TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

VOLUME XX.

INCLUDING SESSIONS LVIII. TO LX.

(1893-94 TO 1895-96).

WITH TEN PLATES AND ELEVEN WOODCUTS.

EDINBURGH:

PRINTED FOR THE BOTANICAL SOCIETY.

MDCCCXCVI.

CONTENTS OF VOL. XX.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

VOLUME XX.

PART I.

EDINBURGH:

PRINTED FOR THE BOTANICAL SOCIETY.

MDCCCXCIV.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LVIII.

MEETING OF THE SOCIETY,

Thursday, November 9, 1893.

Dr. David Christison, President, in the Chair.

The following Officers of the Society were elected for the Session 1893–94:—

PRESIDENT.

Professor F. O. Bower, D.Sc., F.R.SS. L. & E., F.L.S.

VICE-PRESIDENTS.

William Craig, M.D., F.R.S.E., F.R.C.S.E.
William Sanderson.
Rev. David Paul, M.A.
Malcolm Dunn.

COUNCILLORS.

Colonel Fred. Bailey, R.E.
Patrick Neill Fraser, F.R.S.E.
Symington Grieve.
Henry Halcro Johnston, M.B., C.M.
Robert Lindsay.
Robert Robertson, M.A., B.Sc. Edin.
Andrew Semple, M.B., F.R.C.S.E.
T. Bond Sprague, M.A., F.R.S.E.
Robert Turnbull, B.Sc.
John H. Wilson, D.Sc., F.R.S.E.

Issued November 1894.

Honorary Secretary—Professor Sir Douglas Maclagan, M.D., LL.D., P.R.S.E.
Honorary Curator—The Professor of Botany.
Foreign Secretary—Andrew P. Aitken, M.A., D.Sc., F.R.S.E.
Treasurer—Richard Brown, C.A.
Assistant Secretary—James Adam Terras, B.Sc.
Artist—Francis M. Caird, M.B., C.M.
Auditor—Robert C. Millar, C.A.

LOCAL SECRETARIES.

Aberdeen—A. Stephen Wilson of North Kinmundy.
,, Professor J. W. H. Trail, M.A., M.D., F.L.S.
Beckenham, Kent—A. D. Webster.
Berwick—Francis M. Norman, R.N.
Birmingham—George A. Panton, F.R.S.E., 73 Westfield Road.
,, W. H. Wilkinson, F.L.S., F.R.M.S., Manor Hill, Sutton Coldfield.
Bridge of Allan—Alexander Paterson, M.D.
Calcutta—George King, M.D., F.R.S., Botanic Garden.
,, David Prain, M.D., F.R.S.E., F.L.S., Botanic Garden.
Cambridge—Charles C. Babington, M.A., F.R.S., Professor of Botany.
,, Arthur Evans, M.A.
Chirnside—Charles Stuart, M.D.
Croydon—A. Bennett, F.L.S.
Glasgow—Professor F. O. Bower, D.Sc., F.R.S., F.L.S.
Kelso—Rev. David Paul, M.A., Roxburgh Manse.
,, Rev. George Gunn, M.A., Stitchel Manse.
Kilbarchan—Rev. G. Alison.
Lincoln—George May Lowe, M.D., C.M.
London—William Carruthers, F.R.S., F.L.S., British Museum.
,, John Archibald, M.D., F.R.S.E.
Melbourne, Australia—Baron Ferdinand von Mueller, M.D., K.C.M.G., F.R.S.
Nova Scotia—Professor George Lawson, LL.D., Dalhousie.
Ottawa, Ontario—W. R. Riddell, B.Sc., B.A., Prov. Normal School.
Perth—F. Buchanan White, M.D., F.L.S.
Saharunpore, India—J. F. Duthie, B.A., F.L.S.
Sevenoaks—E. M. Holmes, F.L.S.
Silloth—John Leitch, M.B., C.M.
St. Andrews—Professor M'Intosh, M.D., LL.D., F.R.SS. L. & E.
Wellington, New Zealand—Sir James Hector, M.D., K.C.M.G., F.R.SS. L. & E.
Wolverhampton—John Fraser, M.A., M.D.

John Grieve, M.D., F.R.S.E., was elected Resident Fellow of the Society.

The President made intimation of the death of Robert Harvie, and of Charles Jenner, Resident Fellows of the Society, and of W. Etherington Dixon, Associate.

Presents to the Library at the Royal Botanic Garden were announced. Amongst them being a copy of the first fasciculus of the new "Index Kewensis."

Professor BAYLEY BALFOUR informed the Society that Mr. GEORGE WILLIAM TRAILL, the well-known algologist, had presented his magnificent collection of algæ to the Society.

Mr. MALCOLM DUNN exhibited a number of cut blooms of herbaceous and other plants from the open ground, to show the mildness of the season and the occurrence of late and second blooms, amongst them being:—An apple (Liberton Ringer), several kinds of rose, stock, rosemary, anemone, strawberry tree, primrose, etc.; also twigs of *Chimonanthus fragrans*, with flower buds, and a few clusters of strawberries.

Professor BAYLEY BALFOUR exhibited specimens, sent by Dr. Aitchison from Gulmey, Kashmir, preserved in spirit, of *Arceuthobium minutissimum*, Hook. fil., on *Pinus excelsa*, a loranthaceous plant described by Sir Joseph Hooker in the Flora of British India V., 227, and referred to by him as "the most minute dicotyledonous plant I can call to mind"; also specimens of proliferous *Reseda alba* received from C. A. Middleton, Esq., Manxhead, Stow.

Mr. CAMPBELL sent for exhibition, from the open ground of his garden at Ledaig, Argyllshire, cut blooms of *Veronica Andersoni* and var., *Escallonia macrantha*, and other half-hardy plants.

The following Papers were read:—

EXCURSION OF THE SCOTTISH ALPINE BOTANICAL CLUB TO CLOVA, 1893. By Rev. DAVID PAUL, M.A., Roxburgh.

This year the visit of the Scottish Alpine Botanical Club was to the classic ground of Clova. The party which assembled in the Ogilvie Arms Hotel on the 10th of July consisted of Mr. W. B. Boyd of Faldonside, president; Rev. George Alison, Kilbarchan, chaplain; Rev. George Gunn, Stitchel; Commander Norman, R.N., Berwick; Dr. Stuart of Chirnside; Dr. Church of Edinburgh; Mr. Potts, and myself. A business meeting was held in the evening, at which Mr. Gunn was elected a member of the Club, and a sum of five guineas was voted to the Illustration Fund of the Botanical Society.

Leave having been obtained from the proprietor of Clova and from the shooting-tenant to visit both Glen Dole and Glen Fee, we arranged to confine ourselves next day (Tuesday) to the north side of the latter glen. Fortunately the day was dry, and bright and warm. We met the keeper of the deer forest at Glen Dole Lodge, who gave us every facility to pursue our investigations, but our finds were not very numerous. As we walked up the glen on the low ground, *Trientalis europæa*, L., was plentiful, and *Arctostaphylus Uva-Ursi*, Spreng., was found. Ascending to the rocks on the right, and working round the base of them, we reached the well-known station of the *Oxytropis campestris*, D. C., the only locality where it has been found in Britain. It covers the rock over a considerable area. Many of the plants were very large and fine, and there seems to be no danger of its being exterminated.* Associated with this rare plant on the same rocks the rare moss, *Trichostomum glaucescens*, Hedw., occurs, which, after a good deal of searching, Mr. Boyd found two small morsels of, but not in fruit. The present confusion in the nomenclature of the mosses is well illustrated by this species. Of the eight names that have been given to it, seven have been employed by British bryologists. In 1792, Hedwig named it *Trichostomum glaucescens*, and he was followed by Wilson, and by Hobkirk in the first edition of his Synopsis. In 1801, Dickson called it *Bryum glaucescens*. In 1807, Weber and Mohr gave it the name of *Didymodon glaucescens*, and they were followed by Greville and Hooker. The last author also styles it *Didymodon*

* It is worth noting that in Germany this plant, under the name of *Oxytropis pilosa*, is widely distributed on rocky declivities, while the other species of the same genus, under the name of *O. montana*, occurs only in Bavaria on stony hill-meadows, the rarer species here being the commoner there.

æruginosus. Hobkirk, in his second edition, uses the name *Ditrichum glaucescens*. In Berkeley's Handbook it is found as *Leptotrichum glaucescens*. Finally, Braithwaite calls it *Saelania cæsia*, following Lindberg, and remarks, curiously enough, in the face of all this variety of nomenclature, that "it is a good example of a truly natural genus." It is to be hoped that, after the completion of Dr. Braithwaite's valuable Moss-Flora, a greater degree of order will be introduced into this baffling confusion.

As we proceeded along the base of the rocks, nothing of special importance was found, so Mr. Gunn and I climbed up the face of the cliffs out on to the table-land above in search of *Carex rariflora*, Sm., which, however, we did not light upon. In the midst of a very large bed of *Scirpus cæspitosus*, Linn., occurred a patch of considerable size, which presented a remarkable appearance. On the summit of every stem, in place of the usual flower head, was what had the appearance of a small delicate egg-shaped fruit, like a miniature plum, of a bluish-brown colour, very smooth and regular in shape, and conspicuous enough to be observable some yards off. I gathered specimens, and submitted them to Professor Trail of Aberdeen, who was of opinion that the fungus was probably *Ustilago caricis*, and stated that he had not before met with an *Ustilago* on that plant. Rejoining the members of the party we had left below, who had found a certain number of the Alpine plants that were to be expected in that locality, we at length brought a delightful day to an end.

The chief plants found were these:—*Draba incana*, Linn.; *Silene acaulis*, Linn.; *Oxytropis campestris*, D.C.; *Saxifraga oppositifolia*, Linn.; *S. nivalis*, Linn.; *S. stellaris*, Linn.; *S. aizoides*, Linn.; *Saussurea alpina*, D.C.; *Arctostaphylos Uva-Ursi*, Spreng.; *Trientalis europæa*, Linn.; *Salix myrsinites*, Linn.; *Carex capillaris*, Linn., etc.; *Cryptogramme crispa*, R. Br.; *Asplenium viride*, Huds.; *A. trichomanes*, Linn.; *Polystichum aculeatum*, Syme; *P.* var. *lobatum*, Presl.; *P. lonchitis*, Roth.; *Lastræa oreopteris*, Presl.; *Lycopodium Selago*, Linn.; *L. annotinum*, Linn.; *L. alpinum*, Linn.; *Selaginella selaginoides*, Gray.

Wednesday, 12th July, did not promise well, being cloudy and foggy. We drove up to Acharn, and found that Fraser, the forester, had received a letter, which limited our visit to two days. This obliged us to alter our plans. We had intended to visit that day the south side of Glen Fee in one party, and the next day to go up Glen Dole. We now arranged that Messrs. Alison, Stuart, and Norman should, with the forester, proceed by Glen Dole to the station of the *Lychnis alpina*, Linn., on Little Gilrannock, while the rest of us should examine the corrie on the south side of Glen Fee for *Carex alpina*, Sw., and *Carex Grahami*, Boott. Unfortunately, before we reached the corrie, it came on to rain, and it continued to rain most of the day, making things very uncomfortable for us, as the wind also was cold, and thick mist drifted over the rocks. *Carex Grahami* was found in one spot in a wet, level place, some distance up the rocks, but not very much of it, and it is desirable that when it is found again it should be treated tenderly, as it might easily be extirpated. We got some good specimens, but spared the roots. It grows a foot or 18 inches high, and is not unlike a large *C. pulla*, only not so dark in colour. We gathered also *Carex vaginata*, Tausch; *Carex atrata*, Linn.: and very handsome specimens of *Carex rigida*, Good. We searched long, but unsuccessfully, for *Carex alpina*. If the day had not been so wretchedly bad, we should probably have found it, as it seems to grow on more than one spot; but, as I now understand, we were most of the time hunting on the wrong ground. We meant to go out at the top of the corrie and round by the head of the glen to the other side of the Fee Burn, to examine the upper rocks there for *Woodsia*, and then to meet the other party in Glen Dole: but we had spent so much time in the corrie, and were so wet, that that part of the programme had to be given up. The only other plants we found worth mentioning were *Veronica alpina*, Linn., *Epilobium alsinefolium*, Vill., and *E. alpinum*, Linn. One or two plants of *Tetraplodon mnioides*, B. and S., were also found. On returning to Acharn, we met the rest of our company, who reported that there was still a considerable quantity of *Lychnis alpina* in its old station.

On Thursday, 13th July, we walked up to Loch Brandy, where one of the party fished with more zeal than success, and where a few things were found, such as *Loiseleuria procumbens*, Desv., *Lobelia Dortmanna*, Linn., and *Isoetes lacustris*, Linn. Abundance of *Meum Athamanticum*, Jacq., was growing near the hotel.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during July, August, September, and October. By Robert Lindsay, Curator.

JULY.

The month of July was, on the whole, favourable. Rain fell on 18 days during the month. This was much needed after the long spell of fine dry weather during preceding months. The lowest night temperature was 42°, which occurred on the 6th of the month, and the highest 55°, on the 10th. The lowest day temperature was 61°, on the 4th, and the highest 76°, on the 23rd.

The common lime-tree was laden with blossom more abundantly than usual during the month, and the New Zealand shrub, *Olearia Haastii*, was completely covered with masses of sweet-scented white flowers, both of which were highly attractive to bees.

On the rock-garden 112 species and well-marked varieties came into flower, as against 237 for the corresponding month last year. A few of the best flowered were:—*Anemone rivularis, Anemonopsis macrophylla, Aubrietia macrostyla, Aster Thomsonii, Alyssum argenteum, Campanula macrantha alba, C. isophylla alba, Cistus formosus, Cineraria geifolia, Coronilla iberica, Chrysanthemum maximum, Dianthus Atkinsoni, Fuchsia Riccartoni, Gentiana asclepiadea alba, Helichrysum anatolicum, Hypericum coris, Lilium canadense flavum, Micromeria piperella, Monarda Kalmiana, Meconopsis Wallichii, Œnothera Sellowi, Potentilla verna fl. pl., Rosa viridiflora, Scrophularia sambucifolia, Rhododendron anthopogon.*

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	46°	54°	65°	17th	49°	63°	70°
2nd	51	60	72	18th	49	62	75
3rd	53	57	64	19th	49	63	75
4th	50	54	61	20th	45	64	68
5th	49	54	66	21st	43	63	71
6th	42	61	67	22nd	46	60	70
7th	55	66	70	23rd	49	64	76
8th	52	64	67	24th	49	54	73
9th	53	65	70	25th	47	51	69
10th	55	61	71	26th	50	61	71
11th	49	58	67	27th	42	60	70
12th	52	53	67	28th	42	55	72
13th	47	54	62	29th	50	60	71
14th	47	57	71	30th	45	53	70
15th	48	58	70	31st	46	61	69
16th	46	61	73				

AUGUST.

August was an exceedingly warm month, there was an entire absence of anything like cold weather throughout. Rain and thunderstorms were rather frequent, but the month, on the whole, was a most favourable one. The lowest night temperature was 38°, which occurred on the 28th of the month, and the highest 58°, on the 16th. The lowest day temperature was 63°, on the 31st of the month, and the highest 87°, on the 15th and 16th.

On the rock-garden 73 species and varieties of hardy plants came into flower, as against 103 during the previous August. Amongst the most interesting were:—*Allium glaucum, Campanula floribunda, Centaurea alpina, Colchicum speciosum, Coreopsis verticillata, Carlina subcaulescens, Cyclamen europæum, Erica Lawsoniana, E. Watsoni, Delphinium, sulphureum, Gladiolus Saundersii, Hypericum Elæoides, H. patulum, Montbretia crocosmæflora, Origanum Dictamnus, Polygonum capitatum, P. vaccinifolium, Senecio compacta, Statice minuta, Sedum latifolium, Veronica longifolia subsessilis, Zauschneria californica.*

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	46°	60°	68°	17th	54°	64°	85°
2nd	50	64	72	18th	55	64	81
3rd	49	61	67	19th	51	63	73
4th	49	60	68	20th	54	60	74
5th	46	50	66	21st	52	59	65
6th	45	57	67	22nd	51	61	69
7th	41	56	67	23rd	48	60	71
8th	42	61	78	24th	50	61	69
9th	54	64	80	25th	47	65	70
10th	52	59	74	26th	48	61	69
11th	54	61	73	27th	43	54	65
12th	53	68	75	28th	38	56	64
13th	48	65	76	29th	48	60	72
14th	55	64	81	30th	47	60	71
15th	55	73	87	31st	54	56	63
16th	58	65	87				

SEPTEMBER.

The month of September was cool and unsettled, with heavy falls of rain. The first frost this season took place on the 11th of the month, when the thermometer registered 32°, which was repeated on the 23rd. The lowest day temperature was 50°, on the 23rd, and the highest 72°, on the 2nd of the month.

Most herbaceous plants flowered very well during the month; strawberries and *Gentiana acaulis* were observed in flower for the second time during this month, as were also laburnums and rhododendrons. Autumn tints began to show early in the month, and were most effective on *Pavia flava*, lime-tree, horse-chestnut, and Ghent azaleas.

On the rock-garden a large number of plants were in flower, but only 28 came into flower in September, as against 45 for the corresponding month last year, a few of the most interesting being:—*Adlumia cirrhosa, Aster Stracheyi, Colchicum maximum, Crocus annulatus, C. medius, C. Salzmanni, Dianthus Seguierii, Erica Mackiana, E. Stuartii, Fuchsia sanguinea, Gratiola officinalis, Potentilla Mooniana, Polygonum capitatum, Teucrium flavum, Thymus striatus, Kniphofia nobilis, K. Saundersii, Sedum Fabaria, S. spectabilis.*

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	48°	54°	66°	16th	43°	59°	64°
2nd	54	64	72	17th	44	56	69
3rd	53	58	63	18th	49	55	65
4th	46	60	72	19th	50	55	64
5th	48	61	70	20th	39	54	62
6th	50	58	68	21st	36	40	59
7th	51	58	68	22nd	37	46	57
8th	49	53	63	23rd	32	39	50
9th	40	46	63	24th	34	49	53
10th	34	49	58	25th	33	46	57
11th	32	35	61	26th	41	45	50
12th	33	36	67	27th	43	48	53
13th	45	60	64	28th	43	49	66
14th	53	61	72	29th	43	48	62
15th	54	60	64	30th	43	53	61

OCTOBER.

The month of October was somewhat mild and changeable, but was a favourable month on the whole. The thermometer was at or below the freezing-point on five occasions, indicating collectively 18° of frost for the month, as against 44° for the corresponding month of last year. The lowest readings were—on the 4th, 30°; 5th, 30°; 9th, 32°; 30th, 27°; 31st, 23°. The lowest day temperature was 50°, on the 26th, and the highest 67°, on the 1st. Autumn tints were very fine this season, though of short duration. The beautiful and varied foliage colouring was most effective on scarlet and Hungarian oaks, various species of *Acer* and *Pyrus, Cornus, Liriodendron, Liquidamber, Azalea, Ampelopsis,* and *Berberis.* The brown tints on *Biotas* and other conifers are very pronounced this season, and very interesting. Hardy rhododendrons and azaleas are well set with flower-buds for next season. Fruit is plentiful on most trees and shrubs; hollies are rather poorly set with berries; and *Pyrus latifolia,* large trees of which in the garden never have failed, that I remember, to produce great quantities of fruit—the delight of numerous birds that abound in the garden—this year is a notable exception, being almost barren of fruit; probably the very dry weather which prevailed during their flowering period has prevented the berries from setting. Herbaceous plants and annuals continued to flower freely until the end of the month.

On the rock-garden only 3 plants came into flower during the month, viz.:—*Aconitum californicum*, *Helleborus niger grandiflora*, and *Gynerium argenteum*. A good many plants have flowered a second time, among which were:—*Rhododendron ferrugineum*, *Ulex europæus*, and *Pyrus japonica*.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	45°	55°	67°	17th	45°	49°	63°
2nd	37	55	65	18th	37	48	55
3rd	39	52	60	19th	47	53	62
4th	30	40	57	20th	45	51	63
5th	30	51	57	21st	51	57	63
6th	37	52	60	22nd	37	48	62
7th	40	50	59	23rd	39	49	55
8th	43	48	58	24th	45	55	59
9th	32	45	54	25th	45	55	57
10th	36	49	55	26th	34	39	50
11th	38	50	57	27th	34	44	54
12th	37	49	56	28th	39	52	55
13th	36	44	57	29th	37	39	53
14th	42	54	67	30th	27	33	45
15th	53	59	66	31st	23	32	46
16th	52	58	62				

II. (1) METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JULY 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours.		Hygrometer.		Direction of Wind.	Clouds.			Rainfall. (Inches.)
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	30·062	68·8	51·2	53·9	53·2	E.	St.	10	E.	0·000
2	30·032	62·3	53·3	57·0	55·8	E.	St.	10	E.	0·075
3	30·112	71·4	56·1	57·7	56·7	E.	St.	10	E.	0·010
4	30·075	59·2	53·1	55·1	53·1	E.	Cum.	10	E.	0·000
5	29·995	57·0	51·9	53·7	51·7	E.	Cum.	10	E.	0·000
6	30·020	59·0	50·9	58·2	54·1	E.	Cum.	1	E.	0·000
7	29·851	62·0	53·9	61·8	57·9	E.	...	0	...	0·000
8	29·700	68·8	53·9	56·1	53·3	E.	Cum.	10	E.	0·535
9	29·413	64·1	55·5	64·4	61·6	S.E.	Cum.	2	S.E.	0·200
10	29·678	68·0	55·8	60·3	57·3	S.E.	Cum.	10	S.E.	0·480
11	29·700	64·8	55·3	58·7	57·3	S.E.	Cum.	10	S.E.	0·070
12	29·659	60·8	55·0	55·7	55·1	N.E.	Nim.	10	N.E.	0·200
13	29·653	56·6	50·9	53·7	50·3	N.E.	Cum.	10	N.E.	0·000
14	29·804	57·7	49·9	55·1	50·9	N.	Cum.	9	N.	0·000
15	29·867	61·8	51·9	56·5	51·1	N.E.	Cum.	10	W.	0·000
16	29·744	62·8	46·8	60·7	56·9	W.	Cum.	9	S.W.	0·230
17	29·611	66·7	49·1	63·3	56·2	N.W.	Cum.	6	N.W.	0·001
18	29·826	65·8	52·1	61·9	56·3	N.W.	Cir.	2	N.W.	0·210
19	29·347	67·8	53·0	63·9	60·9	W.	Cum.	6	W.	0·001
20	29·248	71·2	54·3	60·1	55·1	W.	Cum.	9	W.	0·000
21	29·457	66·6	49·0	50·8	55·1	W.	Cum.	2	W.	0·000
22	29·684	67·8	50·1	61·8	55·1	W.	Cum.	6	W.	0·000
23	29·924	68·4	43·8	59·8	52·9	W.	...	0	...	0·010
24	29·624	66·5	58·0	62·2	58·2	S.W.	Cum.	10	S.W.	0·260
25	29·472	72·0	50·9	54·0	53·2	W.	Nim.	10	W.	0·035
26	29·708	68·6	52·8	60·1	55·9	N.	Cum.	10	N.	0·001
27	30·106	63·7	46·0	59·9	52·1	N.E.	Cir.	4	N.	0·000
28	30·104	63·8	46·2	55·1	53·0	S.E.	St.	10	E.	0·010
29	29·902	64·9	52·8	58·9	56·1	W.	Cum.	10	W.	0·000
30	29·773	65·8	47·5	58·3	54·1	N.	Cum.	10	N.	0·340
31	29·787	63·5	48·3	62·5	55·8	N.	Cum.	5	N.	0·060

Barometer.—Highest Observed, on the 3rd, = 30·112 inches. Lowest Observed, on the 20th, = 29·248 inches. Difference, or Monthly Range, = 0·864 inch. Mean = 29·772 inches.

S. R. Thermometers.—Highest Observed, on the 25th, = 72°·0. Lowest Observed, on the 23rd, = 43°·8. Difference, or Monthly Range, = 28°·2. Mean of all the Highest = 64°·8. Mean of all the Lowest = 51°·6. Difference, or Mean Daily Range, = 13°·2. Mean Temperature of Month = 58°·2.

Hygrometer.—Mean of Dry Bulb = 58°·7. Mean of Wet Bulb = 55°·0.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 2·728 inches. Greatest Fall in 24 hours, on the 8th, = 0·535 inch.

A. D. RICHARDSON,
Observer.

(2) Meteorological Observations taken at Royal Botanic Garden, Edinburgh, during the Month of August 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·811	65·0	49·6	60·1	54·3	N.W.	Cir.	6	N.W.	0·065
2	29·675	64·3	58·0	64·3	59·2	N.W.	Cum.	5	N.W.	0·180
3	29·361	69·1	53·0	62·9	61·7	S.W.	Cum.	10	S.W.	0·155
4	29·410	66·2	49·7	64·3	58·1	S.W.	Cum.	1	S.W.	0·430
5	29·714	64·8	49·1	52·3	51·3	N.	Nim.	10	N.	0·050
6	29·967	62·7	45·1	58·0	53 0	E.	Cir.Cum. Cum.	8 1	W. S.E.	0·235
7	29·753	64·7	54·1	57·8	56·4	S.	St.	10	S.E.	0·001
8	29·872	70·9	55·5	63·7	61·4	W.	Nim.	10	S.W.	0·013
9	29·976	71·0	53·9	63·9	61·2	N.W.	Cum.	8	W.	0·069
10	29·805	77·9	57·5	58·9	58·0	E.	Nim.	6	E.	0·165
11	29·801	68·7	57·3	60·4	59·3	S. E.	Cum.	10	E.	0·074
12	29·863	69·9	53·5	68·7	63·9	S.W.	Cum.	5	S.W.	0·000
13	30·065	73·5	50·5	66·9	61·3	W.	Cir.	4	W.	0·000
14	30·095	75·0	57·0	65·8	63·9	W.	Cir.	2	W.	0·000
15	30·053	75·8	58·0	75·0	68·3	W.	...	0	...	0·000
16	30·048	82·8	59·4	68·2	64·4	W.	Cum.	7	W.	0·000
17	29·883	75·0	57·1	63·9	61·9	S.W.	Cum.	10	S.W.	0·000
18	29·579	75·8	58·5	64·5	62·2	S.W.	Cir.	8	S.W.	0·000
19	29·617	77·0	54·5	69·7	62·2	S.W.	...	0	...	0·505
20	29·341	74·2	55·2	60·0	58·7	S.W.	Cir. Cum.	2 6	S.W.	0·298
21	29·008	71·6	56·7	59·7	55·5	S.W.	Cum.	2	S.W.	0·024
22	29·358	66·1	54·3	62·6	56·5	S.W.	Cum.	6	W.	0·267
23	29·567	68·0	48·8	59·0	56·9	S.W.	Cum.	8	S.W.	0·099
24	29·637	67·9	49·1	59·0	55·8	S.W.	Cum.	4	W.	0·000
25	29·983	67·0	50·1	63·0	57·4	N.W.	Cir.	2	N.W.	0·000
26	30·011	66·6	50·0	58·8	54·9	W.	Cum.	6	W.	0·000
27	30·017	68·6	49·3	56·4	51·3	N.E.	Cum.	8	N.E.	0·000
28	30·150	63·9	40·8	56·1	52·4	N.E	Cir. Cum.	2 4	N.E.	0·000
29	30·127	63·1	49·0	60·6	56 3	W.	Cum.	8	W.	0·000
30	29·952	73·3	51·1	63·0	57·9	S.W.	Cum.	6	S.W.	0·019
31	29·791	70·7	54·0	54·7	53·8	N.E.	Nim.	10	N.E.	0·022

Barometer.—Highest Observed, on the 28th, = 30·150 inches. Lowest Observed, on the 21st, = 29·008 inches. Difference, or Monthly Range, = 1·142 inch. Mean = 29·784 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 82°·8. Lowest Observed, on the 28th, = 40°·8. Difference, or Monthly Range, = 42°·0. Mean of all the Highest = 70°·0. Mean of all the Lowest = 52°·9. Difference, or Mean Daily Range, = 17°·1. Mean Temperature of Month = 61°·4.

