a peculiar fungus that is found on the Tasmanian beech

(*Fagus Cunninghami*), and stated that a similar fungus was found on a closely allied species of beech in South America, and in no other part of the world.

Vacancies in the Council.

The Honorary Acting Secretary announced that Dr. J. S. Purdy and Mr. Samuel Clemes had resigned their seats in the Council, and that an election to fill the vacancies would be held at the August meeting of the Society.

Paper.

Dr. F. Noetling read a paper entitled, "Notes on the Section at One Tree Point, near Hobart."

A discussion followed, in which Mr. Rodway referred to Ettingshausen's identifications of the plant remains in the One Tree Point beds. Mr. Rodway said that nowadays plant palæontologists hesitated to identify fossil leaves by their similarity to the leaves of existing species. The leaves of plants were essentially plastic organs, of little phylogenetic value. There were three plants living to-day in Tasmania—one a composite, one a heath, and one a stylidium—whose leaves could not be distinguished from one another. The fruits found in the One Tree Point leaf beds led one to suppose that the plants that formed them belonged to the proteaceous family. They certainly did not belong to any European family of plants.

11th August, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Mr. L. Rodway in the chair.

Election of Members of Council.

Professor T. Thomson Flynn and Dr. J. L. Glasson, being the only members nominated to fill the vacancies in the Council caused by the retirement of Dr. J. S. Purdy and Mr. Samuel Clemes, were declared elected.

Election of Members.

The following were elected members:—Mr. T. C. Brammall, M.A., Mr. W. C. Annells, M.A.

Paper—Educational Experiments.

Mr. J. A. Johnson, Principal of the Philip Smith Training College, read a paper, entitled "Recent Developments in Experimental Pedagogy."

In the course of his paper, Mr. Johnson observed that, 30 years ago, a competent observer would have hesitated to claim for education the dignity of being even the beginnings of a science, but to-day he would speak with the voice of hopefulness. Science now seemed to have claimed for itself the field of education, and was using therein with success the instruments of observation and experiment. The practical man was looking forward to a greater degree of certainty in co-ordinating the work of the schoolroom with that of everyday life, and hoped the day was close at hand when Bernard Shaw's epigram, "My education was interrupted by my schooling," would cease to be applicable. The educationalist, seeing the transformation that had taken place in the world as a result of science, was hopeful that the same means would produce no less brilliant transformations in his own particular department. The age of mere speculation was passing away, and the time was close at hand when vague impressions would be replaced by the emphatic utterances of positive science. On the one hand they saw a keen interest in the raw material of education. A class of men, not teachers, but mostly doctors, were establishing a separate department of work, and were tabulating the results of thousands of experiments in well-defined directions. On the other hand, the practical men were more or less dissatisfied with the present conditions of working. Between the two stood the child, the object of the experiment and the one to be taught. It must be recognised at the outset that the function of the experimenter was subject to much limitation, but this would not prevent him from taking a permanent place in solving problems which often blocked the road to reform. The movement that was known as experimental pedagogy had its commencement towards the close of last century in what was known as child-study. As chemistry had its origin in alchemy, and astronomy in astrology, so the new science of education had begun in simple experiments. One of the results of the movement had been the advent of the medical officer in the school, and another had been the introduction of humane methods of treating defectives. Another significant feature was the abandonment of the old method of repression, and everywhere spontaneity was encouraged. There was no worse sign in a child than the attitude of doing nothing at all, and there was no worse sign in the teacher than the neglect to develop the child's powers of self-activity and originality. The author then dealt at some length with the various means by which the physical and mental qualities of children were studied, and the

information which had been thus derived. He said that one discovery was that the endurance of boys was greater than that of girls, at all ages, and this difference became very striking during adolescence. In generalising on the results of experiments of this nature, the first question that faced the experimenter was how far did the physical and mental developments influence one another? Did the admission of children of an early age to school tend to hinder their physical development? In regard to this latter question, very accurate measurements could be taken by even unskilled persons. It had been found that the relative growth of the various parts of the body varied very considerably during normal growth, and in some years was quicker than others. An authority on the subject had said that anthropometry had been able to lay down very few universal laws. The present paper only touched the fringe of the subject, which was one of vast importance, and required years of study. Why should not the University of Tasmania take up this work, if only in a small way? One of the promising graduates might be chosen and sent to Germany, England, and America to study the subject, and on his return work with the lecturers on education and mental science. Such a scheme would be in keeping with the splendid forward movement that was taking place in our University. A laboratory for work of this nature could be equipped at a cost of £70, and all that was wanted was a man to do the work. In Tasmania we had only small numbers for work of this kind, and there must be large numbers for comparative purposes, but even here we could do something in the way of experimental education.

The paper was illustrated by a number of lantern slides of the apparatus used in the study of the physical and mental characteristics of children.

A discussion followed, in which Mr. L. F. Giblin, M.H.A., and Messrs. J. A. McElroy, S. R. Dickinson, L. Dechaineux, G. V. Brooks, and Newham Waterworth joined.

8th September, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Dr. A. H. Clarke in the chair.

Election of Member.

Mr. C. E. Masterman was elected a member.

1913.

Papers.

The following papers were read:—

"Some Australian Brachiopods." By Professor Friedrich Blochmann, of Tübingen (communicated by Mr. W. L. May).

"Notes on the List of Native Words of the Oyster Bay Tribe presented by Mr. J. W. Beattie at the June meeting." By H. B. Ritz, M.A.

Monday, 13th October, 1913.

The Monthly Meeting of the Society, falling on 13th October, was made the occasion of a celebration of the Seventieth Anniversary of the Society, which was founded on 14th October, 1843.

His Excellency the President, Sir William Ellison-Macartney, was in the chair, and the Society's room was crowded with members and their friends.

Mr. Thomas Stephens, the senior member of the Society, sent a letter regretting that he was not able to be present. Apologies were also received from Dr. A. H. Clarke and Colonel W. V. Legge.

Exhibits and Presentations.

Professor T. Thomson Flynn exhibited some *Pycnogonida* (sea spiders) collected by the Australasian Antarctic Expedition.

Mr. J. R. Chapman exhibited a specimen of Milparinka sandstone, some handsome specimens of petrified wood, opal, and gypsum, from New South Wales; and a fossil jawbone form Cheltenham, Victoria—which he was about to present to the Tasmanian Museum.

Mr. J. C. E. Knight presented a set of E. J. Lowe's "Ferns, British and Exotic," 8 volumes. (London, 1856-1860.)

Mrs. Russell Young presented a portrait of the late Mr. Russell Young, for many years a member of the Society.

Mr. T. W. Fowler presented to the Society—

1. A facsimile of "Chart of Terra Australis, by M. "Flinders, Comm. of H.M. Sloop Investigator, South Coast, "Sheet V., 1798, 1802 & 3," published with Flinders' "Voyage to Terra Australis" in 1814. This shows the coast-lines bounding Bass' Strait, and the islands in it, as laid down by Flinders from his own and other surveys available to him; and his own work on the coast-line, and his soundings, are distinguished from the work of others.

Later editions do not discriminate between the work of the various explorers.

2. A photograph of "A Chart of Basses Strait between "New South Wales and Van Diemen's Land surveyed by "Lieut. Flinders of His Majesty's Ship Reliance by order "of His Excellency Governor Hunter, 1798-9," published by A. Arrowsmith of London, 16th June, 1801; from the copy in the Petherick collection in the Commonwealth Library. This chart, Mr. Fowler remarked, "clearly shows "that the Hunter Islands were laid down by Flinders with "considerable accuracy long before the Baudin expedition "left France, and hence that an attempt made to alter "Flinders' names is unwarranted."

3. A photograph of a later copy of the same in the Public Library of New South Wales.

4. A photograph of four charts on one sheet, published by Arrowsmith; from a copy in the Public Library of New South Wales. These include plans of Twofold Bay, Western Port (from Bass' eye-sketch, of which, according to Bladen, no copy was known to exist), and Port Dalrymple (River Tamar)—the latter being of interest as showing Flinders' survey of that river.

Seventieth Anniversary of the Society.

In commemoration of the foundation of the Society on 14th October, 1843, the Honorary Acting Secretary (Mr. E. L. Piesse) read a paper on the "Foundation and Early Work of the Society."

His Excellency said they must all be extremely grateful to their secretary for his paper. They had now attained a very respectable age, and since they had made so few mistakes in the past they could look forward to the future with confidence. Though they were only 70 years old as the Royal Society of Tasmania, he could not dissociate the Society from the earlier Van Diemen's Land Scientific Society of 1829, which was founded in the good old British way, with a very solid dinner and a very long toast list. A thing worth noting was the alacrity with which the early settlers supported a society which could not advance their purely material interests. It showed they had a very considerable conception of the future of the island, and a desire to widen the bounds of knowledge. The Society had certainly done much for Tasmania. In proof of that they had only to point to the Botanical Gardens. What would have been the fate of the Gardens if the Society had not taken up the responsibility of them in Sir Eardley Wilmot's days? The origin of the Society was a curious one; it began with a revolutionary coup, carried out by the Governor of the day, a coup as bold and daring in its way as that by which Louis Napoleon founded the Third Empire. There were some curious human touches in the history Mr. Piesse had put before them. For instance, there was the curious rule that no lady member should change her proxy within 12 months. He wondered if the secretary had discreetly concealed from them what the records of the Society contained on this point. Was it that the male members of the Society felt they could not possibly deserve the confidence of the lady members for more than 12 months, or did they have their doubts about the stability of the female mind? On behalf of all the members he tendered their most grateful thanks to Mr. Piesse for presenting to them such a clear, concise, and interesting narrative of the Society's early history.

A number of books, documents, and portraits connected with the early years of the Society were shown. Among these were the Minute Book of the Tasmanian Society for 1841; a list of the original Fellows of the Society; the first book purchased for the Society's library (Loudon's "Encyclopædia of Plants," purchased in 1846); a book presented by the University of Cambridge in 1847 (the first presentation to the library); the visitors' books of the Society's Museum from 1852 to 1860, and of the Gardens from 1856 to 1859; a microscope by Andrew Ross, formerly the property of Mr. J. E. Bicheno, F.R.S., F.L.S., purchased for the Society by direction of Sir William Denison in 1851, and afterwards the subject of a debate in the Legislative Council on 28th January, 1852; and portraits of early Presidents and members.

Other Papers.

The following papers were taken as read:—

"Tasmanian Bryophyta" (continued). By L. Rodway.

"Some New Australian Asilidæ (Diptera)." By Arthur White.

"Notes on a Fossil Whale from Wynyard." By H. H. Scott (communicated by R. N. Atkinson).

11th November, 1913.

The Monthly General Meeting was held at the Museum at 8 p.m., Mr. L. Rodway in the chair.

Election of Members.

The Honorary Acting Secretary read a notification from the Council that it had nominated Dr. Douglas Mawson, leader of the Australasian Antarctic Expedition for election as an honorary member, under Rule 17. Dr. Mawson, being balloted for, was duly elected.

Mr. Loftus Hills, M.Sc., and Mr. G. W. K. Ife, LL.B., were elected ordinary members.

Exhibit.

Mr. H. M. Nicholls showed a microscope by Ross and Co. of the most recent pattern, lent for exhibition by the Government Bacteriologist, Dr. Nairn Butler. With this microscope were placed two others of older patterns by the same firm belonging to the Society, and Mr. Nicholls illustrated several features in the development of the microscope by reference to these instruments. The oldest instrument, formerly the property of Mr. J. E. Bicheno, Colonial Secretary, and acquired by the Society in 1851 (see page 293), was of the earliest pattern made by Andrew Ross, the founder of the firm of Ross and Co., of London, and dated from the thirties of the last century. Ross, working on Lister's computations, found that when an objective was corrected for an uncovered object, the correction was disturbed by the introduction of a cover glass. After much experiment he found that this error could be removed by altering the positions of the component lenses of the combination, and he devised for this purpose a sliding cap, which moved up and down upon the barrel of the objective. This sliding cap—the first attempt at cover-glass correction ever made—was fitted to the objectives of Mr. Bicheno's microscope. The microscope was in good order, and capable of doing excellent work. It possessed a remarkably efficient fine adjustment of the micrometer screw order. The second instrument—formerly the property of the late Mr. W. Valentine, of Campbell Town—was of the last type made by Andrew Ross; it dated from about the fifties. The third instrument, by the present firm of Ross and Co., had the most recent improvements used by that firm. The three together formed an interesting illustration of the development of the microscope.