Hygrometer.—Mean of Dry Bulb = 62°·0. Mean of Wet Bulb = 58°·4.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 2·671 inches. Greatest Fall in 24 hours, on the 19th, = 0·505 inch.

A. D. RICHARDSON, } *Observers.*
A. ANDERSON, }

(3) Meteorological Observations taken at Royal Botanic Garden, Edinburgh, during the Month of September 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected. 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·756	59·9	50·5	59·9	53·9	S.W.	Cum.	10	S.W.	0·055
2	30·007	66·0	55·6	64·1	60·0	N.W.	Cum.	10	N.W.	0·000
3	30·190	71·8	53·7	58·9	55·1	E.	Cum.	10	E.	0·000
4	30·091	63·5	48·8	63·3	58·9	N.	Cir.	1	N.	0·000
5	29·853	71·8	49·4	62·8	58·2	W.	...	0	...	0·000
6	29·633	70·2	51·4	60·1	56·9	W.	Cum.	8	W.	0·060
7	29·449	67·8	53·1	60·1	58·2	W.	Cum.	9	W.	0·080
8	29·440	68·0	50·3	59·7	55·0	W.	Cir. / Cum.	4 / 2	W.	0·065
9	29·776	62·8	41·0	51·9	47·7	N.	Cum.	5	N.	0·010
10	30·014	62·9	36·2	50·2	44·9	N.W.	...	0	...	0·000
11	29·777	58·0	36·0	54·0	49·4	N.	...	0	...	0·000
12	30·204	60·9	36·5	57·2	52·1	N.W.	...	0	...	0·000
13	29·769	64·6	51·8	60·3	57·2	S.W.	Cum.	10	S.W.	0·000
14	29·959	64·0	54·9	61·0	59·1	W.	Cum.	10	W.	0·000
15	29·803	67·7	59·2	62·7	59·1	S.W.	Cum.	10	S.W.	0·000
16	29·756	63·8	50·9	57·7	54·3	W.	Cum.	1	W.	0·000
17	29·587	62·9	45·0	54·1	51·3	W.	Cum.	10	W.	0·020
18	29·356	58·8	52·4	57·1	56·0	W.	Nim.	10	W.	0·040
19	29·065	61·6	53·0	57·1	52·0	W.	Cum.	2	W.	0·045
20	29·203	61·7	41·4	49·0	45·8	W.	Cir.	4	W.	0·000
21	29·346	58·7	38·0	46·8	44·8	W.	Cir.	10	N.	0·130
22	29·490	52·0	40·0	47·3	44·1	N.W.	Cum.	9	N.W.	0·070
23	29·356	53·2	34·8	40·9	37·9	N.W.	St.	10	N.W.	0·010
24	29·806	48·3	36·1	46·8	43·8	W.	Cir. St.	9	N.	0·050
25	29·857	51·1	42·0	48·2	42·4	N.W.	Cir.	2	N.W.	0·060
26	29·793	54·0	42·0	45·5	44·2	E.	Cum.	10	E.	0·020
27	29·615	49·8	45·0	49·8	49·1	W.	Nim.	10	W.	0·090
28	29·326	55·7	44·0	55·7	51·7	W.	Cum.	9	W.	0·840
29	28·820	64·6	46·0	56·1	51·0	S.W.	Nim.	10	S.W.	0·130
30	28·943	61·8	45·2	53·2	49·0	S.W.	Cir.	2	S.W.	0·175

Barometer,—Highest Observed, on the 12th, = 30·204 inches. Lowest Observed, on the 29th, = 28·820 inches. Difference, or Monthly Range, = 1·384 inch. Mean = 29·635 inches.

S. R. Thermometers.—Highest Observed, on the 3rd and 5th, = 71°·8. Lowest Observed, on the 23rd, = 34°·8. Difference, or Monthly Range, = 37°·0. Mean of all the Highest = 61°·3. Mean of all the Lowest = 46°·1. Difference, or Mean Daily Range, = 15°·2. Mean Temperature of Month = 53°·7.

Hygrometer.—Mean of Dry Bulb = 55°·0. Mean of Wet Bulb = 51°·4.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 1·950 inch. Greatest Fall in 24 hours, on the 28th, = 0·840 inch.

A. D. RICHARDSON,
A. ANDERSON, } *Observers.*

(4) Meteorological Observations taken at Royal Botanic Garden, Edinburgh, during the Month of October 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·331	60·9	44·7	55·4	51·3	S W.	Cir.	5	N.W.	0·020
2	29·381	60·9	40·9	52·3	49·8	W.	Cir. St.	4	S.	0·045
3	29·134	58·8	42·3	48·0	45·3	W.	Cir.	2	S.	0·010
4	28·917	56·8	34·8	42·2	41·6	S.W.	Cum.	10	S.W.	0·000
5	29·008	48·0	33·1	45·9	43·9	N.W.	...	0	...	0·000
6	29·202	55·6	39·9	48·5	46·8	W.	...	0	...	0·000
7	29·493	57·7	43·6	51·1	48·8	W.	...	0	...	0·950
8	29·451	57·0	42·8	50·3	50·1	N.E.	Nim.	10	N.E.	0·060
9	29·745	53·8	35·0	47·2	45·2	S.	Cum.	5	S.	0·000
10	29·539	52·4	39·9	46·4	44·8	S.W.	...	0	...	0·000
11	29·494	53·8	40·1	48·2	44·2	N.W.	...	0	...	0·000
12	29·759	56·0	41·8	46·8	43·2	W.	...	0	...	0·000
13	29·941	54·8	39·0	45·7	43·1	N.W.	Cir. St.	10	N.W.	0·365
14	29·487	56·4	45·4	56·1	55·9	W.	Nim.	10	W.	0·245
15	29·550	60·0	55·6	59·7	58·7	S.W.	Cum.	10	S.W.	0·020
16	29·528	63·4	55·6	59·0	56·1	W.	Cum.	4	W.	0·000
17	29·857	61·4	47·2	50·0	48·0	W.	...	0	...	0·000
18	30·025	58·0	39·0	48·0	46·7	N.W.	Cum.	6	N.W.	0·000
19	30·157	55·9	46·9	53·3	50·9	W.	Cum.	10	W.	0·000
20	30·107	58·5	47·9	51·4	48·8	S.W.	Cir. St.	10	S.W.	0·000
21	29·858	59·9	50·9	59·3	57·1	S.W.	Nim.	10	S.W.	0·025
22	29·981	61·8	41·6	50·1	47·2	S.W.	Cum.	2	W.	0·000
23	30·294	55·6	38·7	43·6	42·3	W.	...	0	...	0·000
24	30·027	53·8	42·9	52·0	49·5	W.	Cum.	5	W.	0·185
25	29·486	56·9	49·0	49·2	48·7	S.W.	Nim.	10	S.W.	0·700
26	29·418	49·8	36·1	40·0	38·1	W.	Cir.	5	N.	0·000
27	29·703	46·0	36·0	43·7	41·2	W.	...	0	...	0·000
28	29·337	52·8	43·1	52·8	50·1	W.	Cir. / Cum.	2 / 1	W.	0·010
29	29·400	56·8	38·0	39·2	37·8	W.	...	0	...	0·020
30	29·821	44·9	29·1	33·1	31·5	N.W.	...	0	...	0·000
31	30·098	43·9	26·0	31·7	30·6	N.W.	...	0	...	0·055

Barometer.—Highest Observed, on the 23rd, = 30·294 inches. Lowest Observed, on the 4th, = 28·917 inches. Difference, or Monthly Range, = 1·377 inch. Mean = 29·630 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 63°·4. Lowest Observed, on the 31st, = 26°·0. Difference, or Monthly Range, = 37°·4. Mean of all the Highest = 55°·2. Mean of all the Lowest = 41°·5. Difference, or Mean Daily Range, = 13°·7. Mean Temperature of Month = 48°·3.

Hygrometer.—Mean of Dry Bulb = 48°·4. Mean of Wet Bulb = 46°·4.

Rainfall.—Number of Days on which Rain fell = 14. Amount of Fall = 2·710 inches. Greatest Fall in 24 hours, on the 7th, = 0·950 inch.

A. D. RICHARDSON,
Observer.

III. ON RIBES SUBVESTITUM, Hooker and Arnott. By A. D. RICHARDSON.

In 1882 a *Ribes*, of which a dried specimen is exhibited, was received by the Edinburgh Arboretum from the Royal Gardens, Kew, under the name of *Ribes Cynobasti*.

In the end of April of the present year, when the plant was in flower, I endeavoured to ascertain whether it was correctly named, the result being that it turned out to be, not *Ribes Cynobasti*, but *R. subvestitum* of Hooker and Arnott.

On a first comparison I was led to believe that it was *R. Lobbi* of Gray, a Californian species, from the fact that a woodcut and description in the "Gardeners' Chronicle" (Vol. XIX., N. S., p. 11), of what I then understood to be that species, seemed to agree very closely in every respect with our plant, and which was stated in the accompanying letterpress to be synonymous with *R. subvestitum* of Hooker in the "Botanical Magazine" (Vol. 82, t. 4931), but not with *R. subvestitum* of Hooker and Arnott in the "Botany of Beechey's Voyage." On turning to the "Botanical Magazine," however, I was surprised to find that the plant there figured as *R. subvestitum* was said to be synonymous with *R. subvestitum* of Hooker and Arnott, but it did not quite agree with our plant, or with that figured in the "Gardeners' Chronicle."

In the belief that two species were involved in the "Botanical Magazine" and "Gardeners' Chronicle" figures, and seeing that these two works contradicted each other regarding the synonymy, I sent to the editor of the "Gardeners' Chronicle" (Dr. Masters) a specimen of our plant, and, at the same time, drew his attention to the contradictory statements before mentioned. In his reply, Dr. Masters stated that the plant from which the "Gardeners' Chronicle" figure was made was received from Kew as *R. subvestitum* of Hooker in the "Botanical Magazine"; and that that plant being the same as *R. Lobbi* of Gray, a mistake had somehow arisen in attaching the name *Lobbi* to the figure. He also stated that the "Gardeners' Chronicle" plant and our plant were one and the same species, viz., *R. Subvestitum* of Hooker and Arnott, which species in his opinion was only a variety of *R. Menziesii* of Pursh.

The synonymy, therefore, stands thus:—

1. *R. Lobbi* of the "Gardeners' Chronicle" (not of Gray) and the Edinburgh Arboretum plant are *R. subvestitum* of Hooker and Arnott (not of the "Botanical Magazine.")
2. *R. Lobbi* of Gray (not of the "Gardeners' Chronicle") is the same as *R. subvestitum* of Hooker in the "Botanical Magazine" (not of Hooker and Arnott.)

R. subvestitum of Hooker is a native of California, and was first discovered by the naturalists of Captain Beechey's surveying voyage. It was subsequently introduced into this country by Lobb, and it therefore seems appropriate that Gray should have selected the specific name *Lobbi* in preference to the older one, especially as another species bearing the same name was already in existence at that time. This species seems, however, to be little known.

R. subvestitum of Hooker and Arnott flowers freely in the Edinburgh Arboretum, and forms, when in full flower in spring, a very striking and pretty object, the flowers hanging down like those of a small flowered fuchsia. It has not, however, produced ripe fruit here.

IV. The Plants in the Palm House and Temperate House. By R. L. Harrow.

Since the opening of the Palm House on the 1st of September last, nearly 150 species and varieties of plants have flowered, and the effects of the past exceptional summer are now visible in many ornamental and foliage plants, in their production of a more intense colour and greater substance in the leaves. The success attending the planting out of the occupants in the beds arranged for their reception has been entirely satisfactory. Planted in tubs, as these specimens formerly were, their growth was in some cases naturally stunted; since more root-action was allowed there has been produced a greater plenitude of both flowers and foliage. The palms in the Temperate House, which were formerly subjected to warmer treatment, are now growing luxuriantly under a much lower temperature, *Bambusa arundinacea*, which started its first growth about the middle of August, has since thrown up five other shoots exhibiting great vigour. Another plant, *Euterpe edulis*, which, on account of its height, could not be placed in a more tropical position in the Palm House, is still producing foliage almost the size of that found under its original warmer temperature. As these plants are generally grown under tropical conditions, an interesting illustration of the fact that plants will often thrive in lower temperatures than those thought to be essential for their successful culture is presented.

During the past month many interesting, and several rare plants have flowered, a few of the most noticeable being the following:—

Euadenia eminens, a native of tropical Africa, and belonging to the order *Capparideæ*. Its flowers are borne upon a terminal inflorescence, are of a greenish-yellow colour, and are in considerable numbers. The two upper petals are about 4 inches in length, spread out in an upward position, while the two lower are almost suppressed. This plant has, to our knowledge, never been fruited under cultivation, and our attempts were unsuccessful, although pollen was produced in abundance.

Stapelia gigantea, of which a flower is exhibited, is noted, as its name implies, as being the largest of this remarkable genus, our largest flower measuring nearly a foot in diameter.

Aristolochia gigas, var. *Sturtevantii*, which was received by us in the spring of this year from Kew, has since planting produced five flowers, four others in different stages being still upon the plant. The dimensions of the largest flower were 14 inches across, 1 foot 8 inches long, exclusive of the tail of the flower, which, being included, gave it a total length of 5 feet 3 inches. This being the first occasion of its having flowered in Scotland, it is still a source of great attraction to visitors.

Amongst the many others worthy of remark are:—*Allamanda neriifolia, A. Williamsii, Crinum asiaticum variegatum, Eranthemum albiflorum, Ixora coccinea, Momordica Charantia, Luffa ægyptica, Jasminum hirsutum, Whit-*

fieldia lateritia, Croton discolor, Medinilla venosa, Theobroma Cacao, Begonia sinuata, Costus igneus, Bignonia purpurea, Trichosanthes anguina, Astelia Banksii, Streptocarpus Dunnii, Rhodochiton volubile, Bauera rubioides, Tinea æthiopica, Pitcairnea Andreana, Jatropha podagrica.

On the table are exhibited plants and cut specimens, in flower, of: *Gordonia anomala*, Spreng. = *Polyspora axillaris*, Don. and Roxb., — a free-flowering shrub, of the order *Ternstrœmiaceæ*, bearing white flowers; it is a native of Tropical and Sub-Tropical Asia, introduced in 1816. *Callicarpa purpurea*,—a native of India, bearing flowers in cymose clusters, which are very insignificant; but producing berries of a deep glossy violet colour. *Solanum Seaforthanium*, — a beautiful climbing plant, formerly figured in the "Botanical Magazine" as *S. venustum*. Introduced 1804. *Malpighia glabra*, Bardados cherry,— coming from West Indies, where it is sometimes cultivated for its fruit; its flowers, of a light pink colour, are produced late in the autumn from the axils of the leaves. *Globba Schomburghii*, from Siam, and *G. atrosanguinea*, from Bornea,—species of a genus of *Scitamineæ*, remarkable for the development of root-tuber-buds in the axils of the lower bracts of the spicate inflorescence. These are commonly mistaken for the fruit of the plant, with which, however, they have no resemblance. *Clerodendron nutans*, —a creamy-white flowered species. *Gynura sarmentosa*,— a composite with dark-coloured phyllaries, and a peculiar, rather offensive, odour in the flowers. *Phyllanthus nivosus*, from South Sea Islands, — a very effective foliage euphorbiaceous plant.

MEETING OF THE SOCIETY,

Thursday, December 14, 1893.

Dr. Craig, Vice-President, in the Chair.

Reginald Macleod, Queen's and Lord Treasurer's Remembrancer, and Percival C. Waite, were elected Resident Fellows of the Society.

The Chairman informed the Society of the deaths of Rev. George Gordon, LL.D., and of A. Stephen Wilson, Non-Resident Fellows of the Society.

The Treasurer briefly stated the financial position of the Society, particulars of which he promised to communicate at the next meeting of the Society.

The following donations to the Illustration Fund were announced:—

Dr. Cleghorn, ...	£1	0	0
Sir J. D. Hooker, . . .	2	2	0

Presents to the Library at the Royal Botanic Garden were announced, amongst them being the second fasciculus, completing the first volume of the "Index Kewensis."

Mr. Rutherford Hill said—Among some Museum specimens, received a few days ago, was a specimen of the Malay fish poison, called Aker Tuba. It is the root of *Derris elliptica*, Benth., a papilionaceous woody climber, which grows wild on the plains in Perak, and is also rather extensively cultivated. The roots, known as Tuba root, are done up into bundles like the one I now exhibit. This one is quite dry, but as sold in the East they are in the fresh state, and have a rather pleasant aromatic, resinous smell, resembling that of fresh liquorice root. When cut, a milky juice exudes. This root has for a long time been used by the Malays for poisoning fish, the chopped roots being placed in the water. It also enters into the composition of the "Ipoh" arrow poison of Borneo. As it

Issued November 1894.

completely destroys the stock of fish in a stream, a law has been passed prohibiting its use. The root has also been extensively employed by Chinese gardeners for the destruction of the insect pests which infest gardens and greenhouses. It is interesting to note that another species, *D. uliginosa*, Benth., is employed as a fish poison on the Zambesi, in East Africa.

An examination of the root was made by M. Greshoff in 1891, but a more complete investigation was made last year by Mr. Leonard Wray, Curator of the Perak Government Museum. He found that 20 grains of the fresh root added to 1 gallon of water rapidly killed fish placed in it. By exhausting the root with alcohol, acidulated with hydrochloric acid, and evaporating, a gummy substance separated, and was collected and pressed into a mass. This proved to be the active principle, to which he gives the name of "tubain." Tubain is very brittle, reddish brown, quite insoluble in water, paraffin oil, and benzol, but soluble in alcohol, ether, and chloroform. It is not an alkaloid, but a resinous substance. The dried root yields 9·42 per cent. of tubain by the above process, but it is hardly probable that it has yet been obtained in a pure state. It is intensely poisonous. Mr. Wray found that 1 part of tubain in 350,000 parts of water proves quickly fatal to fish, and so small a quantity as 1 part in 1,000,000 parts of water killed fish in from 15 to 30 minutes. Mr. Wray suggests that this substance might be employed to destroy insect pests, and is well worthy the attention of makers of insecticides, and of floriculturists and horticulturists generally. This investigation being so recent, I have thought it would be of interest to the Fellows to see the specimen of the root which I have shown.

Miss Madden exhibited a cone of *Araucaria imbricata* from Argyllshire.

Professor Bayley Balfour exhibited models, by Deyrolle of Paris, of a section of tree-stem and of a grain of wheat, from the Museum of the Royal Botanic Garden; also the top of a specimen of *Abies grandis* blown down in one of the recent gales at Keir, and sent by Mr. Stirling-Maxwell of Keir. The specimen was remarkable for the growths, in length, of the three past years it exhibited, the length of the stem being in each year over 4 feet.

The following Papers were read:—

Obituary Notice of Charles Jenner. By Robert Lindsay.

We have to record with great regret the death of Charles Jenner, which occurred at Easter Duddingston Lodge, Portobello, on 27th October 1893, in the eighty-fourth year of his age. Born at Chatham, Kent, on the 1st September 1810, he was sent, when thirteen years old, to learn the business which in after life he pursued with so much zeal and energy, and at the age of twenty he came to Edinburgh, founded, and carried on for fifty years, one of the most successful drapery establishments in the city.

Soon after settling in Edinburgh, Mr. Jenner became a member of the Philosophical Institution, and he attributed much of his success in after life to the valuable instruction he received there. His tastes directed him to literary and scientific pursuits, and he joined the Botanical Society in 1851, and found time during his busy life to contribute several papers to our Transactions. His attention was early directed to cryptogamic plants, and he devoted much time to the study of the unicellular Algæ. In 1867 he was elected President of this Society.

Mr. Jenner had an intense admiration of Scottish scenery, and took special delight in botanizing on our Scottish mountains; indeed, nearly all his holidays were thus spent. He began with the Pentland Hills, the geology of which first attracted him; this he followed up until there was scarcely a mountain district in Scotland that he did not know intimately.

In 1868, when President of this Society, he proposed the formation of an Alpine Botanical Club, on the plan pursued at some of the German universities, and a committee was appointed to consider the subject, but it never reported. The idea, however, was not lost sight of, for within two years the Scottish Alpine Botanical Club was formed at

Killin, of which Mr. Jenner was elected an Honorary Fellow on the 5th August 1873. During a botanical visit to Ross-shire and Inverness-shire in 1867, in company with Mr. Charles Howie of St. Andrews, Mr. Jenner discovered a small moss, which Professor Schimper of Strassburg regarded as a new species, and named *Didymodon Jennerii*, in honour of its finder;* and in the same excursion a handsome thistle was found, which has been named *Cnicus Carolorum* (the Charles thistle). Mr. Jenner suggested that the plant was probably a natural hybrid, and this view has been generally accepted, the parents of the form being *C. heterophyllus* and *C. palustris.* In August 1892, at Mr. Jenner's request, I visited the district where he had found the thistle twenty-five years previously, and I was enabled, from his accurate instructions, to find the plant, although its locality is limited to an area of a few yards in extent. A few young plants were brought to Easter Duddingston garden, but have not yet flowered.

Not the least of Mr. Jenner's services to botany and horticulture is the formation and maintenance for so many years of a garden which, in point of richness and interest, is second to none of the private collections of living plants in the kingdom. His garden had always the greatest attractions for him, and a brief account of its origin and outstanding features may be here given.† The grounds were laid out chiefly by the late William Gorrie, the late James Macnab also rendered valuable assistance. The garden now consists of about eight acres, devoted to a large collection of ornamental plants, with the exception of about an acre and a half of vegetable garden. The original rock-garden was constructed by Mr. Jenner and Mr. Howie in 1862, and consists of a series of raised beds, having their margins fitted with blocks of stone set on end, forming pocket-like spaces which were filled with special soil to suit the requirements of various alpine plants. The stone divisions thus prevent

* Figured and described in Trans. Bot. Soc. Edin., vol. ix. (1868), pp. 314. 315. It has since been shown that this is the *Oncophorus polycarpus* (Ehrh.), Brid. See Braithwaite's Moss Flora of Great Britain, I., p. 169.

† An account of the garden. being a paper entitled "A Scientific Garden," read at an evening meeting of the Edinburgh Naturalists' Field Club and Microscropical Society, on 23rd March 1892, with portraits of Mr. Jenner and Mr. Gorrie, and some views by Mr. John Lindsay, was printed for private circulation in 1892.

the more rampant-growing plants from mixing with and over-running the more delicate and slow-growing alpines. A large number of the plants in this part of the rock-garden were gathered by Mr. Jenner during his Highland excursions, the remainder consists of the best kinds of alpines of other countries that were in cultivation at the time. This was the first of this type of rock-garden constructed, so far as I know, in Britain; and that it has answered the purpose intended is witnessed by the fact that the majority of the original plants, planted thirty-one years ago, are still in perfect health and vigour. The raised beds were not stoned, but were simply planted with dwarf-growing shrubs or trees, many of which have been long since removed, as they had outgrown their positions, and in their place groups of lilies, ranunculus, anemone, and other showy plants have been substituted. All the rest of the rock-work at Easter Duddingston was designed by Mr. Gorrie. The best portion is a charming piece of artistic rock-work lying south of the original rock-garden, called by Mr. Jenner "Corriemore," as a memento of a botanical tour. This portion has been laid out in a different manner from the rest. The ground, instead of being raised, is excavated to a depth of about 8 feet, the excavations forming a high bank all round. Rough stones, placed firmly in the ground, support the mass of soil forming the banks, and give the sides a cliff-like appearance. A sloping narrow path runs round both sides, and reaches the bottom, now laid out as a bog-garden. The high banks afford ample protection for the growth of tender plants. Here such plants as *Chamærops Fortunei*, *Aralia Sieboldi*, *Phormium tenax*, *Cordyline australis*, *Bambusa falcata*, *Quercus glabra*, *Ilex latifolia*, and other half-hardy plants, resist the most severe winters.

Adjoining "Corriemore" is an erection for the cultivation of hardy ferns. Under cover of a projecting roof, large blocks of sandstone are set up against a north wall, with spaces for soil. In this hardy fernery most of the British species with their varieties, and several North American species, are successfully cultivated. Some of the sandstone blocks have numerous apertures about 2 inches in diameter hollowed out, in which patches of *Arenaria balearica* are grown for the purpose of draping the stones. In the damper portion of the fernery, the stones are covered with various liverworts.

Of late years several interesting features have been added to the garden. In 1887, Mr. Jenner, to utilize a piece of ground left vacant because unfit for ordinary garden purposes, conceived the idea of converting it into an iris garden. The ground was wet and clayey, and in digging out the clay, water was found at a depth of two feet. Good loam and peat soil having been substituted, the ground was laid out in square beds, with gravel walks intersecting them, the edges of the beds being formed by chips of granite set on end. Some of the best varieties of *Iris Kœmpferi* were imported from Japan, with which the larger beds were filled. As many of the other species as could be obtained were planted separately, along with the best varieties of *Montbretia.* The Japanese irises proved to be magnificent varieties, with enormously large blossoms, both single and double flowers, in various shades of colour. At the edges of the beds are rows of the early-flowering Siberian *Iris reticulata* planted thickly, which in spring is very effective. All the plants are now thriving luxuriantly here, and what was little better than a clay pit, is now one of the most interesting features of Easter Duddingston garden. In 1889, the "Alpine Levels" were formed. This is an arrangement for growing alpine plants in beds—not as single specimens, but in masses. The beds are 32 in number. Each bed measures 9 by 7 feet, and is subdivided into four parts, to contain individually one species in mass, and as their flowering periods vary, the plants are so arranged that the interest is kept up throughout the year. The subdivision of the large beds into four is éffected by longitudinal and transverse rows of an exceedingly dwarf-growing juniper—*Juniperus communis hibernica compressa.* Several specimens of this, planted in the original rock-garden thirty-two years ago, are at present only two feet in height, and are compact, symmetrical, handsome bushes, although they have never been cut or pruned. The large beds are edged with stone, and a gravel path runs round each. Numerous bulbs are planted on both sides of the stone margins, including snowdrops, snowflakes, winter aconite, crocuses, and anemones, which in spring are a beautiful sight. The beds themselves are filled with gentians, primulas, aubrietias, saxifrages, sedums, dianthuses, silenes, lithospermums, dwarf phloxes, etc., which produce masses of colour at different seasons of the year, rivalling the effects by tender bedding plants, besides being permanent and most interesting at all seasons.

Another important feature was added in 1889, viz., "The Climber Garden." This has proved an entire success. It consists of 50 circular beds, each 3 feet in diameter. A good stout spruce fir about 15 feet high is placed in the centre of each bed, round which the climbers cling for support, the remainder of the ground being taken up by gravel paths. No grass is used, in order that the climbers may be examined without getting the feet wet. Among the climbers are various kinds of clematis, jasmines, roses, *Aristolochia Sipho, Actinidia Kolomikta, Periploca græca, Mutisia decurrens, Tropæolum tuberosum, T. speciosum, Wistaria sinensis, Lathyrus latifolius*, hop, virginian creeper, etc. But none is more effective than the new climbing rose, "Crimson Rambler." The history of this rose is intimately connected with Easter Duddingston garden, and affords one of the many instances of Mr. Jenner's characteristic generosity. In 1878, Mr. Jenner received a consignment of plants from Japan, which he had commissioned Professor R. Smith, at that time Professor of Engineering at Tokio, to obtain for him. Among the plants thus received was this splendid rose, which Mr. Jenner named "The Engineer," in compliment to Professor Smith. The rose, which proved to be a new variety of *Rosa polyantha*, was much admired, and Mr. Jenner, wishing to spread such a good plant abroad and at the same time help a deserving man, presented, in 1889, the whole stock to Mr. John Gilbert, a small nurseryman at Lincoln in whom he was interested. Mr. Gilbert, in the following year, exhibited cut flowers of "The Engineer" at a meeting of the Royal Horticultural Society in London, when it was unanimously awarded a certificate of merit, but as he had not the means of placing the plant properly on the market, he obtained Mr. Jenner's permission to dispose of the stock to Mr. Charles Turner, of the Royal Nurseries, Slough Turner changed its name to that of "Crimson Rambler," and it soon became famous in this country and in France. So recently as May last, the gold medal of the National Horticultural Society of France was awarded to it as the best new plant exhibited.