Papers.

The paper by Mr. Ritz read in title at the September meeting, and the papers by Messrs. Scott and White, read in title at the October meeting, were discussed.

ANNUAL REPORT.

The Royal Society of Tasmania,

1913.

Patron:

HIS MAJESTY THE KING.

President:

HIS EXCELLENCY SIR WILLIAM GREY ELLISON-MACARTNEY, P.C., K.C.M.G., GOVERNOR OF TASMANIA.

Vice-Presidents:

Council:

Elected 18th March, 1913.

THE HON. G. H. BUTLER, M.R.C.S., L.R.C.P., M.L.C. *(Chairman).*

A. H. CLARKE, M.R.C.S., L.R.C.P.

SAMUEL CLEMES *(resigned July, 1913)*

J. A. JOHNSON, M.A.

FRITZ NOETLING, M.A., Ph. D.

E. L. PIESSE, B.Sc., LL B.

J. S. PURDY, M.D., D.P.H. *(resigned July, 1913)*

LEONARD RODWAY.

GREGORY SPROTT, M.D., C.M.

Elected 11th August, 1913.

PROF. T. THOMSON FLYNN, B.Sc.

J. L. GLASSON, B.A., D.Sc.

Secretary:

Honorary Acting-Secretary:

E. L. PIESSE.

Honorary Treasurer:

LEONARD RODWAY.

Auditor:

H. W. W. ECHLIN.

Honorary Members:

David, T. W. Edgeworth, C.M.G., B.A., F.R.S., F.G.S. Professor of Geology in the University of Sydney. The University, Sydney.

Mawson, Douglas, B.E., D.Sc. Lecturer on Mineralogy and Petrology in the University of Adelaide. The University, Adelaide.

Shackleton, Sir Ernest H., Kt., C.V.O., F.R.G.S., F.R.A.S. 9 Regent-street, London, S.W., England.

Spencer, W. Baldwin, C.M.G., M.A., F.R.S. Professor of Biology in the University of Melbourne. The University, Melbourne.

Ordinary, Life, and Corresponding Members:

"C," Corresponding Member.
"L," Member who has compounded subscriptions for life.
*, Member who has contributed a Paper read before the Society.

Year of Election.		
1913		Adams, A.W. 24 Grosvenor Street, Queenborough.
1901		Allwork, F., L.S.A. (died 26th April, 1913).
1913		Annells, W. C., M.A. Friends' High School, Commercial Road, New Town.
1912		Atkinson, R.N. Sulphur Creek.
1912		Bagley, W. A. Wentworth Street, Hobart.
1884	C	*Bailey, F. Manson, C.M.G., F.L.S. Government Botanist, Queensland.
1908	L	Baker, Henry D. C/o American Consulate, Hobart.
1887		Barclay, David. 143 Hampden Road, Hobart.
1907	L	Baring, Rev. F. H., M.A., F.R.G.S. Triabunna.
1890		*Beattie, J. W. 1 Mount Stuart Road, Hobart.
1901	C	Benham, W. B., M.A., D.Sc., F.R.S., F.Z.S. Professor of Biology, University of Otago. Dunedin, New Zealand.
1903		Bennett, W. H. "Ashby," Ross.
1900		Bennison, Thomas. 29 Cromwell Street, Hobart.
1873		Bidencope, Joseph. "Bartonvale," Salvator Rosa Glen, Hobart.
1912		Black, R. A. Chief Clerk, Department of Agriculture. 48 High Street, Queenborough.
1909		*Blackman, A. E. Franklin.

1913.

Year of Election.		
1913		Bottrill, W. E., LL.D. 7 Elphinstone Road, Hobart.
1892	C	Bragg, W. H., M.A., F.R.S. Cavendish Professor of Physics in the University of Leeds. University, Leeds.
1904		Brain, Rev. Alfred, M.A. (resigned June, 1913).
1913		Brammall, T. C., M.A. "Blenheim," Brisbane Street, Hobart.
1900		*Brettingham-Moore, G. E. 294 Davey Street, Hobart.
1911		Brooks, G. V. Master of Method, Elizabeth Street Practising School, Hobart. Main Road, New Town.
1907		Brownell, F. L. "Leura," Main Road, Moonah.
1900		*Burbury, F. E. South Esk Street, Trevallyn.
1879		Burgess, The Hon. W. H. "Milliara," Mona Street, Hobart.
1913		Burton, W. J. P. Organising Teacher of Nature Study in the Education Department. "Matlock Dale," Claremont.
1861		Butler, Francis. Garden Crescent, Hobart.
1896		Butler, The Hon. G. H., M.R.C.S., L.R.C.P., M.L.C. Chief Secretary of Tasmania. 138 Macquarie Street, Hobart.
1912		Butler, H. N., M.B., B.S. 182 Macquarie Street, Hobart.
1909		Butler, W. F. D., B.A., M.Sc., LL.B. Bishop Street, New Town.
1913		Butters, J. H. Kingston Road, Lower Sandy Bay.
1912		Chapman, J. R. Holebrook Place, Hobart.
1901	C	Chapman, R. W., M.A., B.C.E. Elder Professor of Mathematics and Mechanics in the University of Adelaide. The University, Adelaide.
1913		Chepmell, C. H. D. Clerk of the Legislative Council. 23 Swan Street, Hobart.
1896		*Clarke, A. H., M.R.C.S., L.R.C.P. 175 Macquarie Street, Hobart.
1887		Clemes, Samuel. Principal of Leslie House School. Clare Street, New Town.
1910		Clemes, W. H. Leslie House School, Argyle Street, New Town.
1877		*Crouch, E. J., M.R.C.S., L.S.A. 184 Macquarie Street, Hobart.

Year of Election.		
1912		Crowther, W. L., M.B., B.S. "Coreen," 147 Macquarie Street, Hobart.
1884		Davies, The Hon. C. E., M.L.C. "Lyndhurst," New Town Road, New Town.
1884		Davies, Sir J. G., M.H.A. (died 12th November, 1913).
1908		Dechaineux, Lucien. Principal of Technical School, Hobart. Moonah.
1903		Delany, Most Rev Patrick. Archbishop of Hobart. 99 Barrack Street, Hobart.
1892	C	Dendy, A., D.Sc., F.R.S., F.L.S. Professor of Zoology in the University of London (King's College). "Vale Lodge," Hampstead, London, N.W.
1911		Dickinson, S.R., M.A. Principal of Leslie House School. Leslie House School, Argyle Street, New Town.
1861		Dobson, The Hon. Henry. Elboden Street, Hobart.
1909		*Dove, H. Stuart. West Devonport.
1911		Dunbabin, Thomas, M.A. 22 Lansdowne Crescent, Hobart.
1908		Ernst-Carroll, Frederick J., M.Sc., F.R.G.S., F.G.S. 23 Bel-Air, Neuchatel, Switzerland.
1913		Erwin, H. D., B.A. Christ's College, Macquarie Street, Hobart.
1909		Fereday, Mrs. R. W. Holebrook Place, Hobart.
1902		Finlay, W. A. 11 Secheron Road, Hobart.
1909		*Flynn, T. Thomson, B.Sc. Ralston Professor of Biology in the University of Tasmania. D'Arcy Street, Hobart.
1890	L	Foster, H. D. 137 Hampden Road, Hobart.
1905	L	Foster, J. D. "Fairfield," Epping.
1913		Fowler, T. W., M.C.E. Engineer-in-Chief of Tasmania. Public Works Department, Davey Street, Hobart.
1908		*Giblin, L. F., B.A., M.H.A. 326 Macquarie Street, Hobart, and "Cobbler's End," Cambridge.
1896		Giblin, W. W., M.R.C.S., L.R.C.P. 142 Macquarie Street, Hobart.
1911		Gibson, G. H., M.B., C.M. 177 Macquarie Street, Hobart.

1913. Year of Election.		
1913		*Glasson, J. L., B.A., D.Sc. Lecturer in Physics in the University of Tasmania. "Woodbourne," Davey Street, Hobart.
1907		Gould, H. T. 324 Murray Street, Hobart.
1907		Gould, Robert. Longford.
1911		Gower, E. I., B.A. Principal of Friends' High School. Commercial Road, New Town.
1905	L	Grant, C. W. "High Peak," Huon Road.
1892		*Green, A. O. Bellerive.
1913		Green, J. W. State High School, Elizabeth Street, Hobart.
1911		*Hall, Robert, C.M.Z.S. Bellerive.
1901	C	*Hall, T. S., M.A., D.Sc. Lecturer in Biology in the University of Melbourne. The University, Melbourne.
1913		Hardy, G. H. Hurlstone. Assistant-Curator of the Tasmanian Museum. The Museum, Argyle Street, Hobart.
1913		Harrison, A. D. "Rosevale," Hayes.
1898		Harrison, M. W. Glenorchy.
1907		Harrisson, E. P. Bellerive.
1893		Harvey, W. A., M.B. 154 Macquarie Street, Hobart.
1902	C	Haswell, William, M.A., D.Sc., F.R.S., F.L.S. Challis Professor of Biology in the University of Sydney. The University, Sydney.
1913		Hawson, Edward. "Remine," 174 Argyle Street, Hobart.
1913		Hills, Loftus, M.Sc. Assistant Government Geologist. Geological Survey, Launceston.
1908		Hogg, G. H., M.D., C.M. 37 Brisbane Street, Launceston.
1892		Horne, William. 16 St. George's Terrace, Hobart.
1909		*Hutchison, H. R. 1 Barrack Street, Hobart.
1913		Ife, G. W. R., LL.B. Summerhill Road, Hobart.
1912		Inglis, C. J. Holebrook Place, Hobart.
1898		*Ireland, E. W. J., M.B., C.M. 160 Elizabeth Street, Hobart.
1887	C	Jack, R. L., F.G.S., F.R.G.S.
1906		*Johnson, J. A., M.A. Principal of the Philip Smith Training College, Hobart. "Wharepuke," Argyle Street, New Town.

Year of Election.		
1873		*Johnston, R.M., I.S.O., F.S.S. Government Statistician. Tasmanian Club, Macquarie Street, Hobart.
1913		Johnstone, G. M., LL.M. Augusta Road, New Town.
1913		Jones, W. Ashton. New Town.
1911		Keene, E. H. D., M.A. "Tantallon," Tarleton.
1910		Kermode, R. C. "Mona Vale," Ross.
1905		Kerr, George. 165 Campbell Street, Hobart.
1913		Knight, J. C. E. "Windermere," Claremont.
1873		*Legge, Col. W. V., R.A. (R.). "Cullenswood House," Cullenswood.
1887		Lewis, Sir Neil Elliott, K.C.M.G., M.A., B.C.L., LL.B., M.H.A. "Werndee," Augusta Road, New Town.
1902		Lewis, R. C. Moore Street, New Town.
1912		Lindon, L. H., M.A. Warden of Christ's College, Hobart. "The Lodge," Park Street, Hobart.
1900		Lines, D. H. E., M.B., Ch.B. Archer Street, New Town.
1875	C	Liversidge, Professor Archibald, M.A., LL.D., A.R.S.M., F.R.S., F.I.C., F.C.S., F.G.S., F.R.G.S. "Fieldhead," Coombe Warren, Kingston, Surrey, England.
1913		Lord, Clive E. "Lauramont," High Street, Queenborough.
1912		Lovell, S. O. Queenborough.
1912		McAlister, Miss M. K. The University, Hobart.
1893		*McAulay, Alexander, M.A. Professor of Mathematics in the University of Tasmania. The University, Hobart.
1884	L	*McClymont, J. R., M.A. Grosvenor Street, Queenborough.
1911		McCoy, W. T., B.A. Director of Education. 20 Adelaide Street, Hobart.
1908		McElroy, J. A. Principal of Franklin House School. 179 Davey Street, Hobart.
1870		Macfarlane, The Hon. James. "Newlands," Augusta Road, New Town.
1913		Mackay, J. Hilton, M.C.E. Professor of Engineering in the University of Tasmania. The University, Hobart.