The garden at Easter Duddingston is specially rich in rare trees and shrubs. The late Mr. Gorrie had a free hand to purchase every hardy plant of interest when the garden was in course of formation, and no one knew better than he where such were to be obtained; consequently, many of the rarest trees and shrubs in cultivation are to be met with here, such as *Fagus Cunninghamii*, over 12 feet high; *Quercus Fordii*, 20 feet; *Plagianthus betulinus* (the "Ribbon Tree" of New Zealand), over 20 feet high, etc., the latter interesting as having been planted by Sir William Jenner in 1879, during a visit to his brother at Easter Duddingston. Dwarf-growing and pendulous varieties of trees are here very numerous, and nearly all the hardy species of Rhododendron are represented, besides maples, oaks, hollies, conifers, etc., in great variety. The entire collection of species and varieties of plants in the garden exceeds 4000.

Mr. Jenner could never be persuaded to take much interest in "in-door" plants. The taste for rare orchids and tender bedding plants he denounced, and would have none of them while there existed so many beautiful plants capable of withstanding our climate. The climate of Midlothian he held to be nearly perfect.

He cordially welcomed the various Natural History Societies throughout the country which paid a visit to his garden. After the death of his wife in 1880, he contemplated bequeathing his unique garden to the Edinburgh Naturalists' Field Club, but unfortunately this was not carried out. The school children of the district, and the children of the Edinburgh Industrial School, were frequently invited to spend a day at Easter Duddingston, and many will long remember the kindness shown on these occasions. Mr. Jenner took much interest in the Industrial School, and was one of its founders. To charitable objects he gave a great deal of help in an unostentatious manner. He enjoyed vigorous health, and to the last week of his life took the greatest interest in his garden, and was full of plans for its further development. His motto was "Endeavour ever,' and his life justified its use. He will be remembered as one of our most successful merchants, a man of large-hearted charity, and a liberal encourager of scientific horticulture.

LIST OF BOTANICAL PAPERS BY MR. CHARLES JENNER.

1. A Comparative View of the more Important Stages of Development of the Higher Cryptogamia and Phanerogamia. Trans. Bot. Soc. Edin., vol. v., p. 55.
2. On the Accessory Organs of the Hybrid Selaginella. Trans. Bot. Soc. Edin., vol. viii., p. 169.
3. On the History and Structure of Urococcus. Trans. Bot. Soc. Edin., vol. viii., p. 318.
4. On the Study of Botany as a Branch of Mental Training. Trans. Bot. Soc. Edin., vol. x., p. 1.
5. Notice of a New Carduus gathered during a Botanical Excursion in Ross-shire. By Mr. Charles Howie and Mr. Charles Jenner. Trans. Bot. Soc. Edin., vol. ix., p. 257.
6. On Spores. Edin. New Phil. Jour., vol. iii., p. 269.

The Non-Assimilation of Atmospheric Nitrogen by Germinating Barley. (From Experiments made in 1880.) By T. Cuthbert Day.

(With Zincographs, Figs. 1 and 2.)

The question of the direct fixation of atmospheric nitrogen by growing plants seems to have been an attractive problem to workers in the field of vegetable physiology, judging by the number of experimenters who have, at different times, attacked the subject. I believe it is generally acknowledged that plants, by themselves, are not able to make any direct use of the element which constitutes four-fifths of the atmosphere, though, by the aid of certain organisms which attach themselves to the roots of some plants, a direct assimilation of atmospheric nitrogen takes place, as has been amply proved by the researches of Hellreigel and Wilfarth, Berthelot, Frank, Schlœsing, Lawes and Gilbert, and others. It is not my purpose to-night to deal with plants as they grow in the soil, but with the germinating seeds of a well-known cereal, namely, barley. Do the seeds of barley take up any nitrogen from the air during the germinating stage of growth? The question does not seem to be of much importance, but as, some years ago, I commenced to study some points in connection with the respiration of germinating barley, it was absolutely necessary, from the nature of the experiments I required to execute, to satisfy myself whether nitrogen was active or not. I consequently went through a series of determinations on the point, and secured a number of concordant results, the outcome of which I thought might prove of interest to this Society, and I have taken this opportunity of laying them before you.

In a paper published in the Transactions of the Chemical Society (September 1880), I gave the results of three experiments on this subject, showing that atmospheric nitrogen takes no active part in the germination of barley.

Taking into consideration the short length of time occupied by each of those experiments, I thought it desirable to confirm the results then obtained by executing a fresh series of experiments, each extending over a longer period, and to observe the fluctuations in the volume of confined air from day to day.

The apparatus employed was the same as in the former experiments. It is seen in Fig. 1. A is a flask of about 100 C.C. capacity, with M.M. graduations on the neck, and carefully calibrated. The flask is inverted, with its mouth under the surface of mercury, in the small glass vessel B, and the whole is immersed in a large beaker full of water. The changes of temperature are observed by means of a thermometer, D. A small plug of platinum wire, in the neck of the flask, serves to keep the germinating corns in their place in the body of the flask. The specific gravity of the platinum plug and of the steeped barley was determined, so that their volume might be deducted from that of the air in the flask.

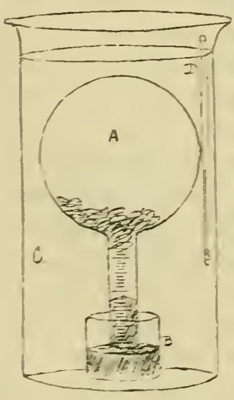


Fig. 1.

When the apparatus was arranged for an experiment, a portion of the confined air was withdrawn by means of a gas syringe, shown in Fig. 2—(The V tube A has a capillary bore; B is a pinchcock on the suction tube.)—and the quantity of nitrogen determined by analysis. At the end of the experiment, another portion of air was taken from the flask, and the quantity of nitrogen again determined. In calculating the volume of the confined air, the usual corrections were applied for temperature, pressure, and tension of aqueous vapour.

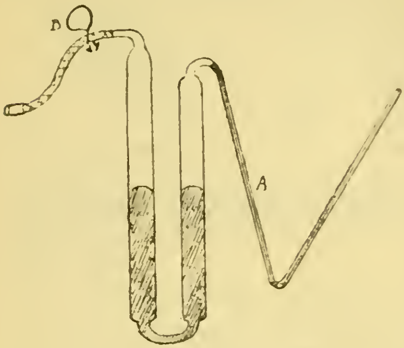


Fig. 2.

By the above means, we have the data necessary for ascertaining the quantity of atmospheric nitrogen present in the germinating flask at the commencement and end of each experiment. I give below the results obtained in the series of six experiments.

EXPERIMENT 1.—2,269 Grammes Steeped Barley.
Temperature during Growth, 15·5° to 19·0° C.

Volume of the Confined Air.		Difference.	State of Germination.
	c.c.	c.c.	
At start of Experiment, Aug. 5......	99·08		Budding.
Do. do. ,, 6......	98·51	−0·57	Growing freely.
Do. do. ,, 7......	97·92	−0·59	Do.
At end of Experiment, Aug. 8......	98·01	+0·09	Rootlets nearly as long as the corns.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·77%	6 29%
Nitrogen	79·23%	80·16%
Carbonic Anhydride......	0·00%	13·55%
	100·00	100·00

Volume of Air—	c.c.		%		c.c.
At start of Experiment ...	99·08,	containing	79·23	Nitrogen	= 78·50
At end of Experiment, ...	98·01,	,,	80·16	,,	= 78·56
				Gain	= 0·06

EXPERIMENT 2.—2,305 Grammes Steeped Barley.
Temperature during Growth, 20·9° to 23·0° C.

Volume of the Confined Air.		Difference.	State of Germination.
	c.c.	c.c.	
At start of Experiment, Aug. 11 ...	96·85		Just budding.
Do. do. ,, 12 ...	96·61	−0·24	Growing rapidly.
Do. do. ,, 13 ...	96·25	−0·36	Do.
At end of Experiment, ,, 14 ...	97·31	+0·96	Root as long as corns.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·84%	0·23%
Nitrogen......................	78·99%	78·97%
Carbonic Anhydride.....	0·17%	20·80%
	100·00	100·00

Volume of Air—	c.c.		%		c.c.
At start of Experiment	...96·85,	containing	78·99	Nitrogen	=76·51
At end of Experiment	...97·31,	,,	78·97	,,	=76·84
				Gain=	0·33

EXPERIMENT 3.—2,138 Grammes Steeped Barley.

Temperature during Growth, 13·0° to 15·8° C.

Volume of the Confined Air.				Difference.	State of Germination.
			c.c.	c.c.	
At start of Experiment,	Sept.	16 ...	95·79		Just budding.
Do. do.	,,	17 ...	95·70	− 0·09	Showing short root.
Do. do.	,,	18 ...	95·07	− 0·63	Roots rather longer.
At end of Experiment,	,,	19 ...	94·63	− 0·56	Roots about ¾ length of corns.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·81%	6·77%
Nitrogen..	99·15%	79·97%
Carbonic Anhydride.. ...	0·04%	13·26%
	100·00	100·00

Volume of Air—	c.c.		%		c.c.
At start of Experiment	..95·79,	containing	79·15	Nitrogen	=75·82
At end of Experiment	...94·63,	,,	79·97	,,	=75·67
				Loss=	0·15

EXPERIMENT 4.—2,144 Grammes Steeped Barley.

Temperature during Growth, 13·2° to 17·0° C.

Volume of the Confined Air.				Difference.	State of Germination.
			c.c.	c.c.	
At start of Experiment,	Sept.	20 ...	99·54		Just starting.
Do. do.	,,	21 ...	99·29	− 0·25	Full bud.
Do. do.	,,	22 ...	98·99	− 0·30	Short rootlets.
At end of Experiment,	,,	23 ...	98·75	− 0·24	Roots nearly ¾ length of corns.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·61%	7·82%
Nitrogen...	79·36%	80·06%
Carbonic Anhydride......	0·03%	12·12%
	100·00	100·00

Volume of Air— c.c. % c.c.
At start of Experiment ...99·54, containing 79·36 Nitrogen = 78·99
At end of Experiment ...98·75, ,, 80·06 ,, = 79·06
Gain = 0·07

EXPERIMENT 5.—2,296 Grammes Steeped Barley.

Temperature during Growth, 15·3° to 15·5° C.

Volume of the Confined Air.		Difference.	State of Germination.
	c.c.	c.c.	
At start of Experiment, Oct. 26 ...	94·63		Starting.
Do. do. ,, 27 ...	94·35	−0·28	Full bud.
Do. do. ,, 28 ...	94·10	−0·25	Short root.
Do. do. ,, 29 ...	93·65	−0·45	Growing steadily.
Do. do. ,, 30 ...	93·99	+0·34	Do.
Do. do. ,, 31 ...	95·63	+1·61	Do.
At end of Experiment, Nov. 1 ...	98·20	+2·57	Roots fully as long as corns.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·36%	0·05%
Nitrogen..............	79·64%	76·48%
Carbonic Anhydride... ..	0 00%	23·47%
	100·00	100·00

Volume of Air— c.c. % c.c.
At start of Experiment ...94·63, containing 79·64 Nitrogen = 75·36
At end of Experiment ...98·20, ,, 76·48 ,, = 75·11
Loss = 0·25

EXPERIMENT 6.—2,268 Grammes Steeped Barley.

Temperature during Growth, 15·5° to 15·7° C.

Volume of the Confined Air.		Difference.	State of Germination.
	c.c.	c.c.	
At start of Experiment, Nov. 6...	98·33		Just starting.
Do. do. ,, 7...	98·19	−0·14	Full bud.
Do. do. ,, 8...	97·41	−0·78	Short root.
Do. do. ,, 9...	97·26	−0·15	Growing freely.
Do. do. ,, 10...	97·49	+0·23	Do.
Do. do. ,, 11...	98·62	+1·13	Do.
At end of Experiment, ,, 12...	100·87	+2·25	Long root.

Composition of the Air in the Flask.

	At start of Experiment.	At end of Experiment.
Oxygen	20·40%	0·00%
Nitrogen.....	79·57%	77·17%
Carbonic Anhydride......	0·03%	22·83%
	100·00	100·00

Volume of Air—	c.c.		%		c.c.
At start of Experiment	98·33,	containing	79·57	Nitrogen	=78·23
At end of Experiment ...	100·87,	,,	77·17	,,	=77·84
					Loss= 0·39

Result of the Six Experiments—Gain or Loss of Nitrogen.

	Gain c.c.	Loss c.c.
Experiment 1.	0·06	—
,, 2.	0·33	—
,, 3.	—	0·15
,, 4.	0·07	—
,, 5.	—	0·25
,, 6.	—	0·39
Sum......	0·46	0·79

The total loss of nitrogen in the six experiments is therefore $0·79 - 0·46 = 0·33$ c.c., or an average loss of 0·055 c.c. nitrogen in about 80 c.c. for each experiment, a quite inconsiderable quantity, and well within the limit of experimental error.

The result arrived at shows pretty conclusively that atmospheric nitrogen takes no active part in the germination of barley. An examination of the daily differences in the volume of the confined air in Experiments 5 and 6, reveals the fact that when the oxygen becomes nearly exhausted, the volume of air increases owing to the evolution, by the seeds, of more carbonic anhydride than can be accounted for by true respiration. The cause of this is no doubt due to intercellular fermentation.

The germination of the barley in all the experiments, even in those occupying the longer period, was perfectly healthy, and no still corns were met with. The corns, when extracted from the flask, had that peculiar fragrant odour which is always noticed in barley when germinated in a confined space.

Records of Scottish Plants for 1892. By Arthur Bennett.

Again I submit the principal records among the additions to local Scottish Botany, being additional comital plants not represented in Topographical Botany, or since recorded by me. As before, full lists appear in the "Annals of Scottish Natural History," pp. 95, 101, 1893.

One species is new to Scotland—*i.e.*, *Orobanche cruenta*, Bert.; but it will be desirable to try and refind it near Oban before full descriptions, etc., appear.

In Dumfries Mr. J. T. Johnstone has continued his careful examination of the flora, and added several interesting species, among them *Vicia Orobus*, *Scutellaria minor*, and *Salix lapponica*.

In Wigtown Mr. J. M'Andrew has found *Malva rotundifolia*, *Carex pendula*, *Melica uniflora*, *etc*.

In Selkirk the Rev. E. S. Marshall and Mr. Boyd have added thirty species to its flora, many of interest, such as *Rosa involuta* and *sepium*, *Cicuta*, *Potamogeton prælongus*, *P. plantagineus*, and *Carex filiformis*.

To Roxburgh, *Utricularia neglecta*.

In Stirling Mr. Kidston and Colonel Stirling have continued their study of its flora, and found, among many more, *Ranunculus Lenormandi*, *Convallaria majalis*, *Triticum caninum*, etc.

To Lanark, W. Perth, Aberdeen, Dumbarton, Clyde Isles, N. Ebudes, W. Ross, and Caithness one species each has only been added.

To M. Perth three—*Hieracium prælongum*, *H. angustatum*, *H. Sommerfeltii*.

To E. Perth seven—*Lastrea æmula* and *Hieracium flocculosum*, etc.

For Forfar Mr. Marshall has six and Professor Traill one—*Lepigonum neglectum*, *Utricularia neglecta*, *Orchis mascula* at 2900 feet (Watson's highest 1500 feet).

To Kincardine Professor Traill adds two species.

To Aberdeen, S., Professor Traill adds two. The Rev. Mr. Marshall found *Stellaria nemorum* at 3000 feet (1200 feet, Watson), and *Potamogeton perfoliatus* at 2300 feet (1200 feet, Watson's highest).

To Easterness (E. Inverness) the Rev. Mr. Marshall has recorded twenty-two additional plants,—*Arctium nemorosum*, *Atriplex littoralis*, *Zostera nana*, etc.

To Westerness (W. Inverness) Mr. S. M. Macvicar continues to add.

Five are added to Argyll, the *Orobanche* before mentioned, etc.

In E. Ross the Rev. Mr. Marshall has succeeded in finding many additions, and among them *Cochlearia grœnlandica*, L. (non Smith), *Hieracium flocculosum* (Bailey herb), *Potamogeton rufescens*, *P. nitens*, *P. pusillus*, *Aira uliginosa*, etc.

In E. Sutherland Mr. Marshall finds *Cherleria sedoides*, etc., *Carex pauciflorus*.

To the Outer Hebrides Mr. W. S. Duncan adds *Raphanus maritimus*, *Centunculus*, *Juniperus communis*.

Summary of Records from Scottish Counties for 1892.

No.			No.	Brought forward,	92
72.	Dumfries,	9	96.	Easterness,	24
74.	Wigtown,	9	97.	Westerness,	9
77.	Lanark,	1	98.	Argyll,	5
79.	Selkirk,	30	99.	Dumbarton,	1
80.	Roxburgh,	1	100.	Clyde Isles,	1
86.	Stirling,	17	104.	Ebudes, N.,	1
87.	Perth, W.,	1	105.	Ross, W.,	1
88.	,, Mid.,	3	106.	,, E.,	30
89.	,, E.,	6	107.	Sutherland, E.,	12
90.	Forfar,	7	108.	,, W.,	1
91.	Kincardine,	2	109.	Caithness,	1
92.	Aberdeen, S.,	5	110.	Outer Hebrides,	6
93.	,, N.,	1			
	Carry forward,	92		Total,	184

A very interesting inquiry would be into the aquatic vegetation of the Lakes of Scotland and their temperature, colouration, transparency, and biological conditions.

To any one willing to undertake any county I would advise them to consult Dr. Maguire's interesting account of the sixty-three lakes of the Jura mountains, entitled—"Recherches sur la Végétation des Lacs du Jura," Paris, 1893. It appeared in "La Revue Générale de Botanique," vol. V., pp. 241–297 and 303-316, 1893.

Professor Bayley Balfour remarked on the important results that a systematic investigation of the flora and biological conditions of our Scottish lakes would supply, and reminded the Society that a Committee of the British Association was appointed at the Newcastle meeting for the purpose of carrying out such an investigation. So far, however, no results had been obtained, but the proposal was one which the members of the Society should endeavour to carry out.

Botanical Notes for the Moffat District, 1893. By J. Thorburn Johnstone, Moffat.

This summer (1893) I visited a number of the small out-of-the-way Linns in the district, such as Harthope and Greskine in Evan Water, Greigsland Burn, Dykehead Linn, Duff Kinnel and its tributaries in Johnstone, and various other places. No new plants were recorded, but new stations were found for several of our uncommon plants, showing that they have a wider distribution in the district than might be inferred from the position of the previous recorded stations. Among the most interesting of these plants were—

Pyrola secunda, gathered in one of the tributaries of Duff Kinnel, this being 16 miles from the nearest of the five stations for it previously known to me.

Hieracium sparsifolium. Also in Duff Kinnel; but the plants are much more luxuriant in their habit than those to be gathered at Beef Tub and Craigmichen Scaurs.

Cardamine impatiens. This I found growing in the stackyard at Middlegill, and it is also growing very abundantly as a garden weed in Kirkpatrick-Juxta Manse garden. It was on the roadside near this manse I found it growing in 1891, when it was reconfirmed for the district. The Rev. Mr. Little (a former minister of the parish), who was an ardent botanist, would most probably plant it in the garden some time during his incumbency, where it has thriven so well as to have now become a regular weed, and the specimens I originally gathered on the roadside must have spread from the garden.

The inside of the garden wall at the Manse is also covered with *Ceterach officinarum*, Willd., which in all probability would be planted by the Rev. Dr. Singer or Mr. Little.

The Rev. Wm. Brodie, the present minister, informs me that both plants have been growing there in abundance all the time he has been resident there.

Arctostaphylus Uva-ursi, Correferron, also a second station.

With the exception of the Hieracia, I have only two plants to record as new to the district. Unfortunately, they are only casuals, and are *Scandix pectenveneris*, casual in garden, and *Sonchus arvensis*, waste ground at Birnock.

In the "Journal of Botany" of May, June, and July 1893, the Messrs. E. F. and W. R. Linton publish a list of Hieracia gathered by them in Scotland, a number of them having stations in this district. They have since named specimens of nearly all of them in a collection I sent up to them for that purpose. Their list, applicable to this district, is as follows :—

Hieracium centripetale, F. J. Hanbury.
,, *clovense*, Linton.
,, *callistophyllum*, F. J. H.
,, *Langwellense*, F. J. H.
,, *Schmidtii*, Tausch.
,, *buglossoides*,* Arvet-Touvet.
,, *argentum*, Fries.
,, *nitidum*, Backhouse.
,, *stenolepis*, Tindel.
,, *stenolepis*, var. *anguinum*, W. R. Linton.
,, *Sommerfeltii*, Tindel.
,, *rubicundum*, F. J. H.
,, *murorum*, Linn.
,, *murorum*, var. *ciliatum*, Almq.
,, *murorum*, sub. sp. *sarcophyllum*, Stenstrom.
,, *duriceps*, T. S. H.
,, *euprepes*, F. J. H.
,, *stenophyes*, W. R. L.
,, *angustatum*, Tindel.
,, *strictum*, Fr. var. *suberocatum*, Linton.

* Mr. Linton makes out that the *Hieracium* gathered by Mr. Backhouse at the Grey Mare's Tail in 1850, and named by him *H. saxifragam*, is the *H. buglossoides* as above. I referred to this plant in a former paper.

The above Hieracia are pretty evenly distributed over the sub-alpine Linns of the district, as Blacks Hope, Correferron, Midlaw Burn, Andrew Whinney, White Coomb, Grey Mare's Tail, Craigmichen Scaurs, Beef Tub, etc.

Notes on the Flora of Fife and Kinross. By Charles Howie.

I.—Addenda to the Moss Flora of Fife and Kinross.

296. *Zygodon Stirtoni*, Sch. Registered as a variety of *Z. viridissima* in "Moss Flora," page 52. With the consent of Professor Lindberg and others, it has been retained as a species, as named by Professor Schimper.
297. *Ephemerum serratum.* Sparingly found at Tayport and St. Andrews, as registered in Ballingal's "Shores of Fife;" refound near Wormet, 1892, by Mr. Fulton.
298. *Dicranella curvata.* By the side of a small ditch, East of Fife; abundant.
299. *Dicranella fulvellum.* Among the cliffs on one part of the east sea cliffs.
300. *Racomitrium sudeticum.* On rocks, Drumcarro Craig; registered in Ballingal's "Shores of Fife," 1872; refound near Denork ground, 1891.
301. *Racomitrium ellipticum.* East sea coast and Drumcarro Craig.
302. *Trichostomum brachydontium.* On Dunbarnie Links.
303. *Polytrichum gracile.* Registered, on the Tents Muir, sparingly, Ballingal's "Shores of Fife;" refound again on the Tents Muir, 1889.
304. *Amphoridium Mougeotii.* On the upper range of the Lomonds; species, irrespective of numerous varieties.

II.—Statistics of the Flora of Fife and Kinross registered as species up to December 1893.

Dicotyledons, 781; *Monocotyledons,* 213; *Pteridophyta,* 43; *Musci,* 306; *Hepaticæ,* 40; *Algæ marinæ,* 248, including a species of *Melobesia* new to the country, in rock pools on the tidal beach, east coast; *Desmidieæ,* 124, principally collected by Mrs. Farquharson; *Lichenes*, 89; *Fungi*, 59, not including the microscopic species. There are several rare species collected in October 1872—*Trametes peronatus* and *Hygrophorus chlorophanus*, and a species new to Britain, *H. meisneriensis*, of a bluish colour, and gelatinous, as attested by Mr. W. Smith, of London.

Notes From The Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during November 1893. By Robert Lindsay, Curator.

During November the thermometer was at or below the freezing point on sixteen mornings, indicating collectively 55° of frost for the month, as against 41° for the corresponding month last year. Falls of rain, snow, and sleet were frequent. The severe northerly gale which passed over the country on the 18th and 19th, with such disastrous effects in various quarters, did no damage at the Gardens. The lowest readings of the thermometer were on the 1st, 25°; 4th, 25°; 5th, 28°; 21st, 24°; 22nd, 26°. Very few plants are now in flower out of doors, vegetation being in an almost dormant condition. Not any plants came into flower during November on the rock-garden.

Readings of exposed Thermometer at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during November 1893.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	25°	41°	49°	16th	33°	40°	56°
2nd	33	40	47	17th	38	44	54
3rd	33	40	49	18th	33	35	38
4th	25	35	43	19th	29	32	39
5th	28	32	46	20th	31	36	41
6th	31	34	46	21st	24	26	44
7th	32	38	43	22nd	26	36	42
8th	32	39	45	23rd	28	34	54
9th	36	39	46	24th	33	42	44
10th	38	40	46	25th	40	43	52
11th	33	40	50	26th	31	34	51
12th	40	46	53	27th	29	40	53
13th	30	38	52	28th	36	41	53
14th	28	38	44	29th	38	48	53
15th	28	37	44	30th	35	41	43

II. METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF NOVEMBER 1893.

Distance from Sea, 1 Mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·420	43·9	30·2	43·8	42·8	W.	Cum.	10	W.	0·095
2	29·404	46·1	34·3	40·3	39·1	W.	...	0	...	0·020
3	29·626	45·9	36·1	41·8	41·1	W.	Nim.	10	W.	0·810
4	29·885	42·9	29·8	32·2	32·0	W.	...	0	...	0·090
5	29·629	40·9	28·8	35·9	35·0	W.	...	0	...	0·020
6	30·151	41·8	30·6	34·1	32·1	N.W.	...	0	...	0·000
7	30·367	42·9	32·4	39·8	36·8	N.	Cum.	5	N.	0·000
8	30·381	41·7	34·8	39·5	37·6	N.W.	Cum.	10	N.	0·000
9	30·446	44·9	38·9	41·1	40·0	N.E.	Nim.	10	N.E.	0·005
10	30·420	44·9	40·9	41·8	39·1	N.E.	Cum.	10	N.E.	0·000
11	30·446	45·0	33·9	40·3	39·6	Var.	Cum.	10	N.E.	0·075
12	30·414	46·2	40·0	43·9	41·6	E.	Cum.	10	E.	0·000
13	30·144	44·9	33 0	38·1	37·6	E.	...	0	...	0·000
14	29·758	45·6	30·2	37·2	36·9	W.	Cum.	10	S.E.	0·000
15	29·820	41·9	31·1	38·1	37·0	W.	Cum.	10	E.	0·010
16	29·743	42·9	36·3	41·1	38·6	S.	Cum.	10	S.	0·010
17	28·485	53·8	41·2	53·2	50·1	S.	Cum.	10	S.	0·090
18	29·461	53·8	36·9	37·2	31·0	N.E.	Cum.	10	N.E.	0·000
19	29 930	37·2	29·2	33·7	31·0	N.E.	Cum.	1	N.E.	0·000
20	30·313	37·9	33·0	37·8	35·2	N.E.	Cum.	9	N.E.	0·000
21	30·461	39·8	28·2	28 9	28 1	N.W.	...	0	...	0·115
22	29·884	44·3	28·2	36·4	34·8	W.	...	0	...	0·000
23	30·153	38·9	29·9	35·1	32·9	N.W.	Cir. St.	6	N.	0·000
24	29·889	43·8	34·7	43·8	41·7	N.W.	Cir. St.	10	N.W.	0·060
25	29·432	48·7	43·5	45·9	45·1	W.	Nim.	10	W.	0·060
26	29 650	51·0	33·9	36·0	32·8	N.W.	...	0	...	0·000
27	29·997	40·6	29·6	40·6	39·2	S.W.	Cir. St.	10	W.	0·025
28	29·853	52·9	40·2	52·6	51·1	W.	Cir. Cum.	2 1	W.	0·000
29	29·689	55·0	51·0	51·2	48·2	W.	Cum.	10	W.	0·000
30	29·603	52·5	41·2	41·9	40 0	N.W.	Cir. St.	10	W.	0·040

Barometer.—Highest Observed, on the 21st, = 30·461 inches. Lowest Observed, on the 17th, = 28·485 inches. Difference, or Monthly Range, = 1·976 inch. Mean = 29·895 inches.