1913.

Year of Election.

1901 MacLeod, P. J., B.A. Lecturer in Chemistry in the University of Tasmania. Technical School, Hobart.

1902 C *Maiden, J. H., F.L.S., F.C.S. Director of Botanic Gardens, Sydney, and Government Botanist, New South Wales. Botanic Gardens, Sydney.

1912 Maskell, J. W., M.R.C.S., L.R.C.P. 152 Macquarie Street, Hobart.

1907 Mason, Michael. 4 Mount Stuart Road, Hobart.

1913 Masterman, C. E. Derwent House, Lower Sandy Bay.

1913 Mather, J. F. 1 Mount Stuart Road, Hobart.

1895 *May, W. L. Sandford.

1909 Millen, J. D. Mount Bischoff Mine, Waratah.

1913 Miller, E. Morris, M.A. Lecturer in Philosophy and Economics in the University of Tasmania. 38 Church Street, Hobart.

1907 Miller, Lindsay S., M.B., Ch.B. 156 Macquarie Street, Hobart.

1894 L Mitchell, J. G. "Ellesmere," Jericho.

1913 Mitchell, P. H., B.A. Headmaster of the State High School, Hobart. Ashfield Street, Queenborough.

1911 Montgomery, R. B. Park Street, New Town.

1911 Moore-Robinson, J., F.R.G.S. Lambert Avenue, Queenborough.

1913 Moore-Robinson, Mrs. J. Lambert Avenue, Queenborough.

1882 Nicholas, G. C. "Cawood," Ouse.

1910 Nicholls, H. Minchin. Vegetable Pathologist and Entomologist in Department of Agriculture. Macquarie Street, Hobart.

1907 *Noetling, Fritz, M.A., Ph.D. "Chatsworth," New Norfolk.

1913 Officer, A. C. "Hallgreen," New Norfolk.

1899 Parker, A. C. "Charlton," Augusta Road, New Town.

1908 Parsons, Miss S. R. 190 Davey Street, Hobart.

1909 Pearce, E. H. 103 Hampden Road, Hobart.

1909 Pedder, Alfred. Stoke Street, New Town.

1902 *Piesse, E. L., B.Sc., LL.B. "Neika," Bay Road, New Town.

Year of Election.		
1913		Piesse, L. F. "East Bank," High Street, Queenborough.
1910		Pillinger, James. Railway Department, Hobart.
1912		Pollard, Rev. Ambrose. "Roseleigh," Davey Street, Hobart.
1908		Pratt, A. W. Courtney. 11 Swan Street, Hobart.
1910		Purdy, J. S., M.D., D.P.H. City Health Department, Sydney.
1911		Reid-Bell, W. Burnie.
1913		Richmond, R. L. "Gagebrook," Old Beach.
1904		*Ritz, H. B., M.A. Lecturer in Modern Languages in the University of Tasmania. 40 Lochner Street, Hobart.
1864		Roberts, H. L. "Beaumaris," Montpelier Road, Hobart.
1884		*Rodway, Leonard. High Street, Queenborough.
1913		Ross, Hector. Sheriff of Tasmania. Elphinstone Road, Hobart.
1896		Scott, R. G., M.B., Ch.M. 172 Macquarie Street, Hobart.
1913		Seager, P. R., LL.B. Lindisfarne.
1892	C	*Shirley, John, D.Sc. Inspector of Schools, Queensland. "Colarmie," Brunswick Street, New Farm, Brisbane.
1901		Shoobridge, Canon G. W. 3 Molle Street, Hobart.
1873		Shoobridge, W. E. "Bushy Park," Glenora.
1909		Simmons, M. W. A.M.P. Buildings, Elizabeth Street, Hobart.
1913		Simpson, T. C. 1 Fitzroy Place, Hobart.
1875		*Simson, Augustus. 49 High Street, Launceston.
1901	C	Smith, R. Greig-, D.Sc. Linnean Hall, Elizabeth Bay, Sydney.
1913		Smithies, John. Lindisfarne.
1913		Sorell, Mrs. "Thornycroft," 313 Macquarie Street, Hobart.
1912		Spencer, H. J. Boa Vista Road, New Town.
1896	L	*Sprott, Gregory, M.D., C.M. 134 Macquarie Street, Hobart.
1911		Stephens, A. A., B.A. Lindisfarne.

1913.

Year of Election.		
1913		Stephens, R. C., B.A. State High School, Elizabeth Street, Hobart.
1858		*Stephens, Thomas, M.A., F.G.S. (died 25th November, 1913).
1896	L	Sticht, Robert, B.Sc., E.M. Mount Lyell Mine, Queenstown.
1913		Susman, Maurice. 88 Murray Street, Hobart.
1912		Tabart, T. A., junior. New Town Road, New Town.
1907		Tarleton, J. W. 108 High Street, Queenborough.
1887		*Taylor, A. J. Librarian of the Tasmanian Public Library. 28 D Arcy Street, Hobart.
1892	C	*Thomsen, G. M., F.L.S. Dunedin, New Zealand.
1913		Tregear, E. C. Cross Street, New Town.
1911		Tucker, A. R. Bellerive.
1896		*Twelvetrees, W. H., F.G.S. Government Geologist. Geological Survey, Launceston.
1889		Walch, Charles E. 97 Davey Street, Hobart.
1901	C	Wall, Arnold, M.A. Professor of English Language and Literature in Canterbury College. Christchurch, New Zealand.
1913		Wardman, John. Superintendent of the Botanical Gardens. Botanical Gardens, Hobart.
1896		Watchorn, A. D. 6 Mona Street, Hobart.
1912		Waterhouse, L. L., B.E. Assistant Government Geologist. Geological Survey, Launceston.
1913		Waterworth, Newham. Lindisfarne.
1902		Watson, Horace. 55 High Street, Queenborough.
1913		Wayn, Miss Lucy. "Fairfield," 246 Campbell Street, Hobart.
1865		Webster, A. G. Holebrook Place, Hobart.
1907		Webster, C. E. Kingston Road, Lower Sandy Bay.
1884		*Weymouth, W. A. 139 Goulburn Street, Hobart.
1912		*White, Arthur. "Broomhill," Mangalore.
1901		Wise, H. J. 4 Colville Street, Hobart.

Year of Election.		
1903		Wolfhagen, Waldemar. Augusta Road, New Town.
1913		Wood, Gordon. State High School, Elizabeth Street, Hobart.
1912		Woods, E. A. The University, Hobart.
1897	C	Woodward, B. H., F.G.S. Director of the Western Australian Museum and Art Gallery. Perth, Western Australia.
1913		Wright, Walter. Headmaster of Central State School. Liverpool Street, Hobart.

Members are asked to inform the Secretary of any change of address or other necessary correction.

ANNUAL REPORT.

In accordance with Rule 39, the Council present a Report on the proceedings of the Society during the year 1913.

The Council and Officers.

At the Annual General Meeting, held on 18th March, the following were elected members of the Council for the year:—The Hon. G. H. Butler, Dr. A. H. Clarke, Mr. Samuel Clemes, Mr. J. A. Johnson, M.A., Dr. Fritz Noetling, Mr. E. L. Piesse, B.Sc., LL.B., Dr. J. S. Purdy, Mr. Leonard Rodway, and Dr. Gregory Sprott. Mr. Clemes and Dr. Purdy sent in their resignations early in July, and at the August meeting Professor T. Thomson Flynn, B.Sc., and J. L. Glasson, B.A., D.Sc., were elected in their places.

Dr. Butler was elected Chairman of the Council, and was given leave of absence during a visit to Europe from April to November. Dr. A. H. Clarke was elected Acting Chairman during Dr. Butler's absence.

The term of Mr. Robert Hall's engagement as Secretary expired in March, and, as the Council wished that the proportion of the Society's income spent in salaries should be diminished, Mr. E. L. Piesse consented to act as Honorary Secretary, and Mr. J. Moore Robinson as Honorary Librarian.

An address was presented on behalf of the Society to Sir William Ellison-Macartney, Governor of Tasmania, on his arrival in Tasmania in June, and His Excellency was pleased to accept the Presidency. of the Society.

The Council elected Drs. Clarke, Noetling, and Sprott, and Messrs. Clemes, Johnson, and Rodway, to be Trustees of the Museum during the current year. Mr. Clemes's seat became vacant when he resigned from the Council, and Mr. Piesse was elected in his place.

The Council held eight Ordinary Meetings and one Special Meeting in the period from the Annual Meeting to the end of the year. The attendance of each member, and the number of meetings held during his membership, was as follows:—Dr. Butler, absent on leave; Dr. Clarke, 8 (9); Mr. Clemes, 2 (3); Professor Flynn, 2 (3); Dr. Glasson, 3 (3); Mr. Johnson, 7 (9); Dr. Noetling, 8 (9); Mr. Piesse, 9 (9); Dr. Purdy, 2 (3); Mr. Rodway, 9 (9); Dr. Sprott, 3 (9).

Meetings of the Society.

Eight Monthly General Meetings, and one Special General Meeting (immediately following the Annual Meeting) of the Society, were held during the year. Sixteen papers were read during the session.

Members.

During the year 43 candidates were elected to the Society, of whom 41 accepted the obligations of membership. The Society lost 13 members through death, resignation, or change of residence. The number of ordinary members at the end of the year was 157, the largest for over fifty years. There were also 9 members who have compounded their subscriptions for life, 4 honorary members, and 15 corresponding members.

The Council has to record the deaths of several of the oldest members of the Society, including Mr. Russell Young and Mr. Thomas Stephens, who were members of the Council for many years. Obituary notices of the deceased members will be found at the end of the Report.

Papers and Proceedings.

An arrangement was made for a better quality of paper for the "Papers and Proceedings" for 1913, and improvements have been made in the printing. The increase in the Society's membership and the additional exchanges which have been arranged have necessitated a larger edition of the "Papers and Proceedings," and the Council ordered 450 copies for 1913, in place of 350 hitherto printed. The Council is anxious to introduce further improvements in the format of the Society's publications, but it has resolved that for the present the needs of the library are more urgent.

In the "Papers and Proceedings" for 1912, there were published the first parts of a complete revision of the Bryophyta of Tasmania, by Mr. L. Rodway. A further part of this paper, completing the Mosses, is published in the volume for 1913. Mr. Rodway has been at the expense of having some additional copies of his paper printed, and has presented them to the Society for sale. The various parts have been bound together, paged consecutively, and issued as a separate volume. *

The Society is indebted to the Chairman of the Council for arranging for the Society to obtain for the "Papers and Proceedings," at a small cost, copies of two papers, by Mr. E. L. Piesse, on Proportional Representation, which were issued also as State publications by the Electoral Department.

A map of Ben Lomond, by Colonel Legge, an old and much esteemed member of the Society, is published with the "Papers and Proceedings" for 1913, in illustration of a paper in which Messrs. Giblin, Piesse, and Hutchison gave an account of their determination of the height of Legge Peak, now found to be the highest summit in Tasmania. The Council was anxious that Colonel Legge's map should be reproduced in the best style, and arrangements were made, through the kind offices of the Agent-General for Tasmania, for the map to be printed at the Ordnance Survey, Southampton. Before the printing of the map, the Tourist Associations in Hobart and Launceston agreed to purchase 100 copies each, and the expense of the map has thus been much lessened.

A catalogue of Tasmanian newspapers, commencing in 1810, is in preparation, and it is hoped to publish it in the "Papers and Proceedings" for 1914.

The Library.

The Council found that the Society's Library had long overgrown the accommodation provided for it. Not only was there no shelving for many of the books which were in the library-room, but many hundreds of volumes were in other rooms in the Museum, in the basement, and in cupboards. A rearrangement of the books, and the removal of many duplicates to a storeroom, gave some additional space; and the Council also installed additional shelving, which will accommodate about 1,200 volumes. It is still necessary, however, to keep many books in

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* Copies are not available for presentation.