S. R. Thermometers.—Highest Observed, on the 29th, = 55°·0. Lowest Observed. on the 21st and 22nd, = 28°·2. Difference. or Monthly Range, = 26°·8. Mean of all the Highest = 45°·1. Mean of all the Lowest = 34°·7. Difference, or Mean Daily Range, = 10°·4. Mean Temperature of Month = 39°·9.

Hygrometer.—Mean of Dry Bulb = 40°·1. Mean of Wet Bulb = 38°·3.

Rainfall.—Number of Days on which Rain fell = 15. Amount of Fall = 1·525 inch. Greatest fall in 24 hours, on the 3rd, = 0·810 inch. Very light shower of Snow, first observed for season, on the 19th.

A. D. RICHARDSON,
Observer.

III. On Plants in the Plant Houses. By R. L. Harrow.

The past month, as might be expected, has shown a gradual decrease in the number of flowering plants, and a comparison of November with October in this respect exhibits a falling off of rather more than a third of the species which have been seen in flower in the plant houses of the Royal Botanic Garden. The usual winter-flowering florists' flowers have done much to brighten up the respective houses; but, apart from these, several representatives of interesting tropical and temperate genera, which are not generally to be seen in cultivation, have produced their blooms. Specimens of some of these are exhibited.

Napoleona cuspidata, Miers. This plant is a native of Old Calabar, belonging to the order Myrtaceæ. The genus was first discovered about the close of the last century by Baron Palisot de Beauvois, the species first discovered being *N. imperialis*, Beauv. The genus has since, says Sir W. Hooker in the "Botanical Magazine," attracted the attention of botanists in no ordinary degree, on account of the extraordinary structure of its flowers, and scarcely two of them have described it in the same way. The species named above was verified by Dr. Masters in the "Gardeners' Chronicle" of 1866, from flowers received from the Edinburgh Botanic Garden. On comparing these with flowers of *N. imperialis* at the Royal Gardens, Kew, he saw at once he had a different species, and dried specimens in the herbarium of Mr. Miers enabled him to determine with accuracy the identity of the plant. Up to 1886 the plant had been under cultivation as *N. imperialis.*

Banksia collina, R. Br. Under the name of *B. littoralis* this proteaceous plant was figured in the "Botanical Magazine" t. 3060, from a specimen sent from the Edinburgh Botanic Garden in 1830, and the plant exhibited was struck as a cutting some fourteen years ago from the original plant, now dead. Besides the above synonym, it has also been grown under those of *B. Cunninghamii*, Sieber, and *B. ledifolia*, A. Cunn. Species of *Banksia* which are seldom seen in cultivation outside of our Botanic Gardens, are natives of Australia, some growing to a height of 20 feet; the foliage is strikingly handsome, usually serrated, dark-green above, covered with silvery hairs on the under surface; the inflorescence takes some considerable time to develope. The plant exhibited has now been in flower for more than two months.

Whitfieldia lateritia is an acanthaceous shrub, named after Mr. T. Whitfield, a botanical collector, and is a native of tropical Africa. The genus consists of only two species the one under notice being the only one as yet introduced to cultivation. Its terminal racemes of flowers are produced in October, continuing to bloom till late in the spring months.

Corynostylis Hybanthus, Mart. — This pretty stove climbing shrub is remarkable as being a member of the order *Violariæ*, and was introduced from Para in 1870. The flowers are produced freely, in racemes: the lower petal of the flower, which is the largest, forms a long spur, somewhat like that of a large white violet. A fine figure of the plant will be found in the "Botanical Magazine," 5960. It is rarely met with under cultivation. Sir J. Hooker describes it as a very variable species, being of the opinion that all the so-called species of the genus hitherto described are referable to one.

Manettia bicolor. — Producing its bright scarlet and yellow flowers in abundance from the axils of the light green leaves, this plant is well worthy of a place in our collections. Messrs. Veitch are credited with the introduction of this species in 1843, from the Organ Mountains. Treated as a climbing plant, in a warm greenhouse, it exhibits its true character to perfection. Belonging to the order *Rubiaceæ*, it is closely allied to *Bouvardia*.

In addition to these, there are on the table: *Centropogon Lucyanus*, Hort.,—a hybrid between the Mexican *C. fastuosus*, Scheidw., and the Brazilian *Siphocampylos betulæfolius*, Don., raised by M. Despond at Marseilles, 1856. *Crassula lactea*, Soland,—a Cape plant. *Wallichia densiflora*, Mart.,—from East Indies. *Plumbago rosea*, Linn.,—an Indian plant. *Cuscuta reflexa*, Roxb.,—from India; and the beautiful winter-flowering East Indian *Ipomœa Horsfalliæ*, Hook, var. *Rheedii*, and var. *Briggsii*.

Of the other plants which have flowered may be noted: *Begonia incarnata*, Link and Otto,—from Mexico; the tropical African *Dracæna fragrans*, Ker-Gawl, and the East Indian *D. angustifolia*, Roxb.; *Kennedya prostrata*, R. Br., var. *Marryattæ*, the finest variety of this Australian climber; *Aloe ciliaris*, Haw., from South Africa; *Rhipsalis rhombea*, Pfeiff, and *R. salicornoides*, Haw., two Brazilian plants; and *Erythroxylon Coca*, Lamk., from Peru.

THE BOTANY OF THE PILCOMAYO EXPEDITION; BEING A LIST OF PLANTS COLLECTED DURING THE ARGENTINE EXPEDITION OF 1890-91 TO THE RIO PILCOMAYO. The Identifications and the Description of New Species by Mr. N. E. BROWN, Assistant in the Herbarium, Royal Gardens, Kew. By J. GRAHAM KERR, Naturalist to the Expedition.

(Read April 1893.)

The following is a list of a small collection of plants, with description of their species, brought by me from Fortin Page—the farthest point reached by the unfortunate Argentine Expedition of 1890–91 to the Rio Pilcomayo, in the Gran Chaco of South America. For particulars of the expedition, and of the region of whose flora these plants form a part, I would refer to the preliminary notice published in Trans. Bot. Soc. vol. xix. page 128, and will here only premise a few words in the nature of an introduction. The specimens contained in this list were collected within a few miles radius of Fortin Page, situated on the banks of the River Pilcomayo, some 300 miles from its mouth measured along its very tortuous course.

Though few in actual number of species, the list will be found to give a tolerably characteristic idea of the phanerogamic flora of the more central and low-lying parts of the Gran Chaco, a region consisting of wide-spreading palm-dotted llanos, varied here and there by patches of hardwood forest, or wide-spreading swamp. This low-lying part of the Chaco is subject to wide-spreading inundations, during which enormous areas remain under water for several months at a time; and at other times to the opposite extreme of climatic conditions, when it undergoes a prolonged parching and dessication, during which the soil becomes saturated with saline matters. Under such circumstances, the poverty of the ordinary plain flora is still further accentuated. The flora of these inner low-lying parts of the Chaco offering a striking contrast to the mild, semi-tropical luxuriance of the riverain regions along the great fresh-water streams.

I am indebted to Mr. W. Botting Hemsley, of Kew, for the following note regarding the collection I made. "Amongst the 200 species are a score or so of novelties. As will be seen, they mostly belong to well-known genera; but the new genus *Diplokeleba* and *Quebrachia Morongii* are specially interesting. The former belongs to the Sapindaceæ, and is remarkable in having a double cup-shaped disc. *Quebrachia* belongs to the Anacardiaceæ, and differs from the only previously known species, in having simple leaves. Much yet remains to be done in working out the flora of the sub-tropical part of the Argentine Republic. Most of the novelties collected by Tweedie in the region of Buenos Ayres, nearly sixty years ago, still lie undescribed in the Kew Herbarium. Doubtless many of them were described from other collections by the late Dr. Grisebach in his Symbolæ ad Floram Argentinam, published in 1879. In that work he enumerates 2265 species of vascular plants, 31 per cent. of which he regarded as endemic, and 24 per cent. of them were common to Brazil and Paraguay. Many interesting particulars of the flora may be gleaned from the work in question; and G. Hieronymus has more recently published further novelties in his Icones et Descriptiones Plantarum Argentinarum.

I desire to thank the Director of Kew for the readiness with which he allowed my collection to be determined in the Herbarium of the Royal Gardens, and the officials of the Herbarium I thank for the courtesy they showed me. I have especially to acknowledge the services of, and to thank Mr. N. E. Brown, who undertook the working up of the collection, and the identification and naming of the species, with the exception of the orchids, the names of which I owe to Mr. R. A. Rolfe. My own work has been limited to merely adding a few notes as to locality, and other details of interest. To Professor Bayley Balfour I would also wish to record my deep gratitude for the interest he has shown throughout, both in the conduct and in the results of the Pilcomayo Expedition.

CLEMATIS BONARIENSIS, DC.
Hab.—Banks of Rio Paraná. Colonia Hernandá. Fl. Jan.

CISSAMPELOS PAREIRA, L.
Hab.—Rio Pilcomayo.

VICTORIA CRUZIANA, d'Orb.
Hab.—Lateral lagunas of Rio Paraguay.
Maiz del Agua, Yrupe.
Leaves 4–6 feet across; rim 3 inches high; upper surface smooth, dark green; lower divided into quadrangular compartments, bright carmine. Flowers said to be about a foot across, pinkish violet, and with beautiful scent. As the name Maiz del Agua indicates, the provincials use the seeds for food.

CAPPARIS RETUSA, Griseb.
Hab.—Monte, near Fortin Page.

CAPPARIS TWEEDIANA, Eichl.
Hab.—In the montes around Fortin Page. A small tree about 15 feet in height.

IONIDIUM GLUTINOSUM, Vent.
Hab.—Rio Pilcomayo. Common in the open campo. Fl. 1st Nov.–1st Jan.

XYLOSMA VENOSUM, N. E. Br. (n. sp.).—Arbor dioicus spinosus, ramis spinis foliisque glabris; foliis coriaceis valde venosis petiolatis ovatis vel subrhomboideo-ellipticis obtuse acutatis, basi cuneato-acutis, crenato-dentatis, dentibus subtus apice glanduliferis, glandulis ad petiolos decurrentibus; floribus axillaribus dense fasciculatis breviter pedicellatis, pedicellis ad medium articulatis, bracteis late ovatis vel ellipticis, obtusis, ciliatis, extus subpuberulis, sepalis 5–7, valde imbricatis, ovatis vel ellipticis obtusis, ciliatis intus pubescentibus, disco crenato, masculis staminibus 20–30, fœmineis ovario glabro stylis 2–4, baccis globosis, seminibus 3–4. Myroxylon Salzmanni, Morong and Britton in Ann. New York Acad. Sc. vii., p. 52, not of Kuntze.

Hab.—Paraguay; Asuncion, Gibert, 10! 1026! Rio Pilcomayo, Kerr!

Spini $\frac{3}{4}$–$1\frac{1}{2}$ poll. longi. Folia $1\frac{1}{4}$–$2\frac{1}{2}$ poll. longa, $\frac{3}{4}$–$1\frac{3}{4}$ poll. lata. Petioli $\frac{1}{4}$–$\frac{3}{8}$ poll. longi. Pedicelli 1–2 lin. longi. Sepala $\frac{3}{4}$ lin. longa. Bacca 2 lin. diam.

According to Gibert this is a large tree, called *Nuati-punta* by the natives. The plant collected at Uberaba, in Minas Geraes, by Regnell (No. 1534), I believe also belongs to this species; but the leaves are larger (up to 3 inches long by 2 inches broad), and the crenations more numerous and finer; in all other respects it perfectly agrees with the plant here described, the leaves having the same peculiarity of being glandular-decurrent on the petioles, by which character it may be at once distinguished from *X. Salzmanni*, Clos., to which it is wrongly referred by Eichler in the Flora Brasiliensis (N. E. Brown).

Polygala paraguayensis, A. W. Benn. (Syn. *P. areguensis*, A. W. Benn.).—I see no distinction between the plants described under the above names. *P. areguensis* is evidently perennial, and not an annual as stated by Bennett (N. E. Brown).

Hab.—Fortin Page. In grass by the edge of the monte. Fl. 8th Oct.

Portulaca sp.

Hab.—Rio Pilcomayo.

Malvastrum Tweediei, Baker fil.

Hab.—Fortin Page. Damp open spots. Fl. 9th Oct.

Sphæralcea bonariensis, Griseb.

Hab.—Rio Paraná. Colonia Hernandá. Fl. Jan.

Pavonia consobrina, N. E. Br. (n. sp.).—*P. hastata* similis sed foliis minus hastatis crenato-dentatis, pedicellis quam petiolis non longioribus, involucri bracteis linearibus vel auguste oblanceolato-oblongis quam calyce distincte longioribus, et corolla calyce vix excedente differt.

Hab.—Uruguay; Montevideo, Gibert, 126! 351! Rio Pilcomayo, Kerr, 66!

Petioli $\frac{3}{8}$–1 poll. longi. Pedicelli $\frac{1}{8}$–$\frac{7}{8}$ poll. longi. Involucri bracteæ $\frac{1}{4}$–$\frac{3}{8}$ poll. longæ, $\frac{1}{24}$–$\frac{1}{12}$ poll. latæ. Corolla $\frac{1}{4}$ poll. longa.

This plant much resembles *P. hastata*, but may be at once distinguished by the pedicels being shorter than, or about equalling, the petioles, and by the involucral bracts distinctly exceeding the calyx. The articulation of the pedicels, too, appears to be much closer to the flower, and the leaves are less hastate, and their toothing more rounded. In *P. hastata* the pedicels are much longer than the petioles, and the involucral bracts are spathulate-ovate and shorter than the calyx. Although the corolla in all the specimens of *P. consobrina* that I have seen is small, and scarcely exceeds the calyx, yet the flowers are certainly not cleistogamous, though possibly a cleistogamous form may exist, as in the case of *P. hastata* (N. E. Brown).

In shady spots by river side near Fortin Page. Fl. 1st Nov.

HIBISCUS CISPLATINUS, St. Hil.

Hab.—Marshy spots—Paraná Delta, Rio Paraná, Rio Paraguay, Rio Pilcomayo. Fl. (Pilcomayo) 11th Dec.

FUGOSIA SULPHUREA, Juss.

Hab.—Open campo near Fortin Page. Fl. 15th Oct. Corolla yellow, with crimson centre.

MELOCHIA PYRAMIDATA, L. var. Hieronymi, Schum.

Hab.—Rio Pilcomayo.

MELOCHIA TOMENTOSA, L.

Hab.—Rio Pilcomayo.

BUETTNERIA FILIPES, Mart.

Hab.—Rio Paraguay.

STIGMAPHYLLON CALCARATUM, N. E. Br. (n. sp.).—Foliis oppositis, breviter petiolatis, oblongis vel lanceolato-oblongis obtusis, mucronatis, basi breviter mucronato-sagittatis, marginibus subintegris absque glandulis supra subtusque glabris, vel subtus sparse pubescentibus petiolis dense adpresse pubescentibus apice biglandulosis: pedunculis axillaribus, adpresse pubescentibus, apice bibracteatis, umbellatim paucifloris; bracteis foliis simillimis, subsessilis, basi biglandulosis, pedicellis adpresse pubescentibus, medio bibracteolatis; floribus flavis, calycis lobis late ovatis obtusis glandulis magnis, staminibus glabris, stigmatibus foliaceis late ovatis, subcucullatis.

Hab.—Bolivia; Marsh near Corumbā, Moore, 1012. Rio Pilcomayo, Kerr.

Folia 1–2$\frac{3}{4}$ poll. longa, $\frac{1}{2}$–1 poll. lata. Pedunculi $\frac{1}{2}$–2$\frac{3}{4}$ poll. longi. Bracteæ $\frac{1}{3}$–$\frac{3}{4}$ poll. longæ. Pedicelli $\frac{1}{4}$–$\frac{1}{2}$ poll. longi. Flores $\frac{3}{4}$ poll. diam.

The elongate leaves, with their small spur-like auricles at the base, at once distinguish this from all previously described species (N. E. Brown).

Janusia guaranitica, Juss.

Hab.—Rio Paraná and Paraguay.

Oxalis chrysantha, Prog.

Hab.—Rio Pilcomayo. Common in open woodlands and in the open campo. Fl. Dec.

Agonandra excelsa, Griseb.

Hab.—Margin of monte, Fortin Page.

Maytenus vitis-idæa, Griseb.

Hab.—In the little patches of monte. Fl. 22nd Sept.

Prov. Arg., *Cápia.*

A shrub ranging to about 10 feet in height, with densely aggregated foilage of thick, fleshy leaves, which are twisted upon their petioles, so as to lie in radial longitudinal planes with regard to the shoot.

Cardiospermum halicacabum, L.

Hab.—Fortin Page. River banks and open places in woods. Fl. May, June. Fruit Aug., Sept.

A creeper with palmipartite leaves and peculiar capsular fruits.

Paullinia angusta, N. E. Br. (n. sp.).—*P. pinnatæ* similis, sed foliolis multo angustioribus 1$\frac{1}{2}$–4 poll. longis, $\frac{1}{3}$–1 poll. latis, elongato-oblongis, subacutis, basi plus minusve cuneatis, utrinque grosse et obtuse 3–7 dentatis, floribus magis pubescentibus, fructibus fusiformibus acutis, nec clavatis et obtusis vel retusis apiculatis, differt.

Hab.—Paraguay; Villa Occidental, Balansa, 2479! Stewart! Rio Pilcomayo, Kerr! Porto Pachico, Moore, 1063!

This is somewhat like *P. pinnata*, but the leaflets are narrower and longer and the fruit is smaller and almost equally narrowed to both ends (N. E. Brown).

PAULLINIA sp.? A small specimen, too imperfect for description.

DIPLOKELEBA, N. E. Br. (gen. nov. Sapindacearum).—Flores unisexuales. Sepala inæqualia biseriata, late imbricata. Petala 5, æqualia, imbricata, obovata, esquamata. Discus duplex, completus, bicupularis, obsolete crenulatus, interiore intus 8-sulcato. Stamina 8, intra discum regulariter inserta, filamentis filiformibus elongatis exsertis glabris; antheræ parvæ versatiles. Ovarium in fl. ♂ rudimentarium subglobosum. Flores ♀ fructusque non vidi.—Arbor vel arbuscula. Folia alterna exstipulata, imparipinnata, foliolis oppositis vel alternis integris, foliolo terminali ad rudimentum filiformem reducto. Paniculæ terminales.

D. FLORIBUNDA, N. E. Br.—Ramulis, petiolis, pedunculis, pedicellisque puberulis; foliolis 6–8 longe petiolulatis, oblongo-lanceolatis acutis, recurvis, glabris; floribus cymoso-vel corymboso-paniculatis; sepalis oblongis obtusis extus intusque pubescentibus; petalis obovatis obtusis, extus intusque pubescentibus, fimbriatulis, albis; disco carnoso aurantiaco; ovarii rudimento pubescenti.

Hab.—Rio Pilcomayo, Kerr, 85!

Sepala $\frac{3}{4}$–$1\frac{1}{2}$ lin. longa, $\frac{1}{2}$–$\frac{3}{4}$ lin. lata. Petala $1\frac{1}{2}$ lin. longa, 1 lin. lata.

Until the female flowers and fruit of this plant are known, its position in the order must remain uncertain, but possibly its place should be near *Sapindus*. In the structure of its very remarkable disc it resembles *Lychnodiscus*, Radlk., but that is an African genus and described as having lepidote leaves, funnel-shaped petals, and ten stamens. Mr. Kerr's specimens consist of two small flowering shoots, and bear only male flowers, so that possibly the plant is diœcious (N. E. Brown).

Hab.—Fortin Page.

The specimens on which Mr. Brown has founded this new genus of Sapindaceæ were collected on 19th Dec. 1890, near Fortin Page, in about 24° 50′ S. Lat. *D. floribunda* is a slender tree about 20 feet in height, with granular bark, slightly fissured quadroidally. The leaves are pinnate with three or four pairs of oblong-lanceolate leaflets. I only found one specimen in flower, and it possessed only male flowers, so that the species is probably diœcious.

Quebrachia Morongii, Britton.

Hab.—Rio Pilcomayo, Kerr 55! Fl. 19th Dec.

According to a note accompanying the specimen, this tree is called "Quebracho colorado" by the provincials, that being also the name by which *Q. Lorentzii* is known, and would imply that the wood is of the same hard character as that of the latter species. The genus *Quebrachia*, Griseb., is the same as *Schinopsis*, Engl., but takes precedence over the latter by two years, having been published by Grisebach in 1874 (N. E. Brown).

Under the generic name Quebracho, which is really a corruption of "quebra-hacha" or "break axe," the Argentine provincials recognise three distinct types of trees, the *Quebracho flojo*, *Quebracho blanco*, and *Quebracho colorado.* The last of these is the most important, and is famous for its dense and hard red heartwood, which is one of the most valued timbers of the Argentine—valued especially for its powers of resisting damp. The *Quebracho colorado*, as hitherto known, has been described by Grisebach in his Plantæ Lorentzianæ as *Loxopterygium Lorentzii*; and later, he founded for it the new genus *Quebrachia* (Symbol. ad Floram Arg. p. 95). The specimens which I was able to obtain, however, have shown that the *Quebracho colorado* of the Pilcomayo region is a different species of the same genus *Quebrachia*—differing from the *Q. Lorentzii* in its simple instead of pinnate leaves.

Crotalaria anagyroides, H. B. K.

Hab.—Rio Pilcomayo.

Indigofera retrusa, N. E. Br. (n. sp.).—Rhizomate lignoso, caulibus herbaceis angulato compressis, appresse cano-pubescentibus; foliis pinnatis, foliolis 3–8, sæpius 5, alternis, lineari-oblongis, subobtusis, mucronulatis, utrinque sparse appresse cano-pubescentibus; stipulis lanceolato-subulatis, liberis: racemis longe pedunculatis, elongatis, multifloris, toto appresse cano-pubescentibus; bracteis parvis caducis, lanceolato-acuminatis; calyce quam corolla duplo breviore, lobis subulatis; vexillo apice pubescente, ovario cano-pubescente, tereto; leguminibus? non vidi.

Hab.—South Brazil, near Porto Alegre, Tweedie, 370! Sandy coast of Rio Grande, near St. Pedras, Tweedie, 311! Rio Pilcomayo, Kerr!

Caules 4–10 poll. longi. Folia $\frac{1}{2}$–$2\frac{1}{4}$ poll. longa. Foliolis $\frac{1}{4}$–$1\frac{1}{4}$ poll. longis, 1–$1\frac{1}{2}$ lin. latis. Pedunculi 1–$2\frac{1}{2}$ poll. longi. Racemi usque ad 4 poll. longi. Flores 4–5 lin. longi.

This plant was confused by Bentham with *I. asperifolia*, Bong., but it is more slender, with more numerous, smaller, and narrower leaflets; the flowers are similar, but the calyx-lobes are rather shorter, and the vexillum more densely canous pubescent. I have not seen the fruit (N. E. Brown).

SESBANIA MARGINATA, Benth.
Hab.—Gran Chaco.

AESCHYNOMENE HISPIDA, Willd.
Hab.—Rio Pilcomayo.

DESMODIUM INCANUM, DC.
Hab.—Rio Pilcomayo.

ERYTHRINA CRUS GALLI, L.
Hab.—Rio Paraguay.

VIGNA LUTEOLA, Benth.
Hab.—Rio Pilcomayo.

CAESALPINIA MELANOCARPA, Griseb.

Hab.—Frequent in the "monte duro" on the Pilcomayo. Fl. 11th Nov. Fruit 11th Dec.

Prov. Arg., *Guayacan.*

A large stout tree, bark green and smooth, delicate feathery foliage.

PARKINSONIA ACULEATA, L.

Hab.—Frequent on bank of Rio Pilcomayo above "Las Juntas."

CASSIA BICAPSULARIS, L.

Hab.—Common all along the lower Pilcomayo in open scrubby places.

A small shrub with spreading woody stems. The fruit consists of an elongated pod, and each seed is contained in a separate chamber. The seeds are albuminous, and the embryo is very rich in chlorophyll, which is probably to be correlated with the translucence of the surrounding tissue.

CASSIA LÆVIGATA, Willd.

Hab.—Rio Paraguay and Rio Pilcomayo.

CASSIA OCCIDENTALIS, L.

Hab.—Rio Paraguay and Rio Pilcomayo.

PIPTADENIA QUADRIFOLIA, N. E. Br. (n. sp.).—Arbor inermis, foliis parvis, pinnis unijugis; foliolis unijugis, oblique obovatis, obtusissimis, supra glabris, subtus pilis minutis paucis; petiolis petiolulisque puberulis, ad apices glandula parva instructis; spicis axillaribus, simplicibus, cylindraceis, breviter pedunculatis; pedunculis, calycibus, corollisque omnibus puberulis; calyce quam corolla triplo breviore, quinquedentato; petalis oblongis obtusis; staminibus exsertis, quam corolla subduplo longioribus; ovario stipitato, dense et appresse cano-tomentoso; legumine plano, scaberulo, fuliginoso; seminibus complanatis, pallidis.

Hab.—Rio Pilcomayo, Kerr, 1!

Folia 1 poll. longa. Petiolis $\frac{1}{4}$ poll. longis. Jugæ petiolis 2 lin. longis. Petiolulis $\frac{1}{2}$–$\frac{3}{4}$ lin. longis. Foliolis 4–7 lin. longis, 3–5 lin. latis. Spicæ 1–2$\frac{1}{4}$ poll. longa. Calyx $\frac{1}{3}$ lin. longus. Corolla 1$\frac{1}{4}$ lin. longa. Stamina 2 lin. longa. Legumen 1$\frac{1}{2}$–2 poll. longa, $\frac{1}{2}$ poll. lata. Semina 2$\frac{1}{2}$ lin. diam.

Nearly allied to *P. fœtida*, Benth., but the leaves seem always to be 1-jugate; the leaflets are broader in proportion to their length, more obovate and more obtuse than in

P. fœtida; the spikes are longer and solitary; and the stamens are twice as long as the corolla, whilst in *P. fœtida* they are only shortly exserted (N. E. Brown).

Toba, *Chigeráik.*

A small tree abundant in the isolated patches of monte around Fortin Page. Leaves began to appear 12th Aug., flowers 30th Aug.; and by 2nd Sept. in full flower. Completely deciduous.

The fruit consists of curved legumes, $1\frac{1}{2}$–2 inches in length, and when mature, of a dark brown colour and very hard, and with a rough outer surface. The seeds are white, also extremely hard, and supported upon an elongated flexible funicle. The brilliant colour of the seeds and the rattling sound that is constantly produced by the slightest wind, owing to the flexible funicle, makes the fruit exceedingly conspicuous and *apparently* beautifully designed for the attraction of birds.

I, however, quite failed to find that anything of this kind actually did take place. On the contrary, the tree appeared to be scouted by animals, the leaves having a very disagreeable alliaceous odour. I examined the stomachs of many hundred birds in the region where the tree grows, and not in a single case did I discover any of its seeds among their contents.

PROSOPIS JULIFLORA, DC., var.

Prov. Arg., *Algarobo*; Toba, *Kamúp.*

This *Algarobo* is fairly common about Fortin Page, growing singly in the drier parts of the campo. In general appearance and in habit, it resembles the *Vinal*, but it is a smaller tree, and its spines are not of the extraordinary size so characteristic of the *Vinal.*

The *Algarobo* furnishes in its dark red heartwood a strong and useful timber, while, growing as it does in the open campo, its broad and leafy head affords a refreshing shade from the rays of the noon-day sun. It is, however, for its fruit that it is especially noted, and from which it gets its name of *Algarobo*, the Carob or Locust tree. These fruits are long, curved pods about 8 inches in length by $\frac{3}{4}$ inch in breadth, whose soft and spongy tissue contains very large quantities of grape sugar and of starch, from 25–35 per cent. of the former, and from 11 to 16 per cent. of the latter. It is almost unnecessary to say that hidden in so attractive an envelope as this, the seeds are encased in hard woody sheaths well calculated to carry them safely through the digestive canal of herbivorous animals.

During the *Algarobo* season, *i.e.*, during December and January, these pods form a very important factor in the food supply of the Toba and other Indians of the Gran Chaco. The women go out during the day to collect the fallen ripe pods from under the *Algarobo* trees. The pods are pounded up in a kind of rude mortar made from the upright base of a dead palm stem, and on separating out the hard seeds a kind of meal is obtained, which forms a very nourishing and staying article of food—*Patai*, while stirred up in water it affords a most refreshing drink. The Tobas, however, take further advantage of the large quantity of grape sugar present. The pods are roughly pounded and steeped in a considerable quantity of water in large calabashes, and left to stand overnight (or in the cold weather, for a couple of nights). Brisk fermentation ensues, and the result is a comparatively mild but at the same time very insidious alcoholic beverage, colourless and with a sourish taste, known to the Tobas as *Luktagá*—to the Provincial Argentines as *Aloja*.

Prosopis ruscifolia, Griseb.

Hab.—Rio Pilcomayo.

Prov. Arg., *Vinal*; Toba, *Nēdasík*.

The *Vinal* is one of the more conspicuous trees of the Chaco, conspicuous alike from its large size, and from its habit of growing alone and solitary in the open palmar. A large specimen measured 50 feet in height by 10 feet in girth at 4 feet from the ground. In general aspect the *Vinal* is much branched, wide-spreading, gnarled, and knotty. Its rough bark is deeply furrowed vertically; its heartwood hard and reddish.

On the Chaco frontiers the fruit of the *Vinal* is much used for feeding cattle, while a decoction of its leaves is of high repute as a remedy for ophthalmia. An Argentine chemist has found that the leaves contain a special alkaloid, which he has named *Vinalin.* The most interesting feature of the *Vinal,* however, is its spines. Other species of the genus *Prosopis* are commonly provided with spines, but in *Prosopis ruscifolia* these attain to gigantic dimensions, so that a tiny twig an eighth of an inch thick may bear spines half-an-inch thick at the thickest point, and 5 inches in length. These spines would form an interesting problem to those who hold the opinion that spines are merely starved branches, and that they mark loss of vegetative power, for here we have the spines enormously larger than the parent branch from which they are given forth.

The presence and the use of these enormous spines is, however, in any case very puzzling. The ordinary function of spines is as a protection against herbivorous animals, but the *Vinal* is a large tree, and there are no large indigenous herbivora, except deer and tapirs, both of which are obviously unable to prey upon the foliage. It seems to me most reasonable to look upon the *Vinal* as a survival of what was fittest a long period of time since, when, as in tertiary and post-tertiary times, the region which it inhabits had a population of large herbivorous mammals.

DESMANTHUS VIRGATUS, Willd.

Hab.—Fortin Page. In the open palmar; growing a few plants together, often on termite hills.

MIMOSA ASPERATA, L.

Hab.—Rio Paraná near Goya. Fl. Jan.

MIMOSA CINEREA, Vell.

Hab.—Open palmar near Fortin Page.

MIMOSA STRIGILLOSA, Torr. et Gr.

Hab.—Fortin Page. Common in the open palmar, resembling clover in its general habit. Fl. 20th Oct.

MIMOSA sp. ? — Specimen too imperfect for determination.

ACACIA BONARIENSIS, Gill.

Hab.—Lower Pilcomayo, by the river margin.

Acacia farnesiana, Willd.

An exceedingly common shrub, amongst the brush by the river bank. The flower balls, which are of a deep yellow, last only a very few days. In flower 15th–25th July. The Argentines of our expedition called this plant *Espinillo*, a name common, however, to almost all shrubby acacias. This was the first of the acacias to flower. The flowers are most beautifully perfumed.

Acacia praecox, Griseb.

A low tree 10–15 feet in height, frequent in the montecitos around Fortin Page.

A well-marked variety of this species seems to be becoming developed, characterised by its very straggling, almost climbing habit, and the (no doubt correlated with this) more numerous and more recurved spines.

The trees burst into a mass of bloom about 12th Aug., continuing in flower until about the end of the month. Each tree in flower exhaled a most delightful perfume, which could be perceived a long distance off, and proved a great attraction to insects and humming birds. The flowers were produced before the foliage. Fruit 1st Dec.

Pithecolobium multiflorum, Benth.

Prov. Arg., *Timbo blanco.*

A tall, slender tree, exceedingly abundant along the river banks in low-lying situations in the Chaco. Trees of this species lost their leaves entirely during the winter. The new leaves burst forth about the 1st Aug., but many of the trees were again stripped of foliage by the frosty night, about 6th Aug. A large specimen had a circumference of 7 feet, at 4 feet from ground.

The heartwood is white and very brittle—quite useless as a timber. The tree is much affected by two species of *Loranthaceæ.*

Fl. 27th Sept.–Oct.

Eugenia glaucescens, Camb.

Hab.—Montes on Rio Pilcomayo.

Tibouchina, cfr. T. sebastianopolitana, Cogn.?

Hab.—Rio Pilcomayo.

NESÆA SALICIFOLIA, H. B. K.
Hab.—Rio Pilcomayo in campo, by margin of monte.

JUSSIÆA BRACHYCARPA, Micheli.
Hab.—Rio Pilcomayo.

BANARA TOMENTOSA, Clos.
Hab.—Rio Pilcomayo.

TURNERA ULMIFOLIA, L. var.
Hab.—Rio Pilcomayo.

PASSIFLORA GIBERTI, N. E. Br. (n. sp.).—Caule scandente tereti glabra; foliis profunde trilobis, basi late rotundatis vel sub-cordatis lobis oblongo-lanceolatis, subacutis, basi pauce serratis, utrinque glabris; petiolis 2–6–glandulosis, pedunculis quam petioli longioribus; stipulis foliaceis, falcato-lanceolatis vel falcato-ovatis, acutis, mucronatis; bracteis liberis, ovatis acutis, mucronatis, basi serratis; calycis tubo brevissimo, basi intruso, sepalis oblongis obtusis, dorso sub apice processu perlongo acuto munitis; petalis oblongis obtusis, coronæ faucialis filamentis subquinqueseriatis, extimis radiatis quam petala $\frac{1}{3}$ brevioribus, intimis erectis circum gynophorum conniventibus eoque paullo brevioribus, intermediis multo brevioribus; corona media e medio tubi enata, membranacea, deflexa, integra; corona basilari membranacea, cupuliformi, integra; filamentis complanatis, antheris magnis; ovario ellipsoideo, glabro, stigmatibus crassis clavatis.

Hab.—Argentine Republic, Gran Chaco, Gibert 43! Kerr! Paraguay, Balansa, 2202!

Folii lamina 2–2$\frac{1}{2}$ poll. longa, 2$\frac{1}{2}$–3 poll. lata. Petiolus $\frac{1}{2}$–1 poll. longus. Pedunculi 1–2 poll. longi. Bracteæ $\frac{5}{8}$–1 poll. longæ, $\frac{1}{3}$–$\frac{5}{8}$ poll. latæ. Flores 3 poll. diam. Cornua sepalorum $\frac{1}{2}$–$\frac{5}{8}$ poll. longa. Gynophorum $\frac{1}{2}$–$\frac{5}{8}$ poll. longum.

This species seems nearly related to *P. Sprucei*, Mart., and *P. violacea*, Vell.; from both it differs in the much longer outer filaments of the corona, and from the latter in its glabrous ovary; from the plant figured as *P. violacea*, in Flora Brasiliensis, vol. xiii., pt. 1, t. 123 (which does not agree with the description given on p. 612 as to the corona), and from that figured in the Botanical Magazine,

t. 6997, as *P. violacea*, it differs in the structure of its corona, and in having the dorsal horns of the sepals placed at about $\frac{1}{4}$–$\frac{3}{8}$ of an inch below the apex of the sepals. The plant figured in the Flora Brasiliensis as *P. violacea*, may be the same as that of the Botanical Magazine, only with the corona erroneously represented, but they are both distinct from the true *P. violacea* of Vellozo, which appears to me to be much more like *P. Sprucei*, than to either of these plants. The petals and interior of the sepals of *P. Giberti* are stated by Balansa to be yellowish, which accords with their appearance in the dried state; the outer coronal filaments appear to be purple or violet with a white base, and have some appearance of being banded, the inner filaments are paler, but this may be due to the process of drying (N. E. Brown).

Passiflora maximíliana, Bor.
Hab.—Rio Pilcomayo.

Cayapona ficifolia, Cogn.
Hab.—Rio Pilcomayo.

Begonia cucullata, Kl.
Hab.—Damp spots in forests of Lower Pilcomayo. Fl. Mar., April. Flowers white.

Sesuvium portulacastrum, L.
Hab.—Fortin Page. Abundant by margins of salt pools, and by margin of river. Always in very salt soil. Fl. Aug., Sept., Oct.

Hydrocotyle leucocephala, Ch. et Sch.
Hab.—Rio Pilcomayo.

Hydrocotyle ranunculoides, Linn. fil.
Hab.—In fresh-water marshes along with *Enhydra*. Fl. October.

Eryngium coronatum, Hook et Arn.
Hab.—Open campo, Rio Pilcomayo.
Toba, *Algwō*.

Eryngium elegans, Ch. et Sch.
Hab.—Estancia Gil. Rio Pilcomayo. Abundant in open campo on Lower Pilcomayo.

SPERMACOCE DIFFUSA, Pohl.
Hab.—Rio Pilcomayo.

SPERMACOCE VERTICILLATA, L.
Hab.—Fortin Page. Abundant in shady spots. Fl. 8th October.

GUETTARDA URUGUENSIS, Ch. et Sch.
Hab.—Gran Chaco.

MACHAONIA ACUMINATA, H. et B.
Hab.—Monte near Fortin Page.

MACHAONIA BRASILIENSIS, Ch. et Sch.
Hab.—In the monte near Fortin Page.

PSYCHOTRIA ALBA, Ruiz et Pav.
Hab.—Rio Pilcomayo.

VERNONIA RUBRICAULIS, H. B. K.
Hab.—Rio Pilcomayo.

STEVIA MULTIARISTATA, Spr.
Hab.—Rio Pilcomayo.

EUPATORIUM CANDOLLEANUM, Hook. et Arn.
Hab.—Gran Chaco.

EUPATORIUM HECATANTHUM, Baker.
Hab.—Rio Pilcomayo. Abundant all along the river's banks. Fl. 15th Sept.

SOLIDAGO MICROGLOSSA, DC.
Hab.—Rio Pilcomayo.

VITTADINIA MULTIFIDA, Griseb.
Hab.—Rio Pilcomayo.

BACCHARIS DRACUNCULIFOLIA, DC.
Hab.—Rio Pilcomayo.

BACCHARIS SERRULATA, Pers.
Hab.—Banks of Lower Pilcomayo.

Tessaria absinthioides, DC.

A small tree like a miniature Lombardy poplar in habit, 15–20 ft. in height. Forms a dense growth on the low-lying islands of the Paraná, especially about Goya, and north of this. Also on banks of Bermejo near its mouth. Occasional thickets on the Pilcomayo, more especially on the southern branch.

Argentine provincial name *Palo bobo.*

Enhydra maritima, DC.

A succulent plant whose stems creep over the surface of mud or shallow water, in fresh-water marshes.

Fl. 9th Oct., near Fortin Page.

Eclipta erecta, L.

Hab.—Rio Pilcomayo.

Wedelia Kerrii, N. E. Br. (n. sp.).—Caule herbaceo, erecto, dichotomo vel trichotomo, hispido; foliis breviter petiolatis, ovatis, obtusis vel subacutis, basi in petiolo angustatis, obtuse serratis, utrinque subhispidis; pedunculis e dichotomiis solitariis, et apice ramorum subcorymbosis, monocephalis, hispidis; involucri squamis biseriatis, lanceolatis, subobtusis, hispidis; paleis lineari-lanceolatis concavis, subacutis, ciliatis, apice luteis; ligulis late oblongis, tridentatis, luteis; pappi squamulis paucis, minutis, caducis, achæniis calvis, compresso-tetragonis, obpyramidalis, apice truncatis cum tubercula centrali, lateris scrobiculatis.

Hab.—Rio Pilcomayo, Kerr!

Folia $1\frac{1}{2}$–$2\frac{1}{2}$ poll. longa, $\frac{1}{3}$–$1\frac{1}{4}$ poll. lata. Pedunculi 1–3 poll. longi. Capitula $\frac{5}{8}$ poll. diam. Achænia $1\frac{1}{2}$ lin. longa, 1 lin. lata (N. E. Brown).

Wedelia pilosa, Baker (*W. brachycarpa*, Baker).

Hab.—Rio Pilcomayo.

Wedelia subvaginata, N. E. Br. (n. sp.).—Caule erecto, subglabro vel sparse et minute appresse strigoso, foliis oppositis, lanceolatis, subacutis, mucronatis, basi acutis, pauce et minute denticulatis, trinerviis, subrigidis, supra subtusque appresse strigosis, breviter petiolatis, petiolis basi in vaginam brevissime connatis; pedunculo solitario, elongato, appresse strigoso; involucri squamis biseriatis, linearibus vel lanceolato-linearibus, obtusis, crassis, minute appresse strigosis, ligulis lineari-oblongis profunde bilobis vel interdum bifidis, lobis oblongis obtusis, luteis; paleis lanceolatis acutis, concavis, apice scabris; pappo coroniformi irregulariter lacerato; achæniis ?

Hab.—Rio Pilcomayo, Kerr.

Folia 2–2½ poll. longa, 5–7 lin. lata. Pedunculus 3½ poll. longus. Capitulum 1½ poll. diam. (N. E. Brown).

ASPILIA BUPHTHALMIFLORA, Griseb.

Hab.—Fortin Page. Abundant in many spots in open palmar. Fl. 15th Oct.

POROPHYLLUM ELLIPTICUM, Cass.

Hab.—Gran Chaco, Rio Pilcomayo.

GAILLARDIA DONIANA, Griseb.

Hab.—Gran Chaco, Rio Pilcomayo.

TRIXIS OCHROLEUCA, Hook. et Arn.

Hab.—Common along river banks, Fortin Page. Fl. Sept., Oct. Flowers white.

PICROSIA LONGIFOLIA, Don.

Hab.—Rio Pilcomayo.

MENODORA INTEGRIFOLIA, Steud.

Hab.—Colonia Hernandá, Rio Paraná.

THEVETIA BICORNUTA, Müll., Arg. (*T. paraguayensis*, Britton).

Hab.—Common in open campo around Fortin Page. Fl. Nov., Dec.

ARAUJA MEGAPOTAMICA, Don.

Hab.—Lower Pilcomayo.

ASCLEPIAS MELLIODORA, St. Hil.

Hab.—Fortin Page. The open campo. Fl. 1st Oct.–30th Nov. In fruit 24th Dec.

CORDIA CYLINDROSTACHYA, Rœm. et Schultes.

Hab.—Rio Pilcomayo.

IPOMŒA ARGENTINA, N. E. Br. (n. sp.).—Caule prostrato vel volubile cum foliis pedunculis sepalisque appresse pubescentibus vel glabrescentibus, foliis breviter petiolatis, anguste lanceolatis, oblongo-lanceolatis vel oblongis, obtusis vel acutis, mucronulatis, basi subacutis vel subobtusis, pedunculis quam foliis brevioribus, 1–3 floris; bracteis parvis, lanceolatis acuminatis; pedicellis calyce brevioribus; sepalis late ovatis vel ovato-lanceolatis, acutis vel subobtusis, basi late rotundatis haud decurrentibus; corolla magna, infundibuliforme, extus vittis quinque appresse pubescentibus; staminibus styloque corolla duplo brevioribus, filamentis glabris basi barbatis, ovario glabro, stigma didyma, lobis globosis.—*Aniseia cernua*, var. *ambigua*, Meissn. in Flora Brasiliensis, vol. vii., p. 319.

Hab.—Buenos Ayres, Tweedie! Uruguay, Tweedie! Lorentz, 65! and 926! Rio Grande, Tweedie! Rio Pilcomayo, Kerr, 63!

Foliorum petioli 2–5 lin. longi; laminæ $1\frac{1}{4}$–3 poll. longæ, $2\frac{1}{2}$–10 lin. latæ. Pedunculi $\frac{1}{2}$–$2\frac{1}{2}$ poll longi. Pedicelli 2–8 lin. longi. Sepala 6–8 lin. longa, $3\frac{1}{2}$–5 lin. lata. Corolla $1\frac{1}{2}$–$1\frac{3}{4}$ poll. longa, et subæquilata.

This species is nearly related to *I. martinicensis*, Mey., but it is at once distinguished by its very much larger flowers, and by the sepals not being decurrent at the base. It also appears to be allied to *I. campestris*, Meissn., *I. prostrata*, Meissn., and *I. Selloi*, Meissn. In the Flora Brasiliensis, Meissner placed it as a variety of *Aniseia cernua*, Mor., which is a very different plant, with flowers that are not one quarter the size of those of the present species; the figure, too, of *Aniseia cernua* given in the Flora Brasiliensis, is totally different from the true plant of Moricand, and probably represents *Aniseia nitens*, Chois (N. E. Brown).

A common ground creeper in shady spots. Fl. 1st Nov.

Ipomœa nuda, N. E. Br. (n. sp.).—Caule volubili, glabro; foliis longe petiolatis, late cordatis acutis vel subtrilobo-cordatis, lobo antico triangulari-acuminato, lobis vel auriculis posticis obtusissime rotundatis, utrinque glabris; pedunculis axillaribus quam foliis brevioribus, trichotomis vel dichotomis, laxe cymoso 5–9 floris, glabris; pedicellis calyce triplo longioribus, glabris; sepalis coriaceis, ellipticis obtusis, minute apiculatis, glabris, exterioribus subbrevioribus; corolla infundibuliformi, glabra; capsula globosa, glabra, calycem dimidio superante; seminibus (immaturis) glabris.

Hab.—Rio Pilcomayo, Kerr, 12!

Petioli $\frac{3}{4}$–$2\frac{1}{2}$ poll. longi. Lamina $\frac{3}{4}$–2 poll. longa $\frac{3}{4}$–2 poll. lata. Pedunculi $\frac{3}{4}$–2 poll. longi. Pedicelli $\frac{1}{2}$–$\frac{3}{4}$ poll. longi. Sepala exteriora 2 lin. longa, interiora $2\frac{1}{4}$ lin. longa, 2 lin. lata. Corolla 9–10 lin. longa.

Allied to *I. umbellata*, Meyer, but the cymes have fewer flowers, the calyx is smaller, and the leaves are different in form.

The collection contains another species of Ipomœa allied to this one, but with larger flowers and differently shaped leaves. The material, however, is insufficient for a description (N. E. Brown).

IPOMŒA VILLICALYX, N. E. Br. (n. sp.).—Caule volubili, cum petiolis pedunculisque dense villoso-tomentoso; foliis cordatis, apice acuminatis, acutis vel obtusis, mucronulatis, utrinque molliter adpresseque tomentosis vel subvillosis; pedunculis quam petiolis longioribus, dichotomis, cymoso 3–9 floris; pedicellis calyce æquantibus, villosis; sepalis oblongis obtusis, subcoriaceis, pilis longis dense villosis; corolla infundibuliformi roseo-purpurea, extus adpresse villosa; staminibus inclusis, filamentis basi dense barbatis; ovario glabro.

Hab.—Argentine Republic, Gran Chaco, Gibert, 67! Rio Pilcomayo, Kerr!

Petioli $\frac{1}{2}$–$1\frac{1}{4}$ poll. longi. Folia $1\frac{1}{2}$–4 poll. longa, $1\frac{1}{4}$–$2\frac{3}{4}$ poll. lata. Pedunculi $1\frac{1}{2}$–2 poll. longi. Pedicelli 4–6 lin. longi. Sepala 5 lin longa, $2\frac{1}{2}$–3 lin. lata. Corolla $1\frac{3}{4}$ poll. longa, circa 2 poll. diam.

A very distinct species, easily recognised by its tomentose surface and shaggy calyx; the branches of the cyme are very short, being only from 1-3 lines long (N. E. Brown).

IPOMŒA PLATENSIS, Ker.

Hab.—Rio Pilcomayo.

IPOMŒA TUBERCULATA, Rœm. et Schultes.

Hab.—Rios Paraná, Paraguay, and Pilcomayo.

Jacquemontia alba, N. E. Br. (n. sp.).—Caule volubili cum foliis, pedunculis, bracteis, pedicellisque tomentoso; foliis breviter petiolatis ovatis vel cordato-ovatis acutis, aristato-mucronatis, marginibus leviter sinuatis; pedunculis quam foliis longioribus, umbellatim vel breviter cymoso 3–11-floris; sepalis oblongis obtusis mucronulatis, pedicello subæquantibus vel subbrevioribus, parce pubescentibus vel subglabrescentibus, ciliatis; corolla infundibulariformi, alba, extus glabra; capsula globosa, glabra, sepalis æquante; semina glabra.

Hab.—Paraguay, Balansa, 1065! Rio Pilcomayo, Kerr! Brazil, Pohl, 1756!

Foliorum petioli 2–6 lin. longi, laminæ 1–2$\frac{3}{4}$ poll. longæ, $\frac{3}{4}$–1$\frac{1}{2}$ poll. latæ. Pedunculi $\frac{3}{4}$–3$\frac{1}{2}$ poll. longi. Pedicelli 2–4 lin. longi. Sepala 2–2$\frac{1}{3}$ lin. longa, 1 lin. lata. Corolla $\frac{3}{4}$ poll. longa. Capsula 2 lin. diam. (N. E. Brown).

Jacquemontia tamnifolia, Griseb.

Hab.—Rio Pilcomayo. Open palmar. Common.

Convolvulus Hermanniæ, L'Herit.

Hab.—Rio Pilcomayo.

Solanum multispinum, N. E. Br. (n. sp.).—Caule, petiolis, pedunculis, pedicellis, calycibusque omnibus dense aculeatis, stellato-tomentosis cum glandulis stipitatis intermixtis; aculeis acerosis, rectis, fulvis, patentissimis; foliis solitariis elongato-ovatis, subobtusis, basi cordatis, breviter sinuato-lobatis, utrinque dense stellato-tomentosis et ad venas aculeis armatis, supra tomento flavescente, subtus pallidiora; pedunculis lateralibus quam petiolis brevioribus, scorpioideis, laxe plurifloris; pedicellis erectis, longis, tenuibus; calyce campanulato $\frac{1}{2}$ vel $\frac{2}{3}$ corollæ æquante, ad dimidium quinquelobato, dense stellato-tomentoso et aculeato, lobis anguste lanceolatis acuminatis, corolla ad medium vel ultra quinquefida, extus stellato-tomentosa, lobis lanceolatis acutis, recurvo-patentibus; antheris lanceolatis, poris apicalibus dehiscentibus.

Hab.—Rio Pilcomayo, Kerr!

Foliorum petioli $\frac{3}{4}$–1$\frac{1}{4}$ poll. longi, laminæ 2$\frac{1}{4}$–3 poll. longæ, 1$\frac{1}{4}$–1$\frac{3}{4}$ poll. latæ. Pedunculi $\frac{1}{4}$ poll. longi (vel ultra ?). Pedicelli $\frac{3}{4}$–1 poll. longi. Calyx 4$\frac{1}{2}$ lin. longi (lobis $2\frac{1}{2}$ lin. longis). Corolla 1 poll. diam. (lobis $3-3\frac{1}{2}$ lin. longis, 2 lin. latis). Antheræ $3\frac{1}{2}-4$ lin. longæ. Aculei $1\frac{1}{4}-2$ lin. longi.

This species should probably be placed near *S. crinitipes*, it seems to be well distinguished by its long pedicels, deeply divided calyx, and the horizontal needle-like spines with which the calyx, pedicels, petioles and stem, are thickly clothed. A plant collected in Paraguay by Balansa (No. 2115) may be a form of this species, but the specimen I have seen is in fruit only, and the leaves have much shorter petioles, are more elongated, more deeply lobed, and have fewer veins (N. E. Brown).

Solanum robustum, Wendl.
Hab.—Lower Pilcomayo. Fl. March.

Solanum sisymbrifolium, Lamk.
Hab.—Gran Chaco.

Physalis angulata, L.
Hab.—Rio Pilcomayo.

Jaborosa integrifolia, Lamk.
Hab.—Common in open campo near Fortin Page.

Petunia violacea, Lindl.
Hab.—Rio Pilomayo.

Nicotiana glauca, Grah.
Hab.—By margin of river, Rio Pilcomayo.

Stemodia palustris, St. Hil.
Hab.—Rio Pilcomayo.

Scoparia flava, Cham.
Hab.—Frequent in open palmar near Fortin Page. Fl. Nov., Dec.

Buchnera elongata, Sw. ?
Hab.—Rio Pilcomayo.

Bignonia corymbifera, Vahl.
Hab.—Montes of Rio Pilcomayo.

Dolichandra cynanchoides, Cham.
Hab.—Rio Pilcomayo. Lat. 24° 48′ S. In margin of "monte duro." Straggling shrub. Fl. 3rd Dec. 1890.

Pithecoctenium cynanchoides, Cham.
Hab.—Rio Paraná, near Goya. Gran Chaco.

Ruellia Tweediana, Griseb.
Hab.—Gran Chaco.

Chætothylax umbrosus, Nees.
Hab.—In the montes, Rio Pilcomayo.

Beloperone Amherstiæ, Nees.
Hab.—In the montes near Fortin Page.

Beloperone Kerrii, N. E. Br. (n. sp.).—Glabra corolla excepta; caule tereto; foliis petiolatis, lanceolatis vel ovatis, obtusis vel acutis, basi rotundatis vel acutis; spica terminali composita, anguste thyrsoidea, basi bifoliata; bracteis bracteolisque anguste spathulatis calycem æquantibus; calycis segmentis lanceolatis acuminatis angustissime albo-marginatis; corolla quam calyce triplo vel quadruplo longiora punicea, lobis extus minute pubescentibus, labio superiori recto, anguste oblongo-lanceolato, apice bifido, inferiori triplo latiori usque ad medium trifido, lobis oblongis obtusis; staminibus corolla brevioribus; antherarum loculi unus super altero positi, inferiori breviter calcarati.

Hab.—Rio Pilcomayo, Kerr, 108!

Foliorum petioli 2–4 lin. longi, laminæ 1–2 poll. longæ, $\frac{1}{4}$–$\frac{3}{4}$ poll. latæ. Spica 1–$1\frac{1}{2}$ poll. longa. Bracteæ et calyx 4 lin. longæ. Corolla $1\frac{1}{4}$ poll. longa.

Of the described species this appears to be nearest allied to *B. plumbaginifolia*, but has a much narrower inflorescence and smaller leaves (N. E. Brown).

Common in open spots in monte.

Dicliptera Pohliana, Nees.
Hab.—Rio Pilcomayo.

Lantana Sellowiana, Link et Otto.
Hab.—Rios Paraná and Pilcomayo.

Lippia canescens, Kunth.
Hab.—Rio Pilcomayo.

Lippia lycioides, Steud.
Hab.—Rios Paraná, Paraguay, and Pilcomayo.

VERBENA CHAMÆDRYFOLIA, Juss.