1913.

other rooms, in addition to the Medical Library, which has for many years been separated from the general Library. The Council records with pleasure its appreciation of the help given by Mr. J. Arnold, the Caretaker of the Museum, in the rearrangement of the Library.

The Library has twice been catalogued, in 1856 and 1885. The last Catalogue, which has many defects in classification and arrangement, has become almost useless, for the Library has twice been rearranged, and no convenient record of additions has been kept. The preparation of a new subject Catalogue will perhaps prove too great a task; but it is hoped to prepare a Catalogue of the titles of the periodicals and an index of authors' names. As a preliminary to a new Catalogue, the Honorary Secretary, with the assistance of the Honorary Librarian and other members, undertook the preparation of a list of the contents of the Library, which at the same time was provisionally rearranged in accordance with the Brussels system of classification. This work has required the closing of the Library for some months, and it may be necessary during the coming year for the Council to ask members to submit to some further inconvenience while the labelling of the books and the author-index are being completed.

As a further aid to the use of the Library, the Council resolved to purchase, so far as the Society's means allowed, the Royal Society Catalogue of Scientific Papers, 1800-1900, and the International Catalogue of Scientific Literature. The Government of Tasmania, alone among the Governments of Australia, has never subscribed to the International Catalogue, and there is no set of it in Tasmania. The income of the Morton Allport Memorial Fund has not been spent in full for several years, and the Council resolved that the accumulation of income, and future income, be spent, in the main, in the purchase of these Catalogues. The income, which is about £10 a year, will not provide for purchasing more than half of the annual volumes of the International Catalogue, to say nothing of past volumes and of the 1800-1900 Catalogue; but the Council is hopeful that if the membership continues to increase it may be possible to devote some of the Society's ordinary funds to this purpose. The volumes purchased during the year were—the Royal Society Catalogue of Scientific Papers (1800-1900), Subject Index, vols. I., II., and III. (Pt. 1); International Catalogue, the first eleven issues for General Biology, Geology, and Zoology.

The Council found, however, that the most urgent need of the Library was the binding of great numbers of periodicals and other publications, which have been presented to the Society in paper-covered parts. In the early days of the Society it was possible to bind most of the presentations; but during the last 30 years many series have been left unbound. During the year the Council was able to bind about 200 volumes, at a cost of £34 6s. 9d.; but to overtake the arrears of binding, of only the publications in most frequent use, an additional expenditure of not less than £200 will be necessary.

The expenditure on the Library during the year was—from the Morton Allport Memorial Fund, £32 11s. 5d.; from the Society's ordinary income, about £70 (including postages); making a total expenditure of over £100.

The Council arranged for several new exchanges during the year, and many gaps in the series of publications in the Library were filled by presentations from Societies and Institutions. A list of the Institutions, etc. (numbering 148), to which the Society's publications are presented, is appended to this Report.

A complete list of the Society's publications, with the prices at which they can be purchased by the public, was prepared and circulated early in the year. The publication of this list has resulted in some increase in the receipts from sales.

The Council takes this opportunity to remind members that the collection of books on the history of Tasmania in the Society's Library, although extensive already, could be added to considerably. The Council will welcome presentations not only of books, but of pamphlets and documents, which may be of little interest now, but may become of great value in the future. Not the least valuable of the books in the Library are some books and pamphlets presented in the early years of the Society, which, though common then, have now become both rare and interesting.

The Council has authorised the purchase of a safe or chest for the custody of manuscripts and rare books belonging to the Society.

The Council thinks it is very desirable that, when the cataloguing of the library has been completed, an attendant acquainted with its contents should be present whenever the library-room is open. If such supervision can be provided, the Council sees no reason why the public should not be admitted to the room. The library was originally intended to be a public one, and there are probably many outside the Society who would be glad to use the books.

1913.

The privilege of borrowing would, of course, still be confined to members.

The number of volumes and pamphlets (excluding duplicates) in the library is about 9,000.

Psychology and Education Section.

Seven Meetings of the Psychology and Education Section were held during the year, with an average attendance of ten members.

Mr. L. H. Lindon was elected Chairman of the Section, and Mr. J. A. Johnson Secretary. The members of the Section were Messrs. W. C. Annells, T. C. Brammall, G. V. Brooks, S. Clemes, W. Clemes, L. Dechaineux, S. R. Dickenson, E. I. Gower, J. A. Johnson, L. H. Lindon, S. O. Lovell, P. H. Mitchell, J. A. McElroy, A. A. Stephens, R. C. Stephens, W. Wright, Gordon Wood.

The subjects of study centred round the recent developments in Experimental Pedagogy. The following papers were read and discussed:—

1. "The Psychological Aspect of Education." G. V. Brooks and J. A. McElroy.
2. "The Philosophical Aspect of Education." S. O. Lovell.
3. "Experimental Pedagogy" (read before the Society on 11th August). J. A. Johnson.
4. "Experimental Work in Sensation." A. A. Stephens.
5. "Experimental Results in Attention." W. Wright.
6. "Experimental Aspects of Perception and Apperception." P. H. Mitchell.
7. "Experiments in Memory." L. H. Lindon.

Miscellaneous.

During the year an application for an extension of the Museum buildings was made to the Government by the Trustees of the Museum. The Council concurred in this application, and pointed out that the present dispersion of the Library in various parts of the Museum, due to insufficient space in the Society's room, was as great a disadvantage to the Society as it was an inconvenience to the Museum.

The Seventieth Anniversary of the Society occurred during the year, and was celebrated at a successful Meeting, at which an account was read of the foundation and early work of the Society, and many books, documents, and portraits, illustrating the early years of the Society, were shown.

The collection of portraits in the Society's room was of great interest in connection with the Anniversary; but the Anniversary also served to remind the Council of the number of early members who are not thus commemorated. For most of the portraits now hanging in the room the Society is indebted to members; and it is hoped that many of the gaps may still be filled.

The Council is pleased to record an increase in the scientific staff of the University of Tasmania. An additional grant of £1,000 per annum, made by the Parliament of Tasmania in 1912, has enabled a separate Department of Physics to be established; and a capital sum of £2,000 included in the appropriations for 1913-14 will provide for additional scientific departments. The strengthening of the University will add to the scientific workers in the Society, and widen the scope of its work; but at the same time it imposes obligations on the Society, of which the Council is not unmindful, to publish researches made in Tasmania, and to provide a more adequate library of scientific periodicals.

Royal Society of Tasmania.

RECEIPTS AND EXPENDITURE, 1913. GENERAL ACCOUNT.

RECEIPTS.

1913.		£ s. d.
Subscriptions:—		
156 Members at £1/1/	£163 16 0	
Arrears	1 1 0	164 17 0
Special Subscriptions		13 2 0
Subscription of British Medical Association for use of Room and Medical Library		10 0 0
Sales of "Papers and Proceedings"		6 15 10
Interest on Savings Bank Account		0 10 8
Payments for use of Society's Room (less expenses of attendance)		3 15 0
		£199 0 6

EXPENDITURE.

1913.		£ s. d.
Salaries—		
Secretary (3 months)	£12 10 0	
Attendant	6 0 0	18 10 0
Papers and Proceedings—		
1912—Printing, etc.	47 9 10	
Postage	3 0 2	
1913—Printing	14 3 9	64 13 9
Library—		
Books and Magazines	7 3 6	
Binding	34 6 9	
Ditto, refund to M.A.M. Fund ...	3 17 0	
Insurance (£2,600)	4 16 0	
Shelving	5 2 6	
Sundries	8 16 3	63 16 0
Expenses of Meetings—		
Notices and Advertising	7 4 0	
Fuel and Light	3 9 6	
Lantern	2 8 6	13 2 0
Miscellaneous—		
Auditor	1 1 0	
Stamps	12 10 7	
Stationery	6 18 10	
Bank Charge	0 10 0	
Sundries	11 10 11	32 11 4
		192 13 1
Balance		6 7 5
		£199 0 6

	£ s. d.		£ s. d.
1913—Credit Balance from above	6 7 5	1913—January 1, Debit Balance	5 9 2
		December 31, Credit Balance to 1914	0 18 3
	£6 7 5		£6 7 5

MORTON ALLPORT MEMORIAL FUND ACCOUNT.*

1913.		£ s. d.	1913.	£ s. d.
Balance from 1912		24 0 1	International Catalogue of Scientific Literature—first 11 issues of Zoology, General Biology, and Geology	29 11 11
Interest received from Perpetual Trustees Co.—5 per cent. on £200 Cascade Brewery Co. Debentures	£10 0 0		Royal Society Catalogue of Scientific Papers, 1800-1900—Subject Index, Vols. I., II., III. Pt. 1.	2 19 6
Less Trustee Co.'s Commission	0 5 0			
		9 15 0	Balance to 1914	10 1 2
Income Tax repaid by Commissioner of Taxes..		5 0 6		
Refund from General Account of Expenditure on Binding, 1912		3 17 0		
		£42 12 7		£42 12 7

* £200 was raised by public subscription in 1878 to establish a Memorial of the late Morton Allport. The Fund is invested in the name of the Perpetual Trustees, Executors and Agency Co. of Tasmania Ltd., and the income is used for the purchase of books for the Library of the Society.

I have this day examined the Books and Vouchers of the Royal Society of Tasmania for the year 1913, and found them correct and in accordance with these Accounts.

H. W. W. ECHLIN,
Auditor.

L. RODWAY,
Honorary Treasurer.

16th January, 1914.

Obituary Notices.

FRANK ALLWORK, L.S.A., 1857-1913.

Dr. Allwork came to Tasmania in 1900, and settled at New Norfolk. He was elected to the Society in 1901, and he became a member of the Medical Section. Dr. Allwork was for several years the Chairman of the Official Visitors to the Hospital for Insane at New Norfolk. He was a prominent Freemason, and an active member of the Church of England.

THE REVEREND GEORGE CLARKE, 1823-1913.

The Reverend George Clarke was born at Parramatta on 29th June, 1823. His father, George Clarke, and mother had arrived at Hobart in September, 1822, in the ship "Heroine," in which Henry Hopkins, Robert Mather, and other well-known colonists were also passengers. From Hobart Mr. and Mrs. Clarke went on to New South Wales, and in 1824 to New Zealand, where they settled as missionaries at the Bay of Islands, in New Zealand. In 1832 George Clarke, junior, was sent to Hobart, and for some time he was a pupil at Mr. R. W. Giblin's school at "Summerhome," Mr. Clarke's future home, in the part of New Town now called Moonah. He returned to New Zealand in 1836, and for a time was a pupil of the Rev. W. Williams, afterwards Bishop of Waiapu, with whom he travelled among Maori tribes that had seldom been visited. In 1840 his father was appointed Chief Protector of the Aborigines under the newly-established Government of New Zealand, and in January, 1841, just after the Government establishments had been removed from Bay of Islands to Auckland, George Clarke, junior, became a clerk in the Native Department of the Civil Service of New Zealand. Mr. Clarke had already determined to become a minister of the Christian Church when opportunity came, but for several years he gave himself to the service of the Government in its relations with the Maoris. His knowledge of the Maori language and customs was of the greatest value to the Government, and in 1842 he was selected as interpreter at the first criminal sittings of the Supreme Court of New Zealand. The case was the trial of a Maori named Maketu, for murder of a white woman and her children, and the greatest care was necessary to make the Maoris understand the trial. Mr. Clarke's conduct in the trial won the confidence of the Government, as well as of the Maoris; and when, later in the same year, a Commissioner came from England to look into the titles of the New Zealand Company to land they had acquired from the Maoris, Mr. Clarke was chosen to accompany him as the medium of communication between the Maoris and the Court, first as interpreter and afterwards as Maori advocate. Mr. Clarke was also made protector of the natives through all the territory claimed by the company. In these capacities Mr. Clarke accompanied the Commissioner in his inquiries, first at Wellington, a settlement formed by the company before the British annexation of New Zealand in 1840, and afterwards at Wanganui, Taranaki, and other districts, and he was able to give much assistance to the Maoris in resisting the claims of the company. In 1844 Mr. Clarke was sent to Otago, to assist in the purchase of a large block of land for the Scotch settlement that was then projected. Mr. Clarke acted for the natives, and the purchase of over 400,000 acres in the vicinity of what is now Dunedin was arranged. Mr. Clarke, in his *Notes on Early Life in New Zealand* (Hobart, 1903), from which this account of his life in New Zealand is taken, remarks with pride that no dispute has ever arisen from this purchase. From Otago Mr. Clarke returned to Auckland. The first Maori War, against Heke, a chief of the Bay of Islands, broke out about this time, and during the war Mr. Clarke took a prominent part in negotiations between the Government and friendly chiefs, and he assisted in bringing the war to an end.*

In 1846, much against the advice of Sir George Grey, the Governor of New Zealand, Mr. Clarke resigned from the service of the Government, so that he might qualify himself as a Christian minister. From New Zealand he came to Hobart, at the invitation of his father's old friend, Henry Hopkins; and early in 1847 he went to London and entered New College. In 1851 Mr. Clarke was ordained in the Congregational Church, and at once returned to Hobart, where he accepted a call to the pastorate of the Collins-street Congregational Church. Of Mr. Clarke's ministry at this church, and at the new and larger church soon built in Davey-street to replace it, some account is given by Mr. Charles E. Walch in an obituary notice in the *Congregational Year Book of Tasmania* for 1913. "How effective that ministry was," says Mr. Walch, "was evi-"denced by the large congregations which filled the church.