Hab.—Frequent in open campo along Rios Paraná, Paraguay, and Pilcomayo. Fl. Aug., Sept., Oct.

VERBENA ERINOIDES, Lam.?

Hab.—Fortin Page. Very common in open campo. White-flowered individuals occasionally seen. Fl. Aug., Sept., Oct.

This is the commonest Verbena on the Pilcomayo.

VERBENA LITTORALIS, H. B. K.

Hab.—Open campo, Rio Pilcomayo.

VERBENA STELLARIOIDES, Cham.

Hab.—Fortin Page. Frequent in open palmar. Fl. Aug., Sept., Oct.

HYPTIS LAPPACEA, Benth.

Hab.—Rio Pilcomayo.

PFAFFIA TENUIS, N. E. Br. (n. sp.).—Caulibus tenuibus, simplicibus vel apice trichotomis, albo-lanatis; foliis sessilibus, lanceolatis, acutis, supra arachnoideis, subtus dense albo-lanatis; pedunculo elongato, terminali, gracili, simplici; capitulo parvo, globoso vel oblongo, rachi lanata; bracteis ovatis cuspidato-acuminatis, stramineis, dorso glabris, apice ciliatis; bracteolis lateralibus late ellipticis, obtusis, glabris, albidis; perianthii segmentis lanceolato-oblongis, obtusis, albidis, basi longe villosis, apice pubescentibus; tubo stamineo parte filamentorum libera basi ciliata subæquante; filamentorum lobis lateralibus medio antherifero multo longioribus, integris, non ciliatis; ovario ovato, stigma subsessile, obsolete bilobo.

Hab.—Uruguay, Lorentz, 998! Rio Pilcomayo, Kerr!

Herba 6–9 poll. alta. Folia $\frac{3}{4}$–$1\frac{1}{4}$ poll. longa, 2–5 lin. lata. Pedunculi $2\frac{1}{2}$–4 poll. longi. Capitula 3–$3\frac{1}{2}$ lin. diam. Bracteæ 1 lin. longæ. Bracteolæ laterales $1\frac{1}{3}$ lin. longæ. Flores $1\frac{3}{4}$ lin. longi.

Very similar to *P. gnaphalioides*, Mart., in appearance, but is easily recognised by the much smaller flower-heads (N. E. Brown).

SALICORNIA PERUVIANA, Kunth.

Hab.—Fortin Page. Abundant upon bare soil by the margins of river and of salt lagunas. Found only on soil saturated with salt. Fl. Sept., Oct.

Rivina laevis, L.
Hab.—Rio Pilcomayo, Fortin Page.

Polygonum acuminatum, Kunth.
Hab.—Marshes of Rios Pilcomayo and Paraguay.

Muehlenbeckia sagittifolia, Meissn.
Hab.—Rio Pilcomayo.

Coccoloba alagoensis, Wedd.
Hab.—Rio Pilcomayo.

Coccoloba cordata, Cham.
Hab.—In monte near Fortin Page. Fl. 4th Jan.

Coccoloba paraguariensis, Lindau.
Hab.—A small shrub frequent along margin of the Rio Pilcomayo.

Nectandra angustifolia, Nees., var. falcifolia, Nees.
Hab.—Banks of Lower Pilcomayo.

Euphorbia adenoptera, Bertol.
Hab.—Open campo near Fortin Page. Fl. 3rd Nov.

Euphorbia brasiliensis, Lamk.
Hab.—Rio Pilcomayo.

Euphorbia hypericifolia, Linn.
Hab.—Rio Pilcomayo.

Euphorbia ovalifolia, Engelm., var montevidensis, Boiss. ?
Hab.—Rio Paraná.

Euphorbia selloi, Klotzsch.
Hab.—Rio Pilcomayo.

Croton lobatus, L.
Hab.—Rio Pilcomayo, Fortin Page.

Croton sarcopetalus, Müll. Arg.
Hab.—Rio Pilcomayo.

Croton urucurana, Baill.
Hab.—Rio Pilcomayo. A small erect shrub 4 ft. in height. Frequent at margin of monte duro. Fl. 20th Sept.

JULOCROTON ARGENTEUS, Didrichs.
Hab.—Rio Pilcomayo, Fortin Page.

CAPERONIA CASTANEÆFOLIA, St. Hil.
Hab.—Banks of Rio Pilcomayo. Lat. 24° 48′ S., May 1890.

CAPERONIA CORDATA, St. Hil.
Hab.—Rio Pilcomayo.

ACALYPHA APICALIS, N. E. Br. (n. sp.). — Caulibus herbaceis simplicibus, laxe et breviter pubescentibus; foliis longe petiolatis, membranaceis, basi quinquenerviis, reliqua parte penninerviis, ovato-lanceolatis acuminatis, basi late rotundatis leviterque emarginatis vel subcordatis, subtiliter crenato-dentatis, supra glabris vel minute puberulis, subtus breviter pubescentibus, stipulis subulatis; spicis masculis axillaribus, solitariis, tenuibus, pedunculatis vel subsessilibus densissime florigeris, pubescentibus, infimis basi bractea palmatifida una fœminea rudimentaria præditis; spica androgyna terminali dense florigera, usque ad $\frac{4}{5}$ fœminea, apice mascula, breviter pedunculata, pedunculo pubescente; bracteis fœmineis unifloris, accrescentibus, palmatisectis, segmentis 9–11 linearibus, scabris; calyce fœminea tripartito, segmentis ovatis acutis, pubescentibus; ovario strigoso-hirsuto, stylis multipartitis, lacinulis filiformibus ovario subæquantibus; capsulis non muricatis, seminibus levibus.

Hab.—Rio Pilcomayo, Kerr!

Petioli $1\frac{1}{2}$–$2\frac{1}{4}$ poll. longi. Foliorum laminæ 3–4 poll. longæ, 1–$1\frac{3}{4}$ poll. latæ. Spicæ masculæ 1–$1\frac{1}{2}$ poll. longæ, 1–$1\frac{1}{2}$ lin. crassæ, pedunculo 1–3 lin. longo. Spicæ androgynæ pars fœminea $1\frac{1}{2}$–$1\frac{3}{4}$ poll. longa, mascula 5 lin. longa. Bracteæ fructigeræ $1\frac{1}{2}$ lin. longæ. Capsula $1\frac{1}{4}$ lin. diam.

The specimens have no root, but have the appearance of an annual, or the annual stems of a herbaceous perennial. In general appearance this species is something like *A. gracilis*, but the terminal androgynous spike at once distinguishes it from all the other South American species (N. E. Brown).

Celtis tala, Gill.

Hab.—Fortin Page. Frequents the edges of the monte. Fl. 26th Sept.

Prov. Arg. *Tala.*

A straggling shrub some 5 feet in height, characterised by its stiff rectangular spinescent branching. Fruit edible.

Quercus sp.

Hab.—Rio Pilcomayo. Frequent in open woodlands.

This is, perhaps, the most interesting plant in the collection from a geographical point of view, but the material is too poor for its determination (N. E. Brown).

Brassavola perrinii, Lindl.

Amongst the plants collected at Fortin Page was a fine Epiphytic orchid with white flowers, apparently belonging to Brassavola, or some allied genus. Its stems creep along the branches of its host. Its leaves are elongate cylindroidal in form, with a deep groove along the upper surface. Flowers numerous. The three sepals are linear and colourless, as are the two smaller petals. The anterior petal is broad, expanded, and white in colour; basally its edges curl upwards, so as to fit round the edges of the hood-like column, and with it to form a funnel leading into the nectary tube. This latter is about two inches in length, so that probably lepidoptera, and from the white colour of the flowers probably night-flying lepidoptera, make most use of the honey. The upper margin of the mouth of the nectary tube is continued into the hood-like column, whose under surface is deeply concave to form the large somewhat conical stigmatic cavity. The inner surface of this is smeared with sticky cement. Below, this cavity is freely open; while above and distally its roof projects downward somewhat, and ends in several comb-like teeth. As it were, completing the hood distally is a large cushion-like structure, which is loosely held in position in a socket-like cavity by the downwardly projecting teeth before alluded to. This cushion has loosely embedded in it the eight pollinia, and its posterior aspect is smeared with a sticky cement. If a slender object is inserted into the nectary tube and withdrawn, it rubs against the downwardly projecting edge of the cushion, and rotates it outwards and upwards. Thus loosened from its attachment, it falls down flat upon the proboscis and sticks firmly. With the slightest touch, the protecting cap is knocked off, and we have left, attached to the proboscis, the eight pollinia. On introducing the proboscis into another flower these naturally touch and adhere to the sticky stigmatic surface.

EULOPHIA MACULATA, Rchb. f.
Hab.—Rio Pilcomayo.

ONCIDUIM PUMILUM, Lindl.
Hab.—Rio Pilcomayo.

STENORHYNCHUS ORCHIOIDES, Rich.
Hab.—Rio Pilcomayo.

THALIA GENICULATA, L.
Hab.—Rio Pilcomayo.

CANNA COCCINEA, Ait. ?
Hab.—Rio Pilcomayo.

CANNA GLAUCA, L.
Hab.—Rio Pilcomayo.

BROMELIA ARGENTINA, Baker. (ÜVIRÁ, Kalyité).

This species of Bromelia, with leaves about 5 feet in length, is much used by the Chaco Indians as a source of fibre, of which they make cord and rope, and also coarse cloth. Around Fortin Page it did not occur at all, but existed in considerable quantities about four days' journey to the N.W. The fibre is obtained from the dried and withered leaves by simply peeling off the upper and lower epidermis. The fibre is one of very considerable tenacity, being quite equal or superior to jute, and it is characterised by its high specific gravity, and especially by its wonderful damp-resisting powers.

A note has recently been published upon this species in the "Kew Bulletin," under the name of Karaguatá. It, however, ought to be pointed out that Karaguatá is a generic name applied in Guarani to almost all large Bromelia-like plants—for instance there is the *Karaguatá guazú* or Great Karaguatá, and the *Karaguatá ü* or Water Karaguatá, and many others. To *Bromelia argentina*, however, one scarcely ever hears a Paraguayan apply the name Karaguatá; it is properly known as *Üvirá*, and this is the name which ought certainly to be used in referring to it, instead of the very vague and indefinite Karaguatá.

Bromelia ? sp. ?

To the Paraguayans this species is known as *Karaguatá ü;* to the Tobas as *Tuklate*.

The *Karaguatá ü* is an inhabitant of the monte, where it forms a dense undergrowth. The leaves are about 3 feet in length, tapering gradually towards the apex. Margins beset, at regular intervals, with spines acutely bent towards the apex. The upper surface is deeply concave, and leads down into the widely sheathing leaf-base. The fruit is very enticing, of a rich yellow colour, and attractive odour. When first met with I hastened to taste the berries, but though pleasant to taste they are very acrid.

The Tobas pile the spiny Karaguatá plants over the graves of their people.

To the traveller in the Gran Chaco this plant is an inestimable boon, for the dews and rains collect in the deep sheathing axils of its leaves, in which one can thus always find a little fresh water, even when the country all around is baked and parched, and when the rivers are either completely dry or have only a runlet of intense salt brine trickling down their beds.

Tillandsia bandensis, Baker.

Hab.—A common epiphyte in the forests of the Pilcomayo.

Tillandsia Hilaireana, Baker.

Hab.—Rio Pilcomayo. Abundant. Epiphytic on nearly every tree.

Tillandsia vernicosa, Baker.

Hab.—Rio Pilcomayo. Epiphytic.

Tillandsia tomentosa, N. E. Br. (n. sp.).—Foliis rosulatis, caule brevioribus, basi subbulboso-convolutis, lineari - attenuatis, recurvis, convolutis, apice circinatis, utrinque dense squamuloso-tomentosis; caule foliis 2–3 instructis, superne in vaginis dense lepidotis abeuntibus; spicis fasciculato-paniculatis, distichis (pedunculis in vaginis occultis, apice fasciculatim 3–4 spicatis), recurvis, 6–12-floris, bracteis ovato-lanceolatis, conduplicatis, obtusis vel acutis, lepidotis vel subglabris, imbricatis, calycem subæquantibus; sepalis oblanceolato-oblongis subobtusis, glabris, ungues petalorum æquantibus; petalis roseo-purpureis, laminis subrotundis; staminibus styloque inclusis.

Hab.—Rio Pilcomayo, Kerr!

Folia 6–8 poll. longa, basi ½ poll. lata. Caulis 16–18 poll. longus. Spicæ 1½–3 poll. longæ, ¼ poll. latæ. Bracteæ 5–7 lin. longæ, 2½–3 lin. latæ. Sepala 6–7 lin. longa, 2½ lin. lata. Petalorum lamina 5 lin. diam.

This species, I think, should be placed near *T. streptophylla*, but is abundantly distinguished from that and all allied species by having the recurving flower-spikes grouped in four or five distant fascicles, forming a distichous panicle 6 or 7 inches long by 4 or 5 inches broad (N. E. Brown).

Hab.—Rio Pilcomayo. Epiphytic. Common.

CYPELLA GRACILIS, Baker.

Hab.—Rio Pilcomayo.

CYPELLA HERBERTI, Herb.

Hab.—Fortin Page. Open campo. Fl. 9th Oct.

MAYACA SELLOWIANA, Kunth.

Hab.—Rio Pilcomayo. Creeping on ground in damp spots in forest.

COMMELINA VIRGINICA, L. (*C. sulcata*, Willd.).

Hab.—Rio Pilcomayo. Very common in shady spots.

Of palms, I found three species conspicuous on the banks of the Pilcomayo, *Copernicia cerifera*, *Trithrinax brasiliensis*, and *Cocos australis*.

COCOS AUSTRALIS, Mart.

This, a tall and beautiful palm called *Pindó* in Guaraní, and *Chaik latḗ* in Toba, was not found in the immediate neighbourhood of Fortin Page. Along the lower reaches of the Pilcomayo, and on the banks of the Rio Bermejo, it is a conspicuous object growing singly and solitary in the dicotyledonous forest. The fleshy pericarp of its drupaceous fruit is sweet and wholesome, while the heart of the crown is also used as a vegetable.

Trithrinax brasiliensis, Mart.

Toba, *Laiardái.*

Hab.—Fortin Page. Common in the "monte duro" of the Pilcomayo. Flowered 1st February.

This species of palm occurred not infrequently around Fortin Page, where it was entirely confined to the montes. Growing as it did in the comparative twilight, it was usually slender and much drawn out, the stem being often 10 or 15 feet in length; and oftener prostrate or semi-prostrate than erect.

Copernicia cerifera, Mart.

Hab.—Rio Bermejo; Rio Pilcomayo.

This, the *Carandaï* or *Palma Negra* of the Paraguaians, the *Chaik* of the Tobas, is the most characteristic palm in the region of Fortin Page, and in fact in the Gran Chaco as a whole. Vast regions in the low-lying parts of the Chaco, occupying many thousand square miles covered with rank grass are dotted all over with *Carandaï* palms, forming immense palm groves or palmares.

The *Carandaï* palm averages about 30 feet in height. It has a smooth stem about seven inches in diameter, marked externally with shallow depressions indicating the leaf scars. Great variability exists in the degree of persistence of the leaf bases. In the young palms they are decidedly persistent, the withered lamina being merely broken off by the wind, but after reaching a height of several feet the leaves are cleanly shed. The persistence of the hard spiny leaf-bases around the young stem must evidently be of great use in preserving it from the attacks of deer and other vegetable feeders; the protection being no longer required higher up. The average height of the *Carandaï* palms on the Pilcomayo is, as I have said, about 30 feet. Two exceptionally tall individuals of which I took the altitude measured 72 feet 6 inches, and 62 feet 10 inches, and the former must, I think, be about the limit of height above which the wind pressure on the leafy head becomes too great for stability. Occasionally, but, comparatively speaking, very rarely, I came across specimens whose stem divided up into several branches. One tall palm bifurcated about 45 feet from the ground. One of those primary limbs bore a leafy crown, the other one bifurcated twice in succession and then split up into a large number of irregular terminal branches, about 20 in all.

The stem of the *Carandaï* is very hard and dense, and very dark in colour, which in fact is the origin of the name *Palma Negra*—black palm. (In what appeared to be a distinct variety the stem remained comparatively soft, and the leaf bases were here much more persistent). These hard trunks are much used in the construction of houses, serving admirably for rafters and pillars.

The *Carandaï* came into flower about 10th December, and ten days later was in full flower. The flowers are borne on branches 7 feet or so in length, and have a rich and fruity scent.

The fruit of this species is not edible, but the young and tender heart we found to be so, and amongst the Indians this *Chaik kūm* is a regular article of diet.

Typha sp.

Abundant in fresh-water marshes. The male flowers are eaten by the Indians; they are rather tasteless, but contain a certain quantity of nourishment. Fl. 11th Dec.

Pistia sp.

Very abundant in all the fresh-water pools, in company with *Azolla magellanica*. Fl. 11th Dec.

Anthurium sp.

Possibly a new species, but material is insufficient for description.

Hab.—Damp spots in the forest, Rio Pilcomayo.

Echinodorus floribundus, Seub., var.

Hab.—Fortin Page. Very common in palmar. Fl. 15th Sept.

Cyperus flavus, Vahl.

Hab.—Rio Pilcomayo.

Cyperus giganteus, Vahl.

Hab.—Rio Pilcomayo.

Cyperus Meyenianus, Kunth.

Hab.—Rio Pilcomayo.

Cyperus sp.

Hab.—Rio Pilcomayo.

Kyllinga odorata, Vahl.
Hab.—Rio Pilcomayo.

Eleocharis geniculata, R. Br.
Hab.—Rio Pilcomayo.

Fimbristylis velata, R. Br.
Hab.—Rio Pilcomayo.

Scirpus paraguayensis, Maury.
Hab.—Fresh-water marshes on Rio Pilcomayo. Fl. Sept.

Paspalum notatum, Flügge.
Hab.—Campo about Fortin Page, Rio Pilcomayo.

Paspalum quadrifarium, Lam., Glabrous form.
Hab.—Rio Pilcomayo. Lat. 24° 47′ S. Common.

Paspalum rufum, Nees.
Hab.—Rio Pilcomayo.

Paspalum tristachyon, Lam.
Hab.—Rio Pilcomayo.

Anthænantia lanata, Benth.
Hab.—Rio Pilcomayo.

Panicum capillare, L.
Hab.—Rio Pilcomayo. Frequent.

Panicum rivulare, Trin.
Hab.—Margin of Rios Paraná and Paraguay.

Panicum spectabile, Nees.
Hab.—Rio Pilcomayo.

Oplismenus sylvaticus, Rœm. et Schultes.
Hab.—Covering ground in more open and dry parts of the forest, Rio Pilcomayo.

Setaria glauca, Beauv.
Hab.—Rio Pilcomayo. Lat. 24° 47′ S.

Imperata brasiliensis, Trin.
Hab.—Rio Pilcomayo. Covering large patches in the open campo.

Chloris polydactyla, Kunth.
Hab.—Rio Pilcomayo.

Diplachne verticillata, Nees et Mey.
Hab.—Forests near mouth of Rio Pilcomayo.

Cheilanthes microphylla, Sw.
Hab.—Same locality as last.

Cheilanthes pedata, A. Br.
Hab.—Rio Paraguay.

Cheilanthes radiata, R. Br.
Hab.—Forests near mouth of Rio Pilcomayo.

Pteris palmata, Willd.
Hab.—Common on prostrate tree trunks in damp forests on the Lower Pilcomayo.

Nephrodium molle, Desv.
Hab.—Common in forests of Lower Pilcomayo.

Polypodium angustum, Mett.
Hab.—On prostrate trunks in same locality as the preceding species.

Polypodium incanum, Sw.
Hab.—Forests of Lower Pilcomayo.

Gymnogramme rufa, Desv.
Hab.—On prostrate tree trunks in forests of Lower Pilcomayo.

Anemia tomentosa, Sw.
Hab.—Rio Pilcomayo.

Azolla magellanica, Willd.
Very abundant upon fresh-water lagunas everywhere, forming a continuous carpet over their surface, green in the younger plants, reddish in the older. Sporangia developed during July, August, and September, *i.e.*, as the waters dry up and the plants are left stranded.

Usnea barbata, var. ceratina, Sch.
Prov. Arg., *Barbara del monte*.
Hab.—Abundant on trees in the montes of the Pilcomayo.

A New Species of Phacelocarpus. By E. M. Holmes, F.L.S.

(With Plate I.)

(Read March 1892.)

In the *Epicrisis Systematis Floridearum*, Dr. Agardh describes six species of the genus, and another has since been added by him in *Till Algernes Systematik*, iv. p. 57. These algae are confined to the coasts of Australia, New Zealand, and South Africa. The genus has been divided into two sections, the first, *Euctenodus*, having compressed, pinnately decompound, linear branches and branchlets, which are distichously pinnate throughout, and the second, *Phacelocarpus*, a more or less cylindrical or terete irregularly branched frond, with the ultimate pinnules or teeth arranged in an irregularly spiral manner around the stem.

The first section includes *P. alatus*, *P. complanatus*, *P. sessilis*, *P. apodus*, and *P. Labillardierii*, and the second, *P. tortuosus*, and *P. tristichus*. The new species about to be described is intermediate between these two sections, in having the branches and branchlets distichous, but the stem twisted at the innovations, so as to give a pseudo-spiral appearance to the frond. It further differs from all the known species in having the fructification attached, not to the teeth, but to the surface of the frond. The name here given to the plant is in allusion to the latter peculiarity.

Phacelocarpus epipolæus* (n. sp.).

Fronde basi teretiuscula, immerso-costata inferne sensim nudiuscula, superne complanata, ramis corymboso-pinnatis, pinnis linearibus pectinato-pinnatis, ala angustissima instructa, dentibus compressis latitudinem rachidis ita formatæ sua longitudine æquantibus vel paululo superantibus, planis, a basi latiore acuminatis, incurvis. Cystocarpiis reniformibus breviter pedicellatis alterutra pagina affixis; nematheciis ovato-globosis breviter pedicellatis;

*Some specimens of the plant have been distributed under the MS. name of *P. disciger*. The name *epipolæus*, being of Greek derivation, is, however, substituted here as more suitable.

antheridiis subsessilibus oblongo-ovatis pallidis, similariter affixis.

Hab.—Ad Africam Australem, prope ostiam fluminis Kowie. Dr. H. Becker.

This interesting species was sent with several other new marine algae from a district in South Africa which appears to have a peculiarly rich algal flora. The plant now under consideration attains, so far as can be judged from the specimens received, a length of 12–18 inches. The stem, which is terete at the base for about 2 inches of its length, arises from a discoid base. The branches, which nowhere exceed a line in diameter, are very irregularly pinnate, two or three ramuli frequently arising near together at variable intervals, and all the branches showing a tendency to corymbose branching towards their apices. The innovations occur at intervals of $\frac{1}{4}$ to $\frac{3}{4}$ inch, and as the frond is slightly twisted at each innovation, it assumes, before pressure, a somewhat spiral appearance. The nemathecia, cystocarps, and antheridia occur on distinct plants, and are situated between the midrib and the margin of the frond, *never in the axils of the teeth, nor on the margin of the teeth*, as in other species. They occur on both sides of the frond, and occasionally two or three are grouped together. The cystocarps are shortly stalked, not perfectly smooth, and are compressed and reniform, closely resembling in shape the sporangium of a Lycopodium. The nemathecia are shortly stalked, and vary in shape from globose to broadly oval. The antheridia are of a yellowish tint, nearly sessile, and ovate or ovate-oblong. The latter organ has not, that I am aware of, been previously described in the genus *Phacelocarpus*. The cells form a dense layer on the surface of the antheridium.

The drawings illustrating this paper have kindly been made for me by my friend and collaborateur Mr. E. A. L. Batters, M.A., B.Sc., F.L.S.

EXPLANATION OF FIGURES IN PLATE I.

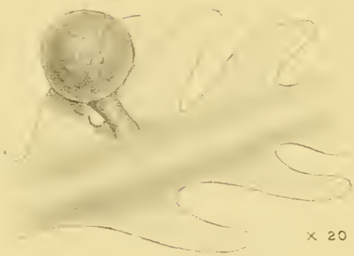
1. Portion of plant, natural size. 2. Magnified portion of branchlet showing position of the pedicel on the surface of the frond. 3. Tetrasporic fruit, showing the lateral cavities containing the tetraspores. 4. A cavity magnified. 5. An isolated tetraspore with paraphyses. 6. A cystocarpic fruit. 7. Longitudinal section of the same. 8. Antheridium.

Fig. 1.

Fig. 3.

× 40

Fig. 2.



× 20

Fig. 4.

× 50

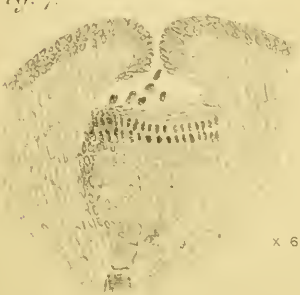
Fig. 5.

× 150

Fig. 6.

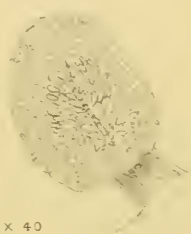
× 30

Fig. 7.



× 60

Fig. 8.



× 40

F. A. L. Batters del. F. Huth, Lith.^r Edin.^r

PHACELOCARPUS EPIPOLÆUS.

MEETING OF THE SOCIETY,

Thursday, January 11, 1894.

Professor BOWER, President, in the Chair.

Mrs. A. DOWELL was elected Resident Fellow of the Society.

Miss CHARLOTTE C. PEARSON and Miss ELIZABETH MADDEN were elected Lady Members of the Society.

Dr. J. J. MOONEY was elected Non-Resident Fellow of the Society.

The PRESIDENT referred to the loss the Society had sustained by the death of RICHARD SPRUCE, Honorary British Fellow of the Society, and commented upon the value of his work.

Presents to the Library at the Royal Botanic Garden were announced.

The TREASURER submitted the following Statement of Accounts for the Session 1892–93:—

RECEIPTS.

Annual Subscriptions, 1892–93, 74 at 15s..	£55	10	0
Do. do. 1892–93, 1 at 15s..	0	15	0
Compositions for Life Membership,	16	16	0
Transactions, etc., sold,	4	6	6
Diploma, Fees,	0	14	5
Interest received,	0	4	0
Subscriptions to Illustration Fund,	22	17	0
	£101	2	11

Issued November 1894.

PAYMENTS.

	£	s.	d.
Printing Transactions, £44, 0s. 6d.; Billets, etc., £9, 9s.,	£53	9	6
Lithographing,	0	13	9
Rooms for Meetings, and Tea,	6	2	0
Charter Box, etc.,	1	7	6
Commission paid to Collector of Subscriptions,	0	10	6
Postages, Carriages, etc.,	9	5	10
Fire Insurance on Books,	0	5	0
Payments,	£71	14	1
Balance of Receipts,	29	8	10
	£101	2	11

STATE OF FUNDS.

Amount of Funds at close of Session 1891–92,				£36	2	2
Increase during Session 1892–93, as above,				29	8	10
Amount of Funds at close of Session 1892–93,				£65	11	0
Being:—Sum on Current Account with Union Bank of Scotland,	£5	7	1			
Sum in Deposit Receipt do.	70	0	0			
	£75	7	1			
Less due to Treasurer,	9	16	1			
				£65	11	0

EDINBURGH, 30*th December* 1893.—Certified as a correct Abstract of the Treasurer's Accounts, which have been audited by me, compared with the Vouchers, and found correct.

ROB. C. MILLAR, C.A., *Auditor.*

The TREASURER intimated the receipt since last meeting of the following subscriptions to the Illustration Fund:—

P. Neill Fraser,	£2	0	0
Dr. H. H. Johnston,	1	0	0

Mr. MALCOLM DUNN exhibited specimen of root of elm gnarled and contorted through its growth in unsuitable stony soil, several stones being overgrown by the wood of the root.