* Much of Mr. Clarke's correspondence during his life in New Zealand, including reports on the war, is in the Hocken Library at Dunedin.

1913.

"But it was not so much the numbers that testified to the "ability and power of the preacher and the mark he had "made in the community, as the attraction it proved to "the more thoughtful and earnest, especially to young "men and women. To them the preaching of Mr. Clarke "most strongly appealed; and who that heard him can ever "forget his New Year's sermons to the young, so winning "and so wise; nor the privilege it was to attend his ex-"pository Bible classes? Many have been the occasions on "which Mr. Clarke has been selected to preach special "sermons, and never has he failed to justify such selection. "Notably was this the case when, at the request of the "Australasian Association for the Advancement of Science, "he preached before the members the annual sermon, "taking for the subject of his discourse, 'From Man to "'Nature, and from Man to God.'" For 52 years Mr. Clarke remained the pastor of his church.

Honoured by all, and greatly beloved by those who knew him best, Mr. Clarke's influence extended throughout the community. Of his work outside his church, the most noteworthy, perhaps, was in the Council of Education and in the University of Tasmania, into which the Council of Education was enlarged in 1890. Mr. Clarke was the first Vice-Chancellor of the University, and in 1898 he succeeded Sir Lambert Dobson as Chancellor. Until his retirement in 1907, Mr. Clarke's venerable figure was to be seen at Commemoration, and, in spite of his great age, he delivered each year a Commemoration address. "The value "of his services to the cause of education and to this Uni-"versity is indeed great," said his successor in the Address on Commemoration Day, 1913, "and only those who try to "follow in his footsteps, and emulate his splendid exam-"ple, can justly appreciate the loss that we have sustained. "In sadness we mourn for him, but we rejoice to know "that, crowned with the majesty of years, he passed into "the long silence, loved and revered by those for whom he "laboured."

Mr. Clarke was elected to the Society in 1852. He was one of the many members who withdrew during the depression which followed the prosperity of the Gold Diggings in Victoria. He was again elected in 1884, and remained a member until 1908. He contributed a biographical note to the volume of papers by the late James Backhouse Walker on the history of Tasmania, published by the Society in 1903 under the title "Early Tasmania."

Mr. Clarke married a daughter of Mr. Henry Hopkins.

He left a family of four daughters and two sons, of whom Dr. Arthur Hopkins Clarke is a member of the Council of the Society, and during 1913 has been its Acting Chairman.

SIR JOHN GEORGE DAVIES, K.C.M.G., M.H.A., 1846-1913.

Sir George Davies was a son of Mr. John Davies, M.H.A., the founder of the Hobart "Mercury," and for many years he was connected with the management of that paper. He was a member of the House of Assembly from 1884 until his death, and from 1903 to 1912 he was Speaker. Sir George was prominent in municipal affairs, and he was Mayor of Hobart for several years. Few men have taken as active and varied a part in public life, and in private life his genial bonhomie won him a wide circle of friends He was elected to the Society in 1884, and he remained a member until his death.

THOMAS STEPHENS, M.A., F.G.S., 1830-1913.

Mr. Thomas Stephens was the second son of the Rev. William Stephens, B.A., vicar of Levens, Westmoreland, England, and was born at Levens in 1830. He received his education at Marlborough College, proceeding thence to Oxford in 1850. Here he entered first at Queen's College, where his elder brother, William John Stephens, for many years Professor of Geology and Palæontology in the University of Sydney, was Fellow and Tutor; but he subsequently obtained a scholarship at Magdalen-hall, now Hertford College. In 1854 he took his B.A. degree, and ten years later received that of M.A. In 1855 Mr. Stephens emigrated to Victoria, intending to follow pastoral pursuits, but in 1856 he came to Tasmania. He was subwarden of Christ's College, Bishopsbourne, for a short time before it was closed early in 1857. Later in the same year he accepted the appointment of Inspector of Schools under the Northern Board of Education. On the amalgamation of the Northern and Southern Boards in 1863 he was appointed Inspector of Schools for Tasmania. While occupying this position, Mr. Stephens had a large and important share in the organisation of the system of primary education, and he was the first to introduce a standard of instruction for the schools, and a scheme of classification for teachers. On the passing of the Education Act in 1885, which placed the Department under the direct control of a Minister of the Crown, the offices of Chief Inspector and Secretary were amalgamated, and Mr. Stephens was appointed permanent head, with the title of

1913.

Director of Education.† Mr. Stephens retained this office until his retirement in 1894.

The *Educational Record* of 15th December, 1913, in an official notice of his work, says:—"The first body of the "regulations issued under the Department was the work "of his hands, and proved to be an admirable foundation "for the larger superstructure which the advancement of "the State and the consequent development of the Depart- "ment have called for. Mr. Stephens administered the "regulations with inflexible fidelity, being immovably firm "in the maintenance of discipline, showing at the same "time a sympathetic consideration for the teachers under "his charge, due in part to his fine qualities as an educated "gentleman and in part to the long and intimate acquaint- "ance he had had with the work of teachers in all parts of "the island."

Mr. Stephens's duties as Inspector of Schools took him into all the settled districts of Tasmania, and he acquired an intimate knowledge of the geology and physical features of the island. In 1861-2 he was an active member of the Northern Board of Works, under whose direction the principal lines of road through the then little-known north-eastern and north-western districts were planned and commenced. His interest in geology lasted through his whole life. He was a fellow of the Geological Society of London, and his geological writings extend over nearly fifty years.

Mr. Stephens's interest in education was not limited to the Education Department. When a scheme for re-establishing Christ's College was under consideration by the Supreme Court in 1876, he suggested the setting aside of surplus revenue for a building fund. The building fund thus established amounted in 1912 to about £20,000, and rendered possible the present re-establishment of the College. In 1877 the Anglican Synod elected Mr. Stephens a member of the first Council of the College. In 1882 he was able to render great assistance to the College in resisting a proposal, brought before Parliament under a misconception of the origin of the College, to appropriate its funds for a Government institution. In 1891 he was elected President of the Council, and he retained this office until a few months before his retirement from the Council in 1911. The scheme for the reorganisation of the College approved by the Supreme Court in 1912 was largely due to Mr. Stephens, although he was opposed to some of its

† The foregoing particulars are taken for the most part from Mennell's *Dictionary of Australasian Biography* (1892).

details. In connection with the reopening of the College he rendered useful service in compiling for the use of those concerned with the future of the College an account of its foundation and early history.§

Mr. Stephens was one of those who worked for the establishment of the University of Tasmania. He was an original member of the Council of the University, and remained a member until his death. In 1900 and 1901 he was Vice-Chancellor. He attended regularly at the meetings of the Council and other bodies connected with the University, and gave much of his time to the management of its affairs.

Mr. Stephens was elected to the Society in 1858, when a resident of Launceston, and he became a member of the Northern Branch. On his removal to Hobart in 1863, he was elected a member of the Council. In 1880 he was appointed a vice-president. He continued to be a vice-president and a member of the Council until 1911. His membership of the Society extended over 55 years, a period which has been exceeded only by Sir James Agnew, who was a member from 1843 to 1901.

The Society has never had a more active or devoted member. For many years he rarely missed a meeting when he was in Hobart, and he would frequently send a note or an exhibit if he was forced to be absent. His time was always available for the Council, and for the numerous committees to which whenever possible he would ask for business to be referred. Mr. Stephens gave much attention to the regular conduct of meetings, and he would frequently intervene to secure a correct procedure. He was usually a vigorous critic of innovations, and he would take much trouble, both in debate and by interesting members, to defeat any proposal which he disapproved; but occasionally he would propose alterations of rules, usually with a view to reverting to the practice of "the first forty "years of the Society," to which he would often allude. His knowledge of these matters was of great use when the Society's rules were redrafted in 1874, and again in 1907 and 1911. Mr. Stephens's precision in the use of language made him especially useful on these occasions.

Mr. Stephens contributed some 27 papers to the Society; and, in addition, many exhibits and notes due to him are recorded in the Society's Proceedings. His papers were almost entirely on the geology of Tasmania. The first, read in 1863, described a discovery of coal in the gold diggings

§ *Christ's College, Tasmania.* Published by the Council of the College. 2/-

at Mangana; while the last, in 1912, is on the mineral springs on the North-West Coast. Mr. Stephens corresponded with many geologists in other countries, and at meetings of the Society he would often read their letters on questions of interest to students of the geology of Tasmania. Mr. Stephens also contributed geological papers to the Proceedings of the Linnæan Society of New South Wales, and to other societies; and at the meeting of the Australasian Association for the Advancement of Science in Hobart in 1902 he read a valuable summary of what was known of the mesozoic diabase of Tasmania.

Mr. Stephens's knowledge of geology was always at the disposal of his friends, and he would take much trouble in answering any inquiries which were made of him. For the last fifty years of his life his home was in Hobart. He built himself several houses, into the last of which he moved only a few weeks before his death. He was twice married, and leaves several children.

RUSSELL YOUNG, 1838-1913.

Mr. Russell Young was a son of Mr. Thomas Young, one of the first solicitors in Tasmania, who settled in Hobart in 1824. Born in 1838, Mr. Young was educated at the High School, and was admitted as a solicitor in 1862. He practised his profession until his death, and for nearly 50 years he was City Solicitor. He was elected to the Society in 1864, and he became one of the most active members. From 1872 to 1877 Mr. Young sat in the House of Assembly as member for Franklin. Among the subjects in which he was interested were forestry and the preservation of scenery. In April, 1876, His Excellency Mr. F. A. Weld, in his inaugural address at the opening of the Society's session, had pleaded "for the preservation of the "ferns and forests which are fast disappearing from the "sides of Mount Wellington," and had urged that Mount Wellington should be "preserved to future generations as a "noble public forest and park." Shortly afterwards Mr. Young, from his place in Parliament, moved that a reserve of 3,750 acres—which includes the whole of what is now the Mountain Park, as well as portion of the area reserved in connection with the water supply of Hobart—"should be made as an inalienable forest for the benefit of "the inhabitants of Tasmania." Both Houses of Parliament adopted an address to the Governor asking for this reservation; and the Report of the Society for 1876 records that, "owing to the exertion in Parliament of one of "our Fellows, Mr. Russell Young, this great boon has been "permanently secured to the public." Mr. Young was elected to the Council in 1877, and he served the Society for 33 years. He gave much time to the Society's affairs, and frequently assisted the Council with his professional advice. He was much interested in microscopic life, and was skilled in photomicrography, though he did not contribute to the "Papers and Proceedings." Mr. Young was one of the most prominent and useful of the citizens of Hobart, and numerous matters of public interest had his attention. For many years he was a member of the Queen's Domain Committee. In private life, Mr. Young was a man of unusual taste and refinement, and he had many accomplishments. He remained a member of the Society until 1910.

INSTITUTIONS, ETC., TO WHICH COPIES OF THE "PAPERS AND PROCEEDINGS" OF THE ROYAL SOCIETY OF TASMANIA ARE PRESENTED.

Australia, Commonwealth of

Commonwealth Library ... ... Melbourne

Austro-Hungary.

K. Akademie der Wissenchaften ... ... Vienna
K. K. Milit r-Geographisches Institut ... ... Vienna

Belgium.

Institut Grand-Ducal de Luxembourg ... Luxembourg
Société Royale de Botanique de Belgique ... ... Brussels
Société Royale des Sciences ... ... Liège
Société Royale Zoologique et Malacologique de Belgique ... ... Brussels

Brazil.

Museu Goeldi ... ... Para

Canada.

Canadian Institute ... ... Toronto
Geological Survey of Canada ... ... Ottawa
Nova Scotian Institute of Science ... ... Halifax
Royal Society of Canada ... ... Montreal

Cape Colony.

Royal Society of South Africa ... ... Capetown
S. African Association for the Advancement of Science ... ... Capetown
South African Museum ... ... Capetown

1913.

Ceylon.

Colombo Museum ... ... Colombo

East Indies.

Sarawak Museum ... ... Sarawak

England.

Agent-General of Tasmania ... ... London
British Museum ... ... London
British Museum (Natural History) ... ... London
Cambridge Philosophical Society ... ... Cambridge
Geographical Association ... ... Oxford
Geological Society ... ... London
Imperial Bureau of Entomology ... ... London
Linnean Society ... ... London
Manchester Literary and Philosophical Society ... ... Manchester
Marine Biological Laboratory ... ... Plymouth
National Physical Laboratory ... Teddington, Middlesex
"Nature" ... ... London
Rothamsted Experimental Station ... ... Harpenden
Royal Astronomical Society ... ... London
Royal Botanic Garden ... ... Kew
Royal Colonial Institute ... ... London
Royal Geographical Society ... ... London
Royal Horticultural Society ... ... London
Royal Institution ... ... London
Royal Microscopical Society ... ... London
Royal Society ... ... London
"Science Abstracts" ... ... London
Society of Chemical Industry ... ... London
Yorkshire Geological Society ... ... Leeds
Zoological Society ... ... London

France.

Société de Géographie ... ... Paris
Société Zoologique de France ... ... Paris

Germany.

Deutsches Entomologisches Museum ... ... Berlin
Gesellschaft für Erdkunde ... ... Berlin
Königl.-bäyer. Akademie der Wissenchaften ... Munich
Naturforschende Gesellschaft ... ... Freiburg. i. Br.
Naturwissenschaftlichen Verein ... ... Hamburg
Physikalisch-Technische Reichsanstalt ... Charlottenburg

HOLLAND.

Koninklijk Nederlandsch Aardrijkskundig Genootschap ... ... Amsterdam
Musée Teyler ... ... Haarlem
Rijks Herbarium ... ... Leiden

INDIA

Agricultural Research Institute ... ... Pusa
Geological Survey of India ... ... Calcutta
Scientific Advisory Board, Indian Research Fund Association ... ... Simla

IRELAND.

Royal Dublin Society ... ... Dublin
Royal Irish Academy ... ... Dublin

ITALY.

Reale Accademia dei Lincei ... ... Rome
Reale Accademia delle Scienze dell' Istituto ... Bologna
Regia Scuola Superiori di Agricoltura ... ... Portici

MEXICO.

Sociedad Cientifica "Antonio Alzate" ... ... Mexico

NEW SOUTH WALES.

Australian Historical Society ... ... Sydney
Botanic Gardens ... ... Sydney
Department of Agriculture ... ... Sydney
Department of Fisheries ... ... Sydney
Department of Mines ... ... Sydney
Linnean Society of New South Wales ... ... Sydney
Naturalists' Society of New South Wales ... ... Sydney
Public Library ... ... Sydney
Royal Society ... ... Sydney
Technological Museum ... ... Sydney
University Library ... ... Sydney

NEW ZEALAND.

Canterbury Museum ... ... Christchurch
Dominion Museum ... ... Wellington
Education Department ... ... Wellington
Geological Survey ... ... Wellington
New Zealand Institute ... ... Wellington

NORWAY.

Bergens Museum ... ... Bergen

1913.

Queensland.

Australian Institute of Tropical Medicine ... Townsville
Colonial Botanist ... ... Brisbane
Geological Survey Office ... ... Brisbane
Queensland Museum ... ... Brisbane
Royal Society of Queensland ... ... Brisbane
University Library ... ... Brisbane

Russia.

Académie Impériale des Sciences ... ... St. Petersburg
Jardin Botanique Impérial ... ... St. Petersburg
Société Impériale des Naturalistes ... ... Moscow

Scotland.

Botanical Society ... ... Edinburgh
Royal Philosophical Society ... ... Glasgow
Royal Scottish Geographical Society ... ... Edinburgh
Royal Society ... ... Edinburgh

South Australia.

Public Library and Museum ... ... Adelaide
Royal Geographical Society ... ... Adelaide
Royal Society of South Australia ... ... Adelaide
University Library ... ... Adelaide

Switzerland.

Naturforschende Gesellschaft ... ... Basel

Tasmania.

Geological Survey ... ... Launceston
Public Library ... ... Hobart
Public Library ... ... Launceston
University Library ... ... Hobart
Victoria Museum ... ... Launceston

United States of America.

Academy of Natural Sciences ... ... Philadelphia
Academy of Science of St. Louis ... ... St. Louis, Mo.
American Academy of Arts and Sciences ... ... Boston
American Chemical Society ... ... Columbus, O.
American Geographical Society ... ... New York
American Museum of Natural History, Central-
park ... ... New York
American Philosophical Society ... ... Philadelphia
Boston Society of Natural History ... ... Boston
Buffalo Society of Natural Science ... ... Buffalo, N.Y.
Bureau of Standards ... ... Washington

United States of America.

Department of Agriculture ... ... Washington
Department of Agriculture (Office of Experiment Stations) ... ... Washington
Field Museum of Natural History ... ... Chicago
Library of Congress ... ... Washington
Lloyd Museum and Library ... ... Cincinnatti, Ohio
Michigan Academy of Science ... ... Ann Arbor, Mich.
Museum of Brooklyn Institute of Arts and Sciences ... ... Brooklyn, N.Y.
Museum of Comparative Zoology ... ... Cambridge, Mass.
National Geographic Society ... ... Washington
New York Zoological Society ... ... New York
Pomona College (Department of Biology) Claremont, Cal.
"Science" ... ... New York
Smithsonian Institution (U.S. National Museum) ... ... Washington
United States Geological Survey ... ... Washington
University of California ... ... Berkeley, Cal.
University of Chicago ... ... Chicago
University of Illinois ... ... Urbana, Ill.
Washington University ... ... St. Louis, Mo.
Yale University ... ... Newhaven, Conn.

Uruguay.

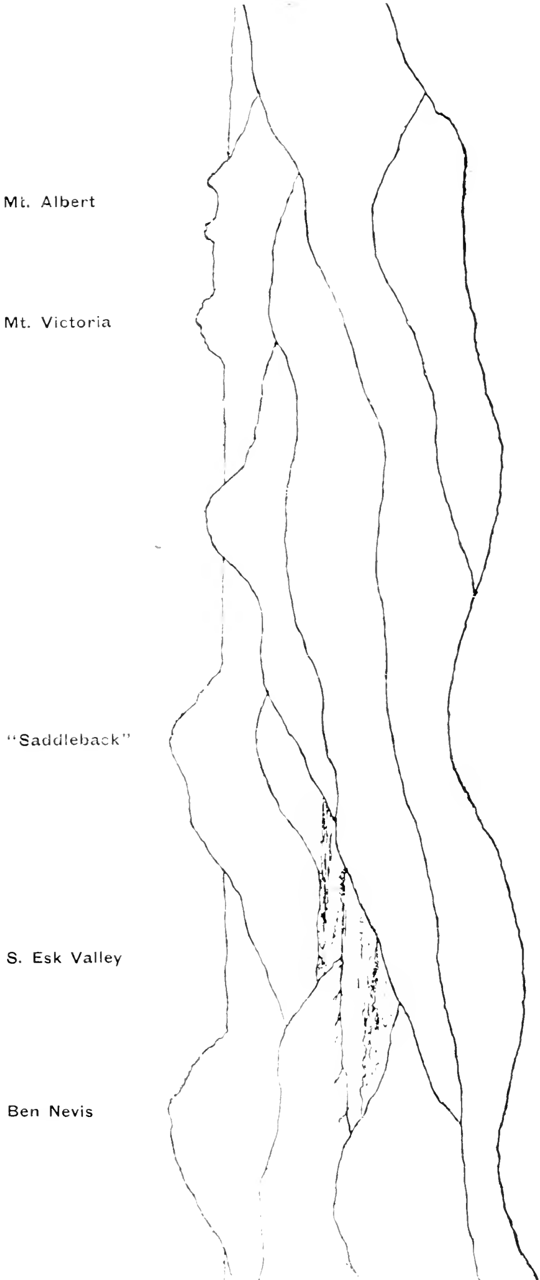
Museo Nacional ... ... Montevideo

Victoria.

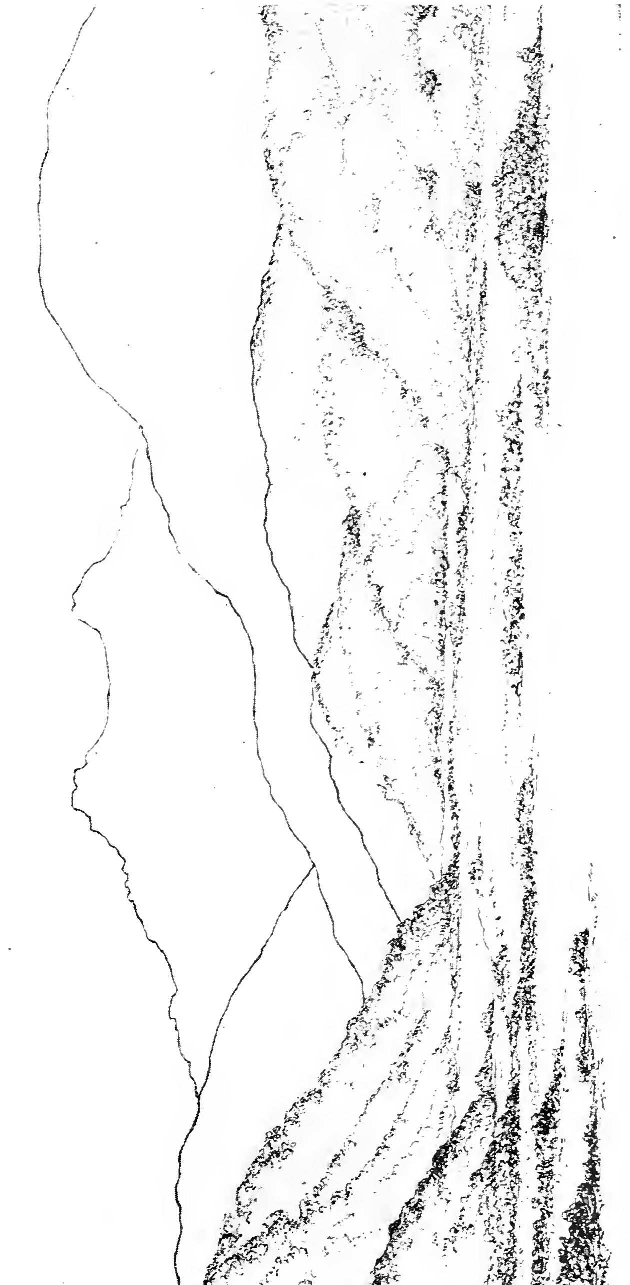
Australasian Institute of Mining Engineers... Melbourne
Department of Agriculture ... ... Melbourne
Department of Mines ... ... Melbourne
Field Naturalists' Club of Victoria ... ... Melbourne
Geelong Naturalists' Club ... ... Geelong
Historical Society of Victoria ... ... Melbourne
National Herbarium ... ... Melbourne
National Museum ... ... Melbourne
Public Library ... ... Melbourne
Royal Australasian Ornithologists' Union ... Melbourne
Royal Geographical Society ... ... Melbourne
University Library ... ... Melbourne

Western Australia.