Mr. CAMPBELL sent specimens of *Anemone, Eranthis,* and *Galanthus* in flower, from his garden at Ledaig, Argyllshire, accompanied by good wishes in rhyme to the Society for the New Year.

Mr. T. CUTHBERT DAY exhibited twin and quadruple barley corns from grain grown in France.

Surgeon-Captain H. H. JOHNSTON exhibited specimens of *Ficus* from Mauritius, beautifully dried and showing the fruit uncompressed, and therefore preserving their features in a way the crushed specimens of the genus, as usually found in herbaria, do not show them. He remarked that Mr. Scott, Assistant-Director (now Director) of the Botanic Garden at Pamplemousses, Mauritius, had found that he could not raise the endemic *F. mauritiana* from seed, and in explanation of this Dr. Johnston stated that he had failed to find a single perfect achene in many fruits he had examined. On opening a fresh ripe fruit he noticed a swarm of flies flew out, and the achenes all showed a puncture at one end and were empty.

Mr. J. H. BURRAGE exhibited twigs of the Peruvian shrub *Ercilla volubilis*, A. Juss, showing remarkable root-cushions in the axils of the leaves. These are developed only on twigs which are adjacent to a support, such as a wall; they do not appear on twigs growing erect in the air away from a support. A further communication upon the structure and development of these cushions was promised.

Professor BAYLEY BALFOUR exhibited :—A specimen of *Orchis maculata*, showing regular peloria of the perianth. The six parts are all alike in size and form, the labellum wanting the spur, but the andrœcium and gynæceum are normal. The specimen was found and sent by Miss Munro, Alness, Caithness. Specimens sent by Mr. Walter Berry, Atholl Crescent, of piles bored by teredo; also a series of dried leaves of *Banksia serrata*, prepared by Mr. Harrow, from a plant in the temperate house of the Royal Botanic Garden, showing remarkable heterophylly.

The following papers were read :—

AFRICAN SPECIES OF THE GENUS FICUS. By G. F. SCOTT ELLIOT, B.Sc.

An Old List of "Stations of Rarer Plants ascertained to grow round Inverkeithing and north of the Forth. By A. Robertson." Communicated by Prof. Bayley Balfour.

Amongst some old papers of the late Professor J. H. Balfour, recently come into my hands, I find one with the title quoted above, which appears to me to be worthy of being laid before the Society. Although the information it contains must have been utilised in the preparation of Balfour and Sadler's Flora of Edinburgh, there are stations noted in the list which do not appear in that work, and in view of the many surface changes in the area included in the list, brought about by new lines of railway communication through it, and the prospect this opens out of the introduction of alien plants, it may be, I think, useful to workers in the future to have before them such a list, showing what botanists of fifty years ago knew of the rarer and introduced plants of the district. Appended to the list is the following note :—

"All the plants marked 'Pitreavie' are decidedly introduced (old garden).

"The Culross plants—*Doronicum Pardalianches, Galanthus, Narcissus,* and *Hypericum Androsæmum* are at best suspicious ; also *Euphorbia Lathyris* and *Arum.*

"The St. David's plants,—(excepting *Thalictrum flavum* and *Allium arenarium*)—some decidedly introduced, others suspicious.

"The Inverkeithing plants—*Saponaria officinalis, Nasturtian sylvestre* and *Sinapis muralis* (also at Charlestown), decidedly introduced.

"The Cleish plants—(*Arabis Turrita*), *Actæa, Meconopsis, Valeriana pyrenaica, Hieracium amplexicaule, Convallaria, Arum,* either decidedly introduced or suspicious (old garden), also *Doronicum plantagineum, Smyrnium Olusatrum ;* and *Peucedanum Ostruthium* probably introduced at both stations.

"*Petasites albus* and *Saxifraga umbrosa* certainly introduced. *Prunus domestica* and *insititia* and *Fragaria elatior* probably introduced ; and also *Acer campestre, Petroselinum,* and *Apium* certainly introduced ; and also *Carum Carui.*

"*Hieracium aurantiacum* introduced, also *Medicago sativa* and *maculata*; *Hesperis matronalis* suspicious also.

"The Inchcolm plants—*Crambe, Verbascum Thapsus,* and *Brassica campestris*; *Dianthus Caryophyllus* certainly introduced."

I have not been able to assure myself as to the identity of "A. Robertson," the writer of the list, but possibly some older members of the Society may be able to furnish information on this point.*

Acer campestre—North Ferry.
Aconitum Napellus—near Fordel, Inverkeithing. A. Robertson, 1834.
Actæa spicata—Cleish (old garden).
Adoxa Moschatellina — Fordel, Woodmill near Dunfermline, near Culross.
Aira præcox—Ferry Hills.
—— caryophyllea—Do.
—— flexuosa—Culross, Cleish Hills, Cullelo Hill.
Ajuga reptans—Ferry Hills, Fordel, etc.
Alisma ranunculoides—Loch Head, 2 miles north of Dunfermline, Loch Leven.
Allium arenarium—Pitreavie near Dunfermline, near St. David's. A. Robertson, in company with Dr. Wallich, 1834.
—— vineale—Ferry Hills, in many places.
Andromeda polifolia—said to have been found on the Cleish Hills by Lady Adam; since then often sought in vain by other botanists.
Anagallis cœrulea—single specimen found by Dr. Dewar north of Inverkeithing.
Anchusa sempervirens—Culross (A. Robertson), Pitreavie (Dr. Dewar).
Angelica sylvestris—Dalmeny Woods, Culross, Lethan's Glen, seven miles north of Dunfermline.
Anthemis arvensis — about Inverkeithing in several places. A. Robertson, 1835.
—— cotula—Do.
Apium graveolens — Culross. A. Robertson, 1834.
Aquilegia vulgaris—Pitreavie. Dr. Dewar.
Arabis hirsuta—near Inverkeithing, Ferry Hills.
—— Turrita—Cleish.
Arbutus uva-ursi—said to have been found on Cleish Hills by an English botanist; since sought for in vain.
Arenaria marina—near Inverkeithing.
—— rubra—Do.
—— serpyllifolia—Do.
—— trinervis—Do., abundant near Cleish and Saline
Artemisia Absinthium—Ferry Hills, Burntisland.
Arum maculatum — Culross, Pitreavie, Cleish.
Aspidium aculeatum (?) or lobatum—Fordel. A. R., 1832.
—— lobatum — Cleish Hills and Lethan's Glen.

* Since communicating this list to the Society I have received, from Dr. William Craig, one of the Vice-Presidents, the following note, which seems to settle this question:—"At a meeting of the Botanical Society, 10th November 1836, Professor Graham in a paper (see *First* Report, page 38) in a record of rare plants mentions *Campanula Trachelium*, near Donibristle. Fife (Rev. A. Robertson). This Rev. A. Robertson was Parish Minister of Inverkeithing, and wrote the account of that parish in the New Statistical Account of Scotland (see vol. ix. page 230, also page 234), where you have an interesting notice of the Botany of the Parish. This was published in 1845. This Rev. Andrew Robertson was ordained in 1792, and must have been nearly fifty years minister of Inverkeithing. He had a son also Rev. A. Robertson, but where he was minister I do not know. Does this throw any light on the 'A. Robertson' who sent a list of plants to your father? See also bottom of page 40, and top of page 41 of *First* Report of Botanical Society for a Miss Robertson, likely his daughter."

Aspidium lonchiloides—Cleish Hills.
—— Oreopteris—Do.
Asplenium Adiantum-nigrum—Ferry Hills, many places.
—— marinum — near Limekilns, Starleyburn, Ravenscraig Castle near Kirkcaldy.
—— Trichomanes—Ferry Hills, near Auchtertool, Cleish Hills.
—— Ruta-muraria—Ferry Hills, walls at Donibristle.
Aster Tripolium—near Inverkeithing, Torryburn (abundant).
Astragalus glycyphyllos — Ferry Hills two places, Dalmeny Woods.
—— hypoglottis—Ferry Hills, and along coast eastward.
Atriplex angustifolia — near Inverkeithing, abundant.
—— laciniata—Do., very rare.
—— littoralis—Do., plentiful.
Atropa Belladonna—Donibristle, near Torryburn.
Avena pratensis—Ferry Hills, abundant.
Ballota nigra — North Ferry, St. David's.
Betonica officinalis — Glenfarg, between Kinross and Perth.
Bidens cernua—Fordel.
—— tripartita—Loch Leven.
Blechnum boreale — woods northward, everywhere.
Blysmus rufus—near Starleyburn.
Botrychium Lunaria — Blairadam, Lethan's Glen, Pettycur.
Brachypodium sylvaticum—near the sea, everywhere.
Brassica campestris—Inchcolm. A. Robertson, 1834.
—— Napus — St. David's, Inverkeithing.
Bromus rigidus—St. David's. Dr. Wallich and A. Robertson, 1834.
—— diandrus (?) — near Kinross, Inverkeithing (?).
Cakile maritima—shore at Ferry Hills.
Calluna vulgaris (*downy*)—abundant at Culross.
Camelina sativa—occasionally at St. David's, Charlestown, Culross.
Campanula glomerata—Pettycur.
—— ranunculoides—near Kirkcaldy.
—— latifolia—Cleish, Castle-Campbell.
Cardamine amara—Cleish, Dhu Craig six miles west of Dunfermline.
—— hirsuta—Culross, near Inverkeithing.
Carduus acanthoides—near Inverkeithing.
—— tenuiflorus—Do., abundant.
Carduus marianus — Inverkeithing, Charlestown.
Carex extensa—Starleyburn.
—— limosa—Otterston Loch. Dr. Graham, 1835.
—— vulpina—shores near Inverkeithing, several places.
Castanea vulgaris—Pitreavie, Dalmeny Woods (introduced).
Cerastium semidecandrum — Ferry Hills.
—— tetrandrum—Do.
Chærophyllum temulentum—Fordel Woods.
Cheiranthus Cheiri—old church of Dunfermline.
Chelidonium majus—Carnock, Culross. Dr. Dewar, 1835.
Chenopodium maritimum — shore near Inverkeithing.
—— Bonus Henricus—near Inverkeithing.
—— urbicum—Ferry Hills.
—— rubrum (?), etc. St. David's.
Chrysanthemum segetum — Ferry Hills and north of Inverkeithing (abundant).
Chrysoplenium alternifolium—Woodmill, Cleish, Fordel.
Cicuta virosa—Otterston Loch, Hillhead Loch three miles north of Dunfermline.
Circæa alpina—rivulet near Crook of Devon.
—— lutetiana — Aberdour Woods, Lethan's Glen, Castle-Campbell, Pittencrieff at Dunfermline.
Cystopteris fragilis — Castle-Campbell, Glenfarg.
Clinopodium vulgare—Burntisland, near Dunfermline, Cullelo Hills.
Cnicus heterophyllus—Lethan's Glen, near Auchtertool.
Cochlearia danica—Inchcolm. A. R., 1834.
Convallaria multiflora—Cleish (old garden).
—— majalis—Pitreavie (old garden).
Convolvulus sepium — Ferry Hills, near Dunfermline.
Corallorhiza innata—between Dunfermline and Culross. Dr. Dewar, in company with A. Robertson, 1835.
Coriandrum sativum—St. David's. Dr. Wallich and A. Robertson, 1834.
Cornus sanguinea—Culross, Pitreavie (introduced).
Coronopus Ruelli—Burntisland, St. David's.
Corydalis claviculata—Culross. A. Robertson, 1834.

Crambe maritima—Inchcolm.
Cryptogramme crispa—West Lomond Hill.
Cynoglossum officinale — Rosyth Castle, Donibristle, Burntisland.
Dianthus deltoides—Duncarn Hill.
—— Caryophyllus—Monastery, Inchcolm.
Dipsacus sylvestris — Charlestown, Donibristle, Inchcolm.
Doronicum Pardalianches—Culross.
—— plantagineum—Cleish.
Eleocharis acicularis—Loch Leven, Lochgelly (large size).
—— cæspitosa — Cleish Hills and Saline Hills.
Empetrum nigrum—Cleish Hills.
Epilobium angustifolium — Cleish Hills, Lethan's Glen, Pitreavie.
—— tetragonum — marshy ground near Inverkeithing.
Epimedium alpinum—near Saline (introduced).
Epipactis latifolia—Blairadam.
Equisetum hyemale—Cleish Hills, Blairadam.
—— sylvaticum — near Inverkeithing.
Eriophorum angustifolium — marsh east of Dalgety Church.
—— polystachyon—Ferry Hills.
Ervum tetraspermum—St. David's. A. Robertson, 1835.
Erysimum Alliaria—east of Inverkeithing (most abundant).
Erythræa littoralis — Burntisland. A. Robertson, 1835.
Euonymus europæus—Pitreavie (introduced).
Eupatorium cannabinum — Starleyburn, near St. David's.
Euphorbia exigua—Ferry Hills, and near Limekilns.
—— Lathyris—Pitreavie, Culross.
—— Paralias — St. David's. A. Robertson, 1834.
—— portlandica—St. David's. A. Robertson, 1834.
Fedia dentata—Ferry Hills, near Limekilns.
Festuca rubra—Ferry Hills.
—— pratensis—Do.
—— duriuscula—Do.
—— rubra—Do.
—— Myurus—Do.
Fragaria elatior—near Fordel.
Gagea lutea—Auchtertool.
Galanthus nivalis — Culross, Pitreavie, near Saline.
Galeopsis versicolor—about Cleish, Inverkeithing.
Galium uliginosum — marshes near Pitreavie and Cullelo.
Genista anglica—Dhu Craig, Dollar, Cleish Hills.
Gentiana campestris—Ferry Hills, Blairadam, Burntisland.
Geranium lucidum — Cleish, near Dunfermline.
—— sylvaticum — Lethan's Glen, Blairadam.
Glaucium luteum—Charlestown.
Gnaphalium dioicum—Ferry Hills.
—— germanicum—Do.
—— sylvaticum—Do.
—— minimum—Do.
—— uliginosum — marshy ground, many places.
Grammitis Ceterach—Kinnoull Hill, Perth.
Gymnadenia Conopsea—Ferry Hills, moist ground north of Dunfermline.
Habenaria albida — Cleish Hills, Lethan's Glen.
—— bifolia — north of Dunfermline.
—— viridis—Do., Ferry Hills, east of Kinghorn.
Helianthemum vulgare—Ferry Hills.
Heliosciadum inundatum — marsh east of Dalgety Church.
Hesperis matronalis—Primrose near Dunfermline, fields about Charlestown.
Hieracium amplexicaule—Cleish.
—— aurantiacum—grass field near Aberdour. A. Robertson, 1832.
—— molle—Lethan's Glen.
—— sabaudum—Do.
—— denticulatum—Do.
Hippuris vulgaris—Otterston Loch, near Carnock.
Hordeum murinum — about Inverkeithing.
Hymenophyllum Wilsoni — ravine near Crook of Devon.
Hypericum Androsæmum — Culross. A. R., 1834.
—— hirsutum — Lethan's Hill and coast east of Inverkeithing, Starleyburn.
—— humifusum—Cleish, Dollar.
—— perforatum—Ferry Hills.
—— pulchrum—Do.
—— quadrangulum — burn north-west of Inverkeithing, Starleyburn.
Iris fœtidissima—Fordel Woods. A. Robertson, 1835.
Juncus compressus—marshes, shore west of Inverkeithing.
—— glaucus—marsh, Ferry Hills.
—— uliginosus and subverticellatus —marsh, Ferry Hills.
Juniperus communis—Dhu Craig.
Lastræa virosa—Kinnoull Hill.

Lamium maculatum—Carnock. Dr. Dewar.
—— —— of Smith—near Culross. Dr. Dewar.
Lavatera arborea—Inchgarvie.
Leontodon palustre — Ferry Hills, Cleish.
Lepidium campestre—Ferry Hills, Culross, Burntisland, Kinross.
—— ruderale — St. David's. A. Robertson, 1835.
—— latifolium — Dalgety. A. R., 1832.
Ligusticum scoticum—shore at Inverkeithing, Inchcolm (most plentiful).
Linaria Cymbalaria—Cleish, east of Kinghorn.
—— repens—Inverkeithing.
Listera ovata—Donibristle, north of Dunfermline.
—— Nidus-avis—Blairadam.
—— cordata—wood between Dunfermline and Culross. Dr. Dewar, in company with A. Robertson, 1835.
Lithospermum officinale — Culross. Drs. Dewar and Currer, 1834.
Littorella lacustris—loch near Auchtertool, Lochgelly, Loch Leven, Loch Fittie, Cleish Lochs.
Lobelia Dortmanni—one of the Cleish Lochs, Loch Leven. Dr. Currer.
Lonicera Xylosteum—near Dunfermline. Dr. Dewar.
Lotus tenuis—Donibristle.
Luzula pilosa — Lethan's Glen, Woodmill, Culross.
—— congesta—Cleish Hills, about Dunfermline and Inverkeithing.
Lychnis viscaria — Glenfarg (abundant).
Lycopodium alpinum—Cleish Hills. Dr. Currer.
—— Selago—Do.
Lycopus europæus—near Dhu Craig. Dr. Dewar, in company with A. Robertson, 1835.
Lysimachia nemorum — Fordel, Cleish, Dollar.
—— Nummularia—Fordel and Donibristle (introduced).
Lythrum Salicaria—near Cleish.
Malaxis paludosa—Cleish.
Malva moschata—near Dunfermline. Dr. Dewar. Culross, near Fordel. A. Robertson.
Matricaria Chamomilla — abundant in many fields about a mile west of Inverkeithing. A. Robertson, 1832.
Meconopsis cambrica—Cleish.
Medicago sativa—Ferry Hills.
Medicago maculata — Donibristle; first found by A. Robertson, 1832; in great abundance, 1835.
Melampyrum pratense — Lethan's Glen.
Melica cœrulea—marshy places, a few miles inland from Inverkeithing and Burntisland, Lethan's Glen, Cleish Hills.
Melica nutans—Lethan's Glen. A. Robertson, 1834.
—— uniflora—Do., very fine near Auchtertool, Culross. A. R., 1835.
Melilotus officinalis—St. David's.
—— leucantha—St. David's, Charlestown, Inverkeithing. A. R., 1834.
Mentha gentilis (?)—near Dunfermline. Dr. Dewar, 1834.
—— crispa of Hooker (Brit. Flora, 3rd edition)—Glenfarg. Messrs. Arnott and Stewart, 1834.
—— viridis — Glenfarg, Crook of Devon, near Milnathort.
—— piperita—Glenfarg.
Meum athamanticum—Cleish.
Milim effusum—Lethan's Glen, Culross Woods. A. R.
Montia fontana—marshy ground near Inverkeithing. A. R.
Muscari racemosum—Pitreavie (once a garden). A. R., 1834.
Myosotis collina—Ferry Hills (abundant).
—— cæspitosa—many marshes about Inverkeithing (usually mistaken for palustris).
—— palustris—rather rare, Lochgelly, Hillhead Loch.
—— sylvatica—abundant, Fordel, Donibristle.
Myrrhis odorata—Inverkeithing, Pitreavie, Cleish, abundant in many hedgerows about Auchtertool.
Narcissus Pseudo-narcissus—Willows west of Culross (abundant).
Nardus stricta—Inverkeithing, Cleish Hills.
Nasturtium terrestre—Loch Leven.
—— sylvestre—Inverkeithing.
Nuphar lutea — Lochgelly, Loch Fittie, Loch Hillhead, Cleish Loch.
Nymphæa alba — Loch Hillhead (abundant).
Œnanthe crocata—shores near Inverkeithing, east and westward.
Ononis ramosissima — St. David's. A. Robertson, 1834.
Ophioglossum vulgatum—Blairadam.
Origanum vulgare — Starleyburn, Burntislaud.
Ornithogalum umbellatum — Pitreavie (old garden).

Ornithopus perpusillus—Ferry Hills.
Osmunda regalis—Culross. A. R., 1834.
Oxytropis uralensis—Ferry Hills.
Parietaria officinalis—Inverkeithing (abundant).
Paris quadrifolia — Cleish Hills, Lethan's Glen, Culross.
Parnassia palustris—north of Dunfermline.
Pastinaca sativa—near Kincardine. Dr. Dewar, 1835.
Petasites albus—Cleish (Dr. Currer); glen near Auchtertool, apparently wild (A. Robertson, 1833).
Petroselinum sativum—Ferry Hills (escaped from a garden). A. R., 1834.
Peucedanum Ostruthium — Cleish, near Auchtertool.
Phalaris arundinacea — Inverkeithing.
—— canariensis—west of Dunfermline. Dr. Dewar.
Phleum arenarium—Burntisland.
Pimpinella Saxifraga—Ferry Hills.
Poa distans—Inverkeithing.
—— procumbens—Do.
—— maritima—Do.
—— rigida — Charlestown (Dr. Dewar), Burntisland.
Polygonum viviparum — Lethan's Glen.
—— lapathifolium—St. David's.
—— Bistorta—west of Dunfermline. Dr. Dewar.
—— Fagopyrum — near Inverkeithing.
—— Hydropiper—Do.
Polypodium Dryopteris—Cleish Hills, Blairadam, Lethan's Glen.
—— Phegopteris—Do.
Polypogon monspeliensis—St. David's. Dr. Wallich, in company with A. Robertson, 1834.
Potamogeton heterophyllus — Loch Fittie.
—— pusillus—Lochgelly.
—— perfoliatus—Do.
—— crispus—Otterston Loch, Lochgelly.
—— lucens—Lochgelly, Kinghorn Loch.
Potentilla verna—Ferry Hills.
—— reptans—Inverkeithing.
Primula elatior—Ferry Hills and shore westward.
Prunus domestica—Ferry Hills.
—— insititia—Fordel Woods.
—— Padus—Lethan's Glen (abundant), Culross.
Pyrethrum Parthenium—Donibristle, Fordel, Otterston, Culross.
Pyrus Malus—near Torryburn.
Radiola millegrana — near Saline, near Kinross.
Ranunculus auricomus — Lethan's Glen, Cleish, Fordel, Woodmill.
Reseda lutea—Limekilns, Inverkeithing, St. David's, Burntisland.
—— luteola—Ferry Hills.
Ribes rubrum—Culross.
Rosa rubiginosa—Ferry Hills.
—— villosa—Do.
—— spinosissima—Do.
Rotbollia incurvata—St. David's. A. Robertson, in company with Dr. Wallich, 1834.
Rubus saxatilis—Lethan's Glen.
—— Idæus — Inverkeithing, Lochgelly, Lethan's Glen, Auchtertool, etc.
Rumex acutus—Inverkeithing.
—— sanguineus—Culross.
—— obtusifolius—Inverkeithing.
Sagina maritima—Dalmeny Park.
Salicornia herbacea—Inverkeithing, Donibristle.
Salsola Kali—Inverkeithing, Charlestown.
Salvia Verbenaca — Burntisland, Kinghorn.
Sambucus Ebulus—Inverkeithing, St. David's, Cleish, Auchtertool.
Sanicula europæa — Lethan's Glen, Castle-Campbell, Woodmill.
Saponaria officinalis—Inverkeithing.
Saxifraga hypnoides — Lomonds, Castle-Campbell. Dr. Currer.
Scirpus maritimus—Ferry Hills.
—— lacustris—Loch Hillhead, Lochgelly, Loch Fittie.
Scleranthus annuus—Ferry Hills.
Scrophularia vernalis—Cleish, Kinross House (abundant). Dr. Currer.
Scutellaria galericulata — near Cleish.
Sedum Telephium—Ferry Hills.
—— reflexum—Inverkeithing.
—— villosum—Ferry Hills, Cleish Hills, Loch Hillhead.
Senecio (leaves linear; not in Hooker)—St. David's. A. Robertson, 1834.
—— sylvaticus—Ferry Hills.
—— viscosus—Do.
—— aquaticus—Cleish, etc., north of Dunfermline.
Setaria viridis — one plant, St. David's. A. Robertson, 1834.
Silene anglica—Ferry Hills. Dr. Graham, 1835.
Sinapis alba — Burntisland, St. David's.
—— nigra—St. David's.

Sinapis muralis — Charlestown (Dr. Dewar, 1834); Inverkeithing (A. Robertson, 1834).
—— tenuiflorus—St. David's.
Sisymbrium Thaliana—about Inverkeithing and Ferry Hills.
Smyrnium Olusatrum — Ravenscraig Castle, south side of Kinghorn (abundant).
Solanum Dulcamara—Dalgety, Culross, Dhu Craig, etc.
—— nigrum—St. David's.
Solidago Virgaurea—Culross, Burntisland east and westward.
Sparganium natans—loch on Dunearn Hill, Loch Hillhead.
—— simplex — Loch Camela near Auchtertool, about Cleish.
Spergula subulata—Ferry Hills, many places.
Stachys arvensis—Ferry Hills and east of Inverkeithing.
Statice Armeria—shore Inverkeithing.
Stellaria nemorum—Cleish Woods.
Symphytum officinale — field near Limekilns.
—— tuberosum—Fordel, Pitreavie.
Thalictrum flavum—St. David's.
—— majus—Ferry Hills.
—— minus—Do.
Thlaspi arvense—Ferry Hills (abundant).
Torilis nodosa—Ferry Hills.
Tormentilla reptans (?)—near Inverkeithing.
Tragopogon major—Dunfermline, Burntisland.
Trientalis europæa—Dunfermline and northward (abundant).
Trifolium striatum — Ferry Hills (abundant).
—— scabrum—Burntisland.
Triglochin maritimum—shore Inverkeithing.
—— palustre—marshes northwards, Ferry Hills.
Triodia decumbens—Ferry Hills, Cleish, etc.
Triticum junceum—Ferry Hills, Burntisland.
—— loliaceum—Burntisland.
Trollius europæus—north of Dunfermline, Cleish (abundant).
Tulipa sylvestris—Pitreavie, Otterston, and North of Alloa.
Urtica urens—Inverkeithing.
Vaccinium Oxycoccos—Otterston, Cleish Hills.
—— Vitis-idæa—Lethan's Glen, Dhu Craig.
Valeriana pyrenaica—Cleish.
Verbascum Thapsus—Inchcolm.
Veronica Anagallis—Burntisland.
—— montana—Cleish Hills.
—— scutellata—marsh east of Dalgety Church, Ferry Hills.
Viburnum Opulus—Dhu Craig, Culross, Lethan's Glen (all truly indigenous). Dr. Dewar and A. Robertson.
Vicia lathyroides—Ferry Hills.
—— lutea—Do., seven places (three additional ones in 1835 by A. R.).
—— sativa—St. David's, Dalmeny Woods. A. R., 1835.
—— Bobartii — Ferry Hills, St. David's. A. Robertson, 1835.
Viola hirta—Ferry Hills, Auchtertool, near Limekilns.
—— lutea a—north of Dunfermline, everywhere.
—— lutea b—near Inverkeithing, Cleish Hills. A. Robertson.
—— odorata — near Dunfermline, near Auchtertool.
—— palustris—marsh east of Dalgety Church, north of Dunfermline (abundant on the marshy hills).
Zannichellia palustris (?) — Loch Fittie.
Zostera marina—abundant between Burntisland and Pettycur.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during December 1893. By Robert Lindsay, Curator.

The month of December was very wet and unsettled, but it was an exceedingly mild month. Frost occurred on ten mornings, indicating collectively only 52° of frost for the month. So little frost has not been registered at the garden for December since 1883. During December 1892 frost was registered on twenty-three mornings, the total amounting to 192° of frost. The lowest readings of the thermometer for last month occurred on the 1st, 22°; 2nd, 18°; 10th, 28°; 12th, 27°; 21st, 28°. The lowest day temperature was 31°, on the 1st, and the highest 58°, on the 16th. *Rhododendron Nobleanum*, *Hamamelis japonica*, *Jasminum nudicaule*, and *Petasites fragrans* were in full flower during December.