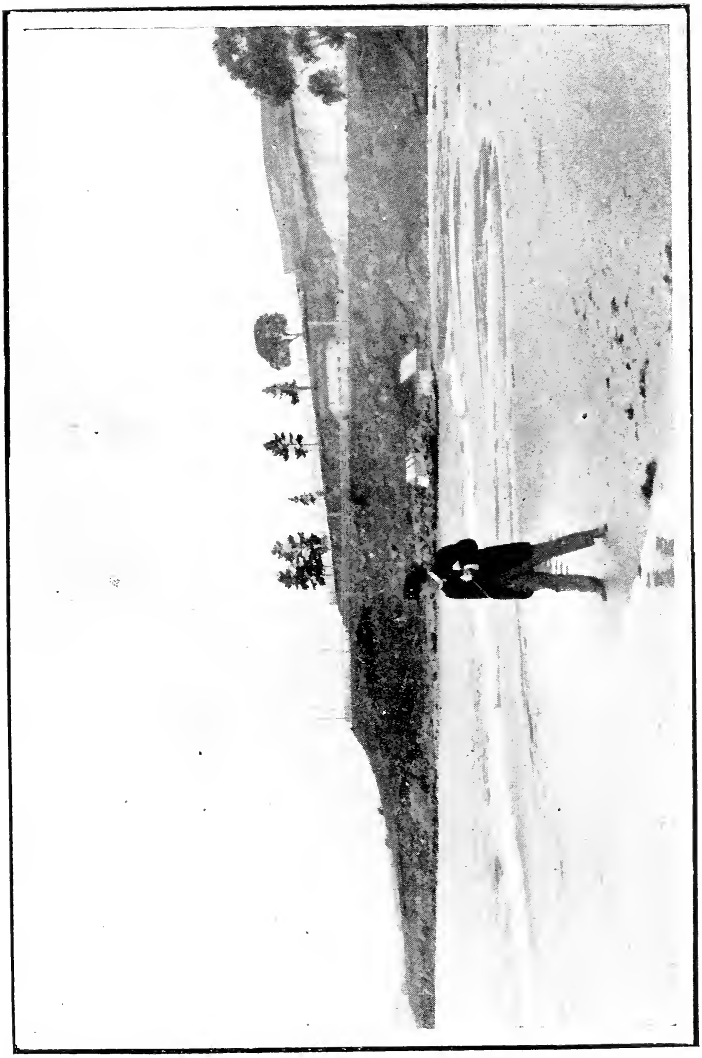
Geological Survey Office ... ... Perth
Royal Society of Western Australia ... ... Perth
University Library ... ... Perth
Western Australian Museum and Art Gallery ... Perth



ASPECT OF N.E. PLATEAU, WITH ITS EASTERN TOR MOUNTAINS.
(FROM MT. NICHOLAS, AT 2,700 FT. ALT.)



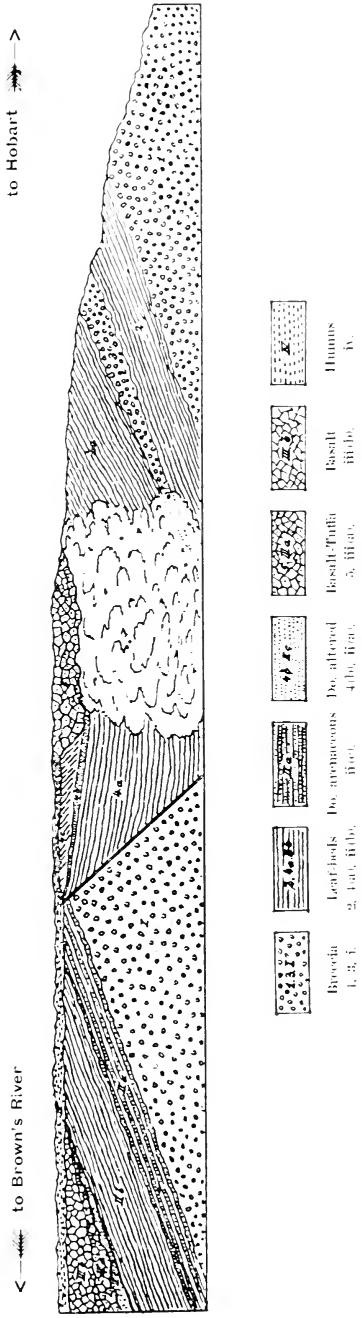
ASPECT OF MT. ALBERT FROM GEORGE RIVER VALLEY.



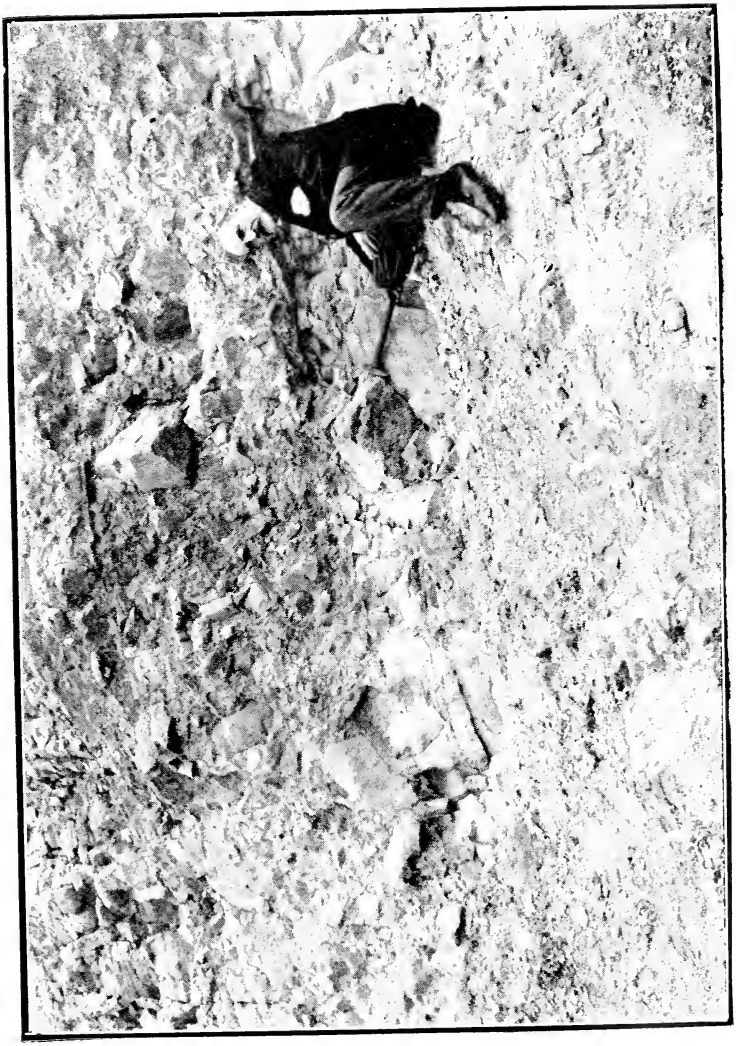
GENERAL VIEW OF ONE TREE POINT.

SECTION AT ONE TREE POINT, NEAR HOBART.

Heights drawn to scale. Scale: 1 mm. 3 metres.



DIABASE BOULDER IN BRECCIA.

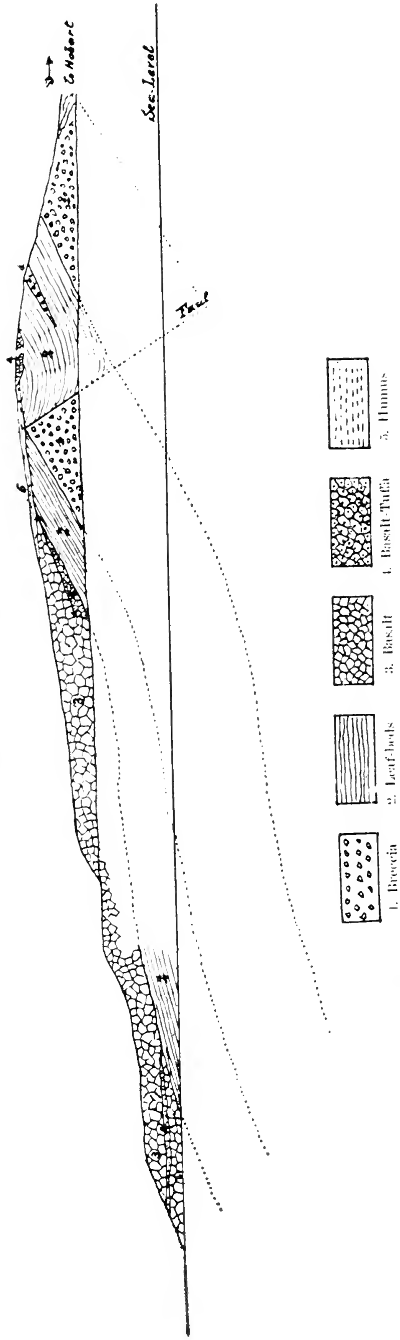


BRECCIA AND LEAF-BEDS. BOULDER PRESSED INTO LEAF-BEDS.

BASALT OVERLYING THE LEAF-BEDS.

SECTION AT ONE TREE POINT.

Scale: 1 inch 131 yards.



PARTIAL RECONSTRUCTION OF ONE TREE POINT VOLCANO.

Original parts shown Red. Present parts shown Black.

Scale: 1 inch 131 yards.

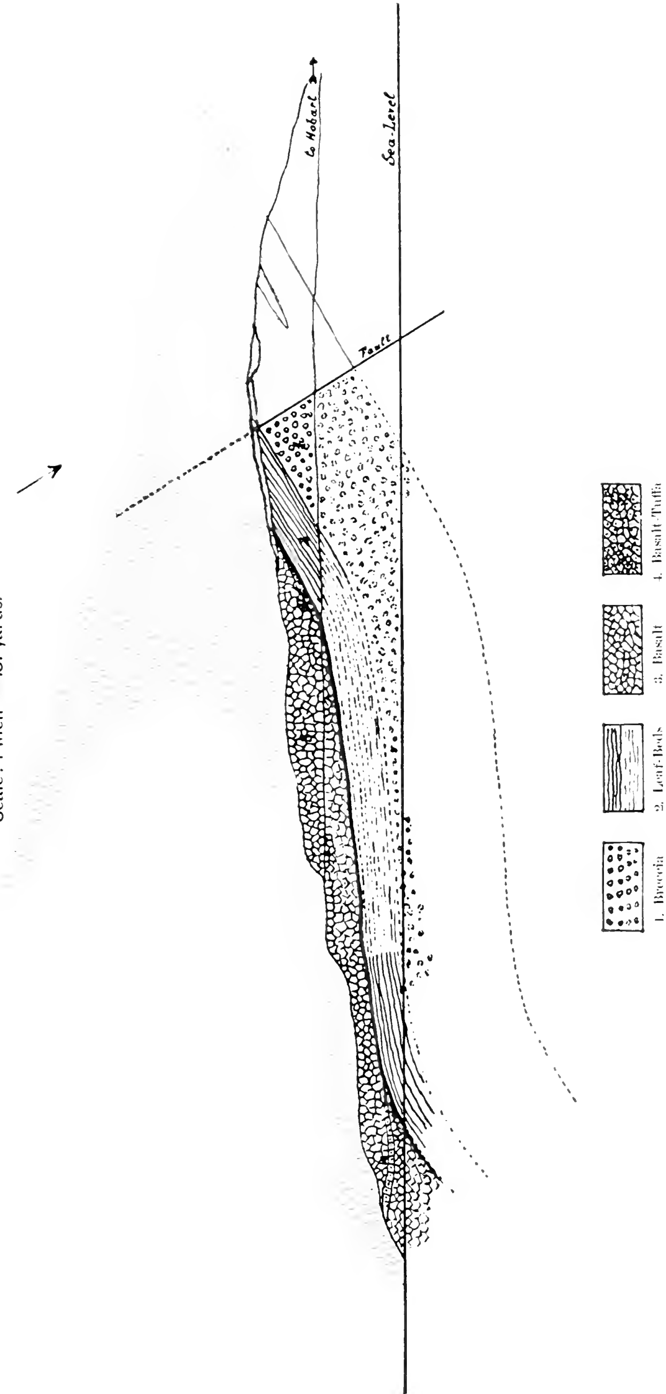


Fig. 1 (2 x)

Fig. 2 (2 x)

Fig. 3 (2 x)

Fig. 4 (2 x)

Fig. 5 (2.5 x)

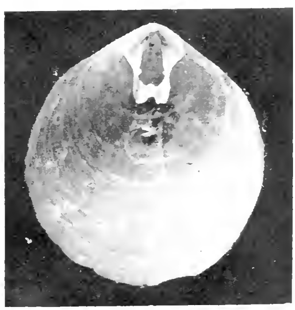


Fig. 6 (2.5 x)

Terebratula (Liothyrina) fulva, Blochmann.

1, 2, Dorsal and side view of a more slender example.
3, 4, The same from a broader example.
5, Brachial apparatus of example, fig. 1.
6, ,, ,, ,, ,, 3.

Fig. 7 (3 x)

Fig. 8 (3 x)

Fig. 9 (3 x)

Fig. 10 (8 x)

Fig. 11 (16 x)

7—9. Terebratella mayi, n. sp.

7, Dorsal view.
8, Front view.
9, Brachial apparatus of a larger example.

10, 11. Argyrotheca mayi, n. sp.

10, Dorsal view.
11, Inner view of dorsal valve.

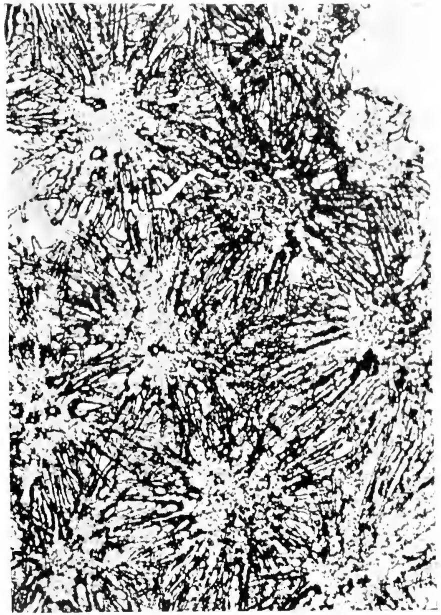


Fig. 12a (45 x)

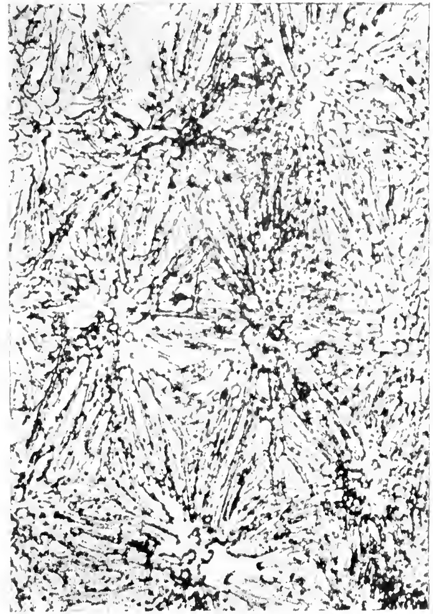
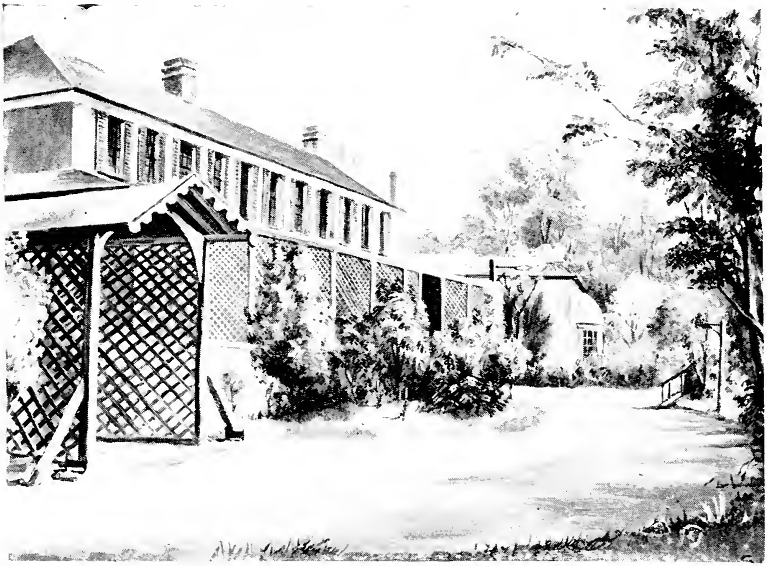


Fig. 12b (45 x)

Terebratula (Liothyrina) fulva, Blochmann.

12a. Spicula out of the dorsal body wall of example of fig. 1.
12b. ,, ,, ,, ,, ,, 2.

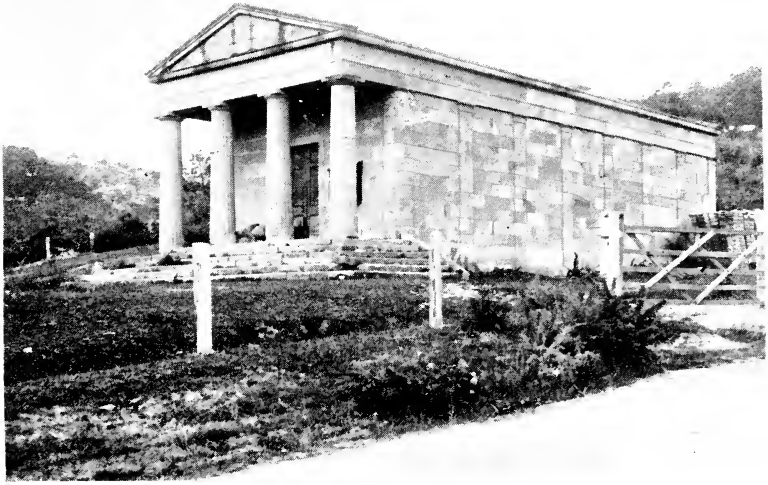


Macquarie St. Front.

Sullivan Cove Front.

GOVERNMENT HOUSE, MACQUARIE ST., HOBART TOWN, 1837,
From Sketches made by J. E. Chapman for Lady Franklin.

The Meeting Place of the Tasmanian Society, 1838–43.
Inaugural Meeting of the Royal Society held in the Library, 14th October, 1843.



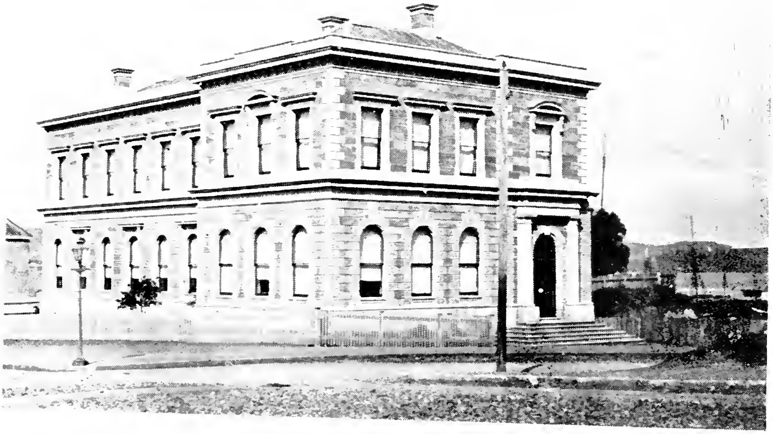
THE FRANKLIN MUSEUM, ANCANTHE, KANGAROO VALLEY, 1913.
Founded 16th March, 1842.

SUPERINTENDENT'S HOUSE, BOTANICAL GARDENS, HOBART
Built 1829.
Meeting Place of the Society in 1846 and 1847.

CUSTOMS HOUSE AND LEGISLATIVE COUNCIL CHAMBERS,
Hobart Town.
Now Parliament House. Built about 1837.

From 1848 52 the Society had its Museum and Library and held its Meetings in rooms in the Legislative Council Chambers.

THE ROYAL SOCIETY'S MUSEUM, 1852 62.
In Harrington St., adjoining St. Joseph's Orphanage.



THE ROYAL SOCIETY'S MUSEUM.
Built 1860—2.

THE TASMANIAN MUSEUM AND ART GALLERY,
Showing extensions built in 1886 and 1901.

LADY FRANKLIN.

SIR JOHN FRANKLIN, F.R.S., etc.,
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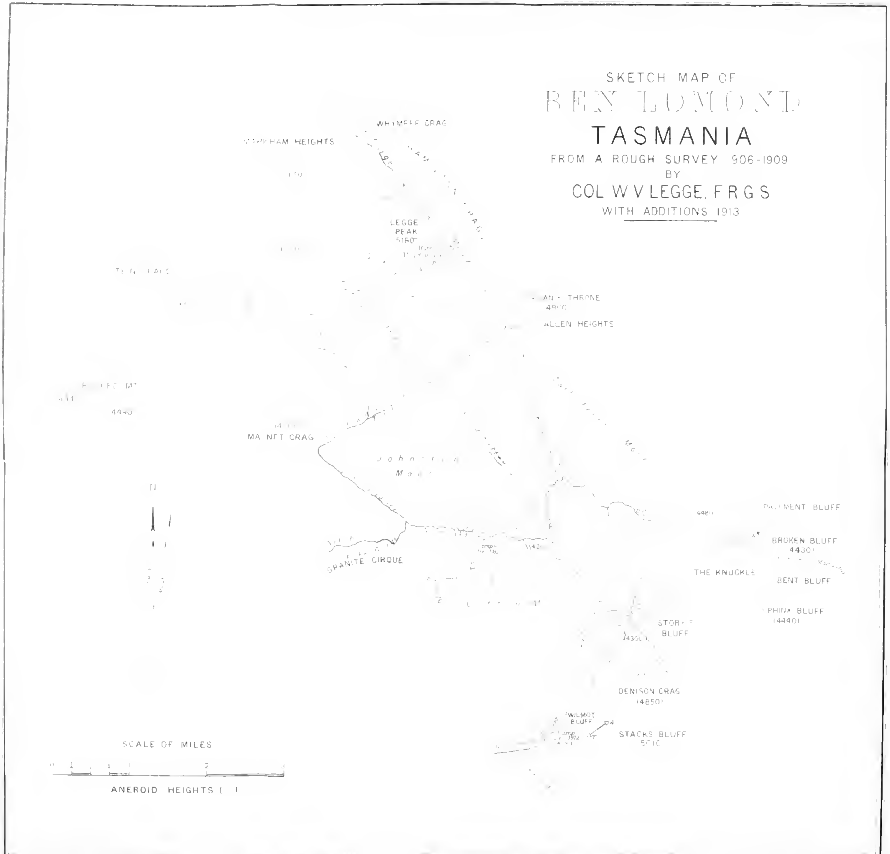
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BEN LOMOND
TASMANIA
FROM A ROUGH SURVEY 1906-1909
BY
COL W V LEGGE, F R G S
WITH ADDITIONS 1913
WHYMPER CRAG
LEGGE PEAK
ALLEN HEIGHTS
GRANITE CIRQUE
BROKEN BLUFF
(4430)
THE KNUCKLE
BENT BLUFF
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(4850)
STACKS BLUFF
SCALE OF MILES
ANEROID HEIGHTS ( )

SKETCH MAP OF BEN LOMOND

CORRECTIONS

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