On the rock-garden four plants came into flower, viz.—*Helleborus grandiflorus*, *H. purpurascens*, variety, *Iris sophonensis*, and *Primula inflata*. The total number of species and well-marked varieties which have flowered on the rock-garden during the year 1893 amounts to 1114, as against 1212 for 1892. The largest number came into bloom during the month of May. The number of species which came into flower each month was as follows:—January, 13; February, 40; March, 81; April, 166; May, 300; June, 294; July, 112; August, 73; September, 28; October, 3; November, 0; December, 4.

Readings of exposed Thermometers at the Rock-Garden.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	22°	27°	31°	17th	38°	45°	53°
2nd	18	24	47	18th	38	42	48
3rd	33	43	51	19th	34	38	46
4th	40	45	51	20th	34	36	40
5th	36	40	52	21st	28	34	47
6th	42	49	53	22nd	35	43	50
7th	32	33	46	23rd	38	41	48
8th	36	42	47	24th	39	48	52
9th	32	36	41	25th	37	44	51
10th	28	32	42	26th	33	35	52
11th	30	34	40	27th	40	45	49
12th	27	34	39	28th	38	45	51
13th	25	32	39	29th	37	45	51
14th	29	35	46	30th	38	45	50
15th	34	43	53	31st	40	45	50
16th	40	50	58				

II. Meteorological Observations taken at Royal Botanic Garden, Edinburgh, during the Month of December 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 71·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·894	42·1	25·0	28·9	26·5	N.	Cir. St.	5	N.	0·000
2	30·302	29·7	21·5	24·8	23·9	W.	Cir.	1	N.	0·000
3	30·019	47·6	24·0	47·6	46·0	W.	{Cir. St. {Cum.	8 1	N.W.} W.}	0·000
4	30·046	49·0	42·8	47·3	46·1	W.	Cum.	10	N.	0·030
5	30·137	49·8	38·0	41·0	40·2	S.W.	Cir.	2	S.W.	0·010
6	29·617	51·4	40·2	50·4	48·2	S.W.	Cum.	10	S.W.	0·490
7	29·279	51·8	34·1	35·7	35·1	S.W.	Nim.	10	S.W.	0·150
8	28·514	46·1	33·6	45·2	43·0	S.S.W.	Nim.	10	S.S.W.	0·130
9	28·903	46·3	35·0	37·6	35·8	W.	Nim.	5	W.	0·125
10	29·164	38·9	30·1	35·0	33·6	E.	...	0	...	0·055
11	29·168	42·9	34·0	35·9	34·0	W.	Cir. St.	5	S.W.	0·100
12	29·079	37·9	29·1	36·0	35·4	S.W.	Cum.	5	S.W.	0·140
13	28·769	39·7	27·9	33·9	33·8	N.E.	Nim.	10	N.E	0·340
14	29·489	37·7	31·2	36·2	35·0	N.W.	Cum.	5	W.	0·010
15	29·852	45·9	35·0	44·8	43·2	N.W.	Cir. St.	4	N.W.	0·005
16	30·009	53·8	44·2	52·3	50·1	S.W.	Cum.	10	S.W.	0·000
17	30·049	53·7	41·8	44·9	42·9	S.W.	...	0	...	0·000
18	29·635	46·7	32·8	44·1	41·6	S.	Cir. St.	4	S.	0·010
19	29·106	47·4	36·9	40·0	39·8	S.E.	Cum.	10	S.E.	0·020
20	28·709	46·0	36·0	37·1	35·3	W.	{Cir. St. {Cum.	8 2	S.W.} W.}	0·000
21	28·932	38·4	31·7	35·6	34·2	S.W.	...	0	...	0·005
22	29·186	46·6	35·1	46·1	43·6	S.W.	Cum.	10	S.W.	0·075
23	29·667	49·5	40·2	42·3	40·8	W.	...	0	...	0·000
24	29·708	47·0	40·8	46·7	43·7	S.	Cir. St.	10	S.	0·530
25	29·639	50·5	38·0	38·7	37·0	S.W.	...	0	...	0·070
26	30·148	41·9	34·8	36·3	36·0	W.	...	0	...	0·000
27	30·091	46·7	35·5	46·7	44·1	S.W.	Cum.	5	S.W.	0·110
28	30·325	49·4	45·7	47·3	47·0	S.W.	Cum.	10	S.W.	0·000
29	30·500	50·0	43·2	46·2	44·6	S.W.	Cum.	10	S.W.	0·000
30	30·493	49·6	39·0	47·0	44·2	W.	Cum.	8	W.	0·000
31	30·350	48·8	41·1	43·6	42·0	W.	...	0	...	0·040

Barometer.—Highest Observed, on the 29th, = 30·500 inches. Lowest Observed, on the 8th, = 28·514 inches. Difference, or Monthly Range, = 1·986 inch. Mean = 29·638 inches.

S. R. Thermometers.—Highest Observed, on the 16th, = 53°·8. Lowest Observed, on the 2nd, = 21°·5. Difference, or Monthly Range, = 32°·3. Mean of all the Highest = 45°·9. Mean of all the Lowest = 35°·4. Difference, or Mean Daily Range, = 10°·5. Mean Temperature of Month = 40°·6.

Hygrometer.—Mean of Dry Bulb = 41°·1. Mean of Wet Bulb = 39°·6.

Rainfall.—Number of Days on which Rain fell = 20. Amount of Fall = 2·445 inches. Greatest Fall in 24 hours, on the 24th, = 0·530 inch.

A. D. RICHARDSON,
Observer.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS TAKEN AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING 1893.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-level, 71·5 feet. Hour of Observation, 9 A.M.

Months.	Barometer, corrected and reduced to 32°. (Inches.) Highest Observed. Date.	Barometer Highest Observed. Reading.	Barometer Lowest Observed. Date.	Barometer Lowest Observed. Reading.	Barometer Range	Barometer Mean.	Thermometers, protected, 4 feet above grass. Self-Registering Thermometers. Highest Observed. Date.	Highest Observed. Reading.	Lowest Observed. Date.	Lowest Observed. Reading.	Range	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Mean Temperature.	Hygrometer. Mean of Dry Bulb.	Hygrometer. Mean of Wet Bulb.	Rainfall. (Inches.) No. of Days on which Rain fell.	Rainfall. Amount.	Greatest Fall in 24 Hours. Date.	Greatest Fall in 24 Hours. Amount
January, . .	11	30·383	29	29·186	1·197	29·896	31	52°·6	6	9°·9	42°·7	40°·8	33°·0	7°·8	36°·9	37°·3	36°·1	21	0·720	16	0·120
February, . .	5	30·168	27	28·826	1·342	29·420	20	53·9	25	25·0	28·9	45·1	34·9	10·2	40·0	38·7	37·1	20	2·425	26	0·730
March, . .	25	30·333	15	29·262	1·071	29·912	26	66·2	19	24·0	42·2	47·4	36·3	11·1	41·8	41·3	40·2	10	0·666	1	0·275
April, . .	8	30·568	29	29·730	0·838	30·097	25	61·8	12	31·0	30·8	54·5	39·1	15·4	46·8	47·1	44·2	11	1·560	15	0·530
May, . . .	8	30·494	20	29·392	1·102	29·961	15, 29	69·0	1	36·0	33·0	60·6	46·2	14·4	53·4	53·7	50·2	12	1·505	17	0·510
June, . . .	8	30·336	23	29·242	1·094	29·898	19	85·8	2	41·2	44·6	66·6	50·1	16·5	58·3	59·8	54·9	9	1·925	22	0·760
July, . . .	3	30·112	20	29·248	0·864	29·772	25	72·0	23	43·8	28·2	64·8	51·6	13·2	58·2	58·7	55·0	18	2·728	8	0·535
August, . .	28	30·150	21	29·008	1·142	29·784	16	82·8	28	40·8	42·0	70·0	52·9	17·1	61·4	62·0	58·4	18	2·671	19	0·505
September, .	12	30·204	29	28·820	1·384	29·635	3, 5	71·8	23	34·8	37·0	61·3	46·1	15·2	53·7	55·0	51·4	18	1·950	28	0·840
October, . .	23	30·294	4	28·917	1·377	29·630	16	63·4	31	26·0	37·4	55·2	41·5	13·7	48·3	48·4	46·4	14	2·710	7	0·950
November, .	21	30·461	17	28·485	1·976	29·895	29	55·0	21, 22	28·2	26·8	45·1	34·7	10·4	39·9	40·1	38·3	15	1·525	3	0·810
December, . .	29	30·500	8	28·514	1·986	29·638	16	53·8	2	21·5	32·3	45·9	35·4	10·5	40·6	41·1	39·6	20	2·445	24	0·530
For Year, . .	Apr. 8	30·568	Nov. 17	28·485	2·083	29·795	June 19	85·8	Jan. 6	9·9	75·9	54·8	41·8	12·9	48·3	48·6	46·0	186	22·830	Oct. 7	0·950

A. D. RICHARDSON,
A. ANDERSON, } *Observers.*

III. Notes on Meteorological Observations made at Royal Botanic Garden, Edinburgh, during 1893.

PRESSURE.

The mean atmospheric pressure at 9 a.m. (29·795 inches) was 0·007 inch above the average of the two previous years (29·788 inches).

TEMPERATURE.

The highest registered (85°·8, on the afternoon of 18th June) was 5°·2 above the highest in 1892 (80°·6), and 6°·1 above the highest in 1891 (79°·7).

The lowest registered (9°·9, on the morning of 6th January) was 1°·5 above the lowest in 1892 (8°·4), and 7°·9 below the lowest in 1891 (17°·8).

The range for the year (75°·9) was 3°·7 greater than that for 1892 (72°·2), 14°·0 greater than that for 1891 (61°·9), and 8°·9 greater than the average of these two years (67°·0).

The mean of all the highest (54°·8) was 2°·5 higher than the average of the two previous years (52°·3).

The mean of all the lowest (41°·8) was 2°·3 higher than the average of the two previous years (39°·5).

The mean of the year (48°·3) was 2°·4 higher than the average of the two previous years (45°·9).

August was the warmest month (mean 61°·4); January the coldest (mean 36°·9).

Frost was registered at four feet above the ground on 57 days during the year.

RAINFALL.

The number of days on which rain fell (186) was 27 less than in 1892 (213), and 21 less than in 1891 (207). The total fall (22·830 inches) was 0·689 inch below that of 1892 (23·519 inches), 2·457 inches below that of 1891 (25·287 inches), and 1·573 inch below the average of these two years (24·403 inches).

March was the driest month (0·666 inch); July the wettest (2·728 inches).

A. D. RICHARDSON,
Observer.

IV. On Plants in the Plant Houses, with Exhibition of Specimens. By R. L. Harrow.

Since the last meeting of the Botanical Society in December up to the present date, very few plants have produced their flowers in the houses of the Royal Botanic Garden, and, indeed, this period is probably the least floriferous of the whole year, alike amongst the occupants of tropical and sub-tropical houses.

In the Palm House, *Brownea coccinea*, Jacq., an old inhabitant of these gardens, has produced its lovely inflorescences of scarlet flowers. These are both terminal, and also produced upon the older parts of its stem and branches. When first visible they appear like leaf buds, gradually swelling into a large globular inflorescence, covered by lightish-coloured scales. The flowers are short-lived, lasting for not more than two days in perfection. The leaves, which are abruptly pinnate, bear from three to six pairs of leaflets. The figure in the "Botanical Magazine," t. 3964, was drawn from a specimen received from these gardens in 1842; and although it had been introduced some years previously, this was the first record of its flowering. The plant was said at the time to be 10 feet in height; our plant in the Palm House is now about 20 feet high. It is a native of Venezuela.

Angræcum sesquipedale, Thouars. This, now a fairly common plant in our orchid houses, is a native of Madagascar, and was first discovered by Du Petit Thouars about the end of the last century, but it was not until 1822, when his history of the plants of Madagascar was published, that it became generally known. For the introduction of living specimens credit is due to the Rev. W. Ellis, who on his return from a visit to that country in 1855 brought, amongst other species of *Angræcum*, three plants of this, the largest of the genus, one of which flowered in the spring of 1857. Owing to the difficulties encountered in transmission to Europe, subsequent attempts to reintroduce it for some time failed; but with increased facilities in this respect, large importations have been made by several orchid dealers. The waxy appearance of its sepals and petals, combined with its long spur, have long been a source of attraction. The late Mr. Charles Darwin, upon asking himself the use of this long spur, which performs the office of a nectary, came to the conclusion that the fertilisation of the flower depended upon its length, as the nectar was only found at the lower extremity; and prognosticated the existence in Madagascar of moths with probosces, capable of extending the length of 10 or 11 inches. In his book on the Fertilisation of Orchids, he says:—"If the *Angræcum* in its native forests secretes more nectar than the vigorous plants in our hothouses, so that the nectary becomes filled, small moths might obtain their share, but they would not benefit the plant. The pollinia would not be withdrawn till some huge moth with a wonderful proboscis tried to drain the last drop. If such great moths were to become extinct in Madagascar, assuredly the *Angræcum* would become extinct also. On the other hand, as the nectar, at least in the lower part of the nectary (spur), is stored safe from depredation by other insects, the extinction of the *Angræcum* would probably be a serious loss to these moths." At the time no moth with this character was known, but since that date they have been, I believe, found in the island. The flower has a powerful odour at night, whereas by day it is quite scentless.

Thunbergia laurifolia, Lindl. This is a beautiful winter flowering tropical climbing plant, belonging to the order Acanthaceæ. It was described by Dr. Lindley in 1856. The plant is a vigorous grower, resembling in the colour of its flowers, to a certain extent, *T. grandiflora*, but differing in its foliage, the species under notice having elliptic, acuminate leaves, and quite glabrous, whilst those of *T. grandiflora* are pubescent. Its racemes are produced laterally from the stronger growths, and sometimes carry as many as a dozen of the beautiful ultramarine blue flowers. About the nodes there are a large number of secretory glands. Mr. W. Gardiner, M.A., F.R.S., in a paper read before the Cambridge Philosophical Society, states that the secretion serves to attract ants, which, besides feeding upon them, also protect the thin young climbing shoots by attacking and destroying other creeping insects of alien races with whom they may meet in their passage up and down the stem.

Barnadesia rosea, Lindl. This plant is a native of South America, the exact locality being at present unknown, but the plant is supposed to be spread over a wide area of the Continent. Its flower heads are produced upon the apex of a branch during the winter and spring months; the florets are of a bright rose colour, the base of the inflorescence being covered by silvery, scaly bracts. The alternate leaves, of an ovate shape, are of a bright green colour. It is figured in "Botanical Magazine," 4232. An interesting feature of the flower heads is the hardening and recurving of the calyx bristles as the fruit ripens. As they bend backwards, these act as springs for gradually drawing out the fruit from within the tubular involucre, and expelling them for distribution. When scattered, these bristles, which are hygroscopic, will no doubt aid further in disseminating the fruit by hooking on to passing animals and by fixing the fruits on a suitable nidus for growth.

Abutilon insigne, Planch. Introduced from New Grenada by Mr. Linden in 1851, this plant is still seldom met with. It is a slight-growing, shrub-like plant, producing its flowers, which hang in a drooping manner, about the beginning of the year. The petals have a ground colour of white, and are thickly penetrated by a rich carmine venation. The stem and the under side of the large alternate leaves are covered by short brown hairs. This plant is sometimes known as *A. igneum.*

Strobilanthes Dyerianus, Hort. This beautifully variegated foliage plant was recently introduced, being sent out by Messrs. Sander & Co., of St. Alban's. Although usually grown as a decorative stove plant, on account of its coloured leaves, it also bears pretty blue flowers, as the specimen on the table shows.

In addition to these, specimens are exhibited of: *Billbergia Bruantii,*—a pretty bromeliad, with large red bracts. *Calliandra hæmatocephala,* Hassk.,—a leguminous stove plant, bearing stalked globose heads of flowers, with long numerous stamens of a lovely scarlet colour, sent to Kew from Mauritius in 1857. *Pithecolobium unguiscata* (*Inga rosea,* Steud.), much similar to the above, but with inflorescences smaller and pinnæ of leaflets more numerous and bipinnate.

MEETING OF THE SOCIETY,

Thursday, February 8, 1894.

Dr. William Craig, Vice-President, in the Chair.

Lady Henry Grosvenor and R. C. Munro Ferguson, Esq., M.P., were elected Resident Fellows of the Society.

The death of Sir Thomas Buchan-Hepburn, Bart., of Prestonkirk, Non-Resident Fellow of the Society was intimated.

Mr. William Sanderson exhibited a plant in flower of *Masdevallia* sp.

Mr. Campbell sent cut flowers of *Daphne Mezereum*, *Anemone Hepatica*, *Erica carnea*, *Leucojum*, etc., from his garden at Ledaig, Argyllshire.

Professor Bayley Balfour exhibited a series of new diagrams, by Professor Dodel Port, illustrating the life-history of *Iris*.

Mr. M'Glashan exhibited a portrait of the late Dr. Richard Spruce.

The following papers were read :—

Obituary Notice of Richard Spruce, Ph.D By G. Stabler.

Dr. Richard Spruce, the distinguished traveller and botanist, died of influenza at Coneysthorpe, near York, on 28th December 1893, at the age of seventy-six years. He was born at Ganthorpe, near the same place, on 10th

September 1817, and was the son of Richard Spruce the highly esteemed and efficient schoolmaster at Ganthorpe, and afterwards at the neighbouring village of Welburn. His mother's maiden name was Etty, a relative of William Etty the eminent artist and Royal Academician.

At Ganthorpe he spent his early life, and when quite a child he showed great aptitude for learning, and at an early age developed a great love of nature. Amongst his earliest amusements was the making of lists of plants, and he had also a great liking for astronomy, which was of use to him in after years. He commenced the study of classics with an old schoolmaster of the name of Langdale, who had originally been designed for the priesthood, and whose scholarship his distinguished pupil always spoke of most highly. When a little older he became a tutor for a short time in a private school at Haxby, near York, and about the beginning of 1840, was mathematical master at the York Collegiate School, which position he filled for five years.

To trace his botanical career it will be necessary to go back a little. The writer of this memoir possesses a neatly written manuscript list, made by Spruce and dated April 1834, of plants found by him mostly within a short radius of Ganthorpe. It comprises 403 species alphabetically arranged. The first page contains a list of abbreviations used in giving localities to the plants, and on the last page is a tabulated summary. This was drawn up when he was sixteen years of age, and most of the records must have been made before he was sixteen. Three years later he drew up the "List of the Flora of the Malton District," the manuscript of which is now in the hands of Mr. M. B. Slater. In it are enumerated 485 species arranged alphabetically, with habitats

The next stage in his botanical career was the commencement of his study of mosses and hepaticæ, which dates from the time he went to York in 1840. For a time, whilst at York, he applied himself severely to the special study of mathematics, and some of his friends suggested that he should enter the church, but he preferred to become "a priest of science," as the great Von Martius, his "very attached friend and admirer," designated him in after years. During one of his summer vacations, when passing over Slingsby Moor, not far from his native place, he met with one of the uncinate *Hypna* in splendid fruit. His love of plants, from which he had been partially weaned for a short time by his mathematical studies, returned with such force, that he vowed on the spot that henceforth the study of plants should be the great object of his life. Hitherto he seems to have been a lover, now he becomes wedded to his favourite science.

For four years, January 1841 to December 1844, his journals show that he took every opportunity to explore the district surrounding the city of York, and especially the extensive unenclosed commons; and in his vacations to take more extended and distant rambles. In June 1841 he spent some days in the North York Moors, and in December of that year he went into Wharfedale. In the summer of 1842 he visited Dr. Thomas Taylor at Dunkerron, in the west of Ireland, and botanised in that rich district for about a month, and at Christmas spent some days collecting in Eskdale and other valleys near Whitby. In the months of June and July of 1843 he made a three weeks' expedition to Teesdale, which formed the subject of an excellent paper to the Botanical Society of Edinburgh, opening out for the first time the great richness of the flora of that valley, on which occasion he discovered *Amblystegium Sprucei*, Bruch. In December of that year he went to Forge Valley and other places in the neighbourhood of Scarboro'. Once more, in the summer of 1844 he spent ten days in Derbyshire. In the three years and a half mentioned he made fully one hundred botanical excursions, some of which we have seen extended over several days.

On 1st May 1845 he left England for the Pyrenees, going and returning by Paris, where he met Dufour. He did not return until the 10th of April 1846. His stay in the Pyrenees enabled him to secure a rich harvest of mosses and hepaticæ, and these plants were the subject of a second and more important paper communicated to the Edinburgh Botanical Society.

The next important step in the life of Dr. Spruce was his determination to explore the Amazon and some of its affluents. After working up and disposing of his Pyrenean plants, he prepared himself for future work by studying exotic plants at Kew and the British Museum. In the latter place he met Robert Brown, for whom he had the highest esteem as a botanist, and whose descriptions of plants he considered as models. Having mentioned Robert Brown, it would perhaps not be out of place to say that at this time Dr. Spruce numbered among his correspondents Dr. Montagne (one of Napoleon's army surgeons in Egypt), Dufour, Bruch, Schimper, Gottsche, Sullivant, W. J. Hooker, Bentham, Greville, Taylor, Borrer, Wilson, Leighton, Babington, Hanbury, Mitten, etc.

In his early manhood Dr. Spruce, who was never robust, was considered by some to be consumptive. He was offered a position on board one of the ships of a Franklin Search Expedition. This he declined, preferring the climate of South America.

Having by this time, by sheer merit, attracted the attention and esteem of botanical authorities, he received, amongst others, commissions from Kew; and on the 7th of June 1849 embarked for America, and arrived at Parà on 13th July. This is not the place to give a detailed account of his travels and work in South America. In 1886, in the "Revue Bryologique," he gave a brief and most interesting *précis* of his travels, written in French, and entitled "Voyage de R. Spruce dans Amérique Equatoriale pendant 1849–1864." Sir Roderick Murchison, in 1864, then President of the Royal Geographical Society, briefly summarised his geographical work thus:—"I have pleasure in announcing that the indefatigable explorer Mr. R. Spruce, who has for fifteen years been unceasingly employed in scientific labours in the valley of the River Amazon and in the Andes of Ecuador, is on his way to England. Of his great services to botany it is not for me to speak, but his geographical work is entitled to special thanks at my hands. Mr. Spruce left England in the year 1849, and landed at Parà, whence he proceeded up the River Amazon and explored several of its least-known affluents. In 1849 he ascended and made a map of the River Tombetas, an important tributary of the Amazon, which was hitherto unsurveyed. In 1853 and 1854 he ascended the Rio Negro, Cassiquiari, and Orinoco; exploring and mapping the River Cunucunúma, a tributary of the Orinoco, and the River Pacimoni, which flows into the Cassiquiari. The maps of these three rivers were made by means of cross-bearings and astronomical observations, and will form an important addition to geographical knowledge. During the years 1855 and 1856, Mr. Spruce ascended the River Huallaga, and in 1857 he successfully surmounted all the difficulties of the navigation of the Rivers Pastasa and Bombonasa, and reached the Andes of Quito. He has since been engaged in exploring the southern part of the republic of Ecuador, and during 1860 he was employed by the Secretary of State for India, in co-operation with Mr. Clements Markham, in collecting chinchona plants and seeds in the forests at the foot of the mountain of Chimborazo. After fifteen years of such incessant toil in the cause of science, exposed to innumerable dangers and privations, the health of Mr. Spruce has been much impaired. . . ."

In consideration of this work Dr. Spruce was elected an Honorary Fellow of the Royal Geographical Society in 1866.

An equally authoritative summary of his botanical work was given by Mr. Bentham, President of the Linnean Society, who worked up and distributed his Phanerogams, as follows:—"His researches into the vegetation of the interior of South America have been the most important we have had since the days of Humboldt, not merely for the number of species which he has collected (amounting to upwards of 7000), but also for the number of new generic forms with which he has enriched science; for his investigation into the economic uses of the plants of the countries he visited; for several doubtful questions of origin as to interesting genera and species which his discoveries have cleared up; and for the number and scientific value of his observations, made on the spot, attached to the specimens preserved, all which specimens have been transmitted to this country, and complete sets deposited in the National Herbarium at Kew."

It was whilst preparing to enter the forests of red-bark (*Cinchona succirubra*), at the west foot of Chimborazo, that his health began to give way. Under date 24th April 1860, he writes: "Woke up this morning paralysed in my back and legs. From that day forth I was never more able to sit straight up or walk about without great pain and discomfort." In September of next year (1861) another misfortune befell him owing to the failure of a mercantile house in Guayaquil, by which he lost 6000 dollars, and thus was brought almost to destitution. He was now under the necessity of selling his most valuable and, to him, most precious books, which realised about 300 dollars. After spending two years on the coast of Ecuador, and sixteen months on the coast of Perú, and finding it impossible to work, he determined to return to England. He landed at Southampton on the 27th of May 1864.

In addition to the results before mentioned, he gave considerable attention to the Ethnography of the districts through which he passed, and drew up twenty-one Indian vocabularies.

After his arrival in England he remained in London for a short time, and then removed to Hurstpierpoint, where he superintended the arrangement and distribution of his South American mosses. This collection, originally intended to be worked up by himself, was undertaken by Mr. Mitten, and we can hardly open a page of Mitten's important work, "Musci Austro-Americani," without noticing plants gathered by Spruce. In 1867 he settled down in lodgings at Welburn. After his arrival in Yorkshire his health was very indifferent. Here he remained nine years, during the early part of which he was unable to do much work. In 1867 he writes: "I can hardly write in any other way than reclining in my easy chair with a large book across my knee by way of table, and consequently I rarely write anything but what is absolutely necessary." In January 1869 he says: "I fear I must henceforth shut my eyes to cryptogams; I have packed the microscope away lest I should enter into temptation;" and in October of the same year, "I have made two attempts to complete my monograph of the South American Plagiochilæ, but the sitting up to the microscope has brought on bleeding of the intestines to such an extent that I fear I must renounce the task altogether, to my deep regret. I have not looked through the microscope for many weeks."

On 11th May 1871 he wrote: "It has been very hard times with me all this year. Nevertheless, I lately plucked up courage to disinter my microscope, after it had been out of sight full eighteen months, and I have gone thoroughly over all my South American Plagiochilas, have described all the forms, and have made up my mind as far as possible about the 'species.' The result has been to make me more Darwinian than ever."

During the last nine years he was at Welburn, and in this broken-down state of health he examined all his South American palms, and the result appeared in his "Palmæ Amazonicæ," a *brochure* of nearly 200 pages, in which are described 118 species, more than half of which are new to science. The first portion of his "Hepaticæ Amazonicæ et Andinæ" was written at Welburn and completed at Coneysthorpe, where he lived for the last seventeen years of his life. The "Hepaticæ Amazonicæ et Andinæ," a book of nearly 600 pages, contains elaborate descriptions in Latin of upwards of 700 species and varieties, two-thirds of which were new to science. This may be said to be by far the most important of his numerous works, from a purely scientific point of view; and as a proof of its merits, leading hepaticologists of other countries have adopted to a large extent the classification of an "illustré et vénere maître." It has been spoken of as one of the remarkable books of this century; and it is a work the publication of which justifies the existence of such bodies as the Botanical Society of Edinburgh. After its completion he had a slight apoplectic seizure. For about two months he never once used the microscope, and, to use his own words, "for the shortest letter I had to avail myself of an amanuensis. I knew exactly what I wanted to write, but my hand refused to write it. I am now writing almost *à mon ordinaire*, but I cannot write much at a time."

It has been observed that through misfortune he was in straitened circumstances when he arrived in England. This, in combination with the state of his health, induced his friend, Mr. Clements Markham, to make representations to the English Government with the view of procuring a pension for him, which at first was refused; and it was not until the seventh Earl of Carlisle used his influence that he was granted in 1865, by Lord Palmerston, a pension of £50 a year. In 1877, through Mr. Markham's further entreaties, he secured for his fellow-pioneer "of the greatest achievement of this century in the domain of practical economic culture of medicinal plants" a further pension of £50 from the Indian Government. These sums, awarded for past services, may be said to have afterwards been used as "endowment of research," for, except when prevented by illness, the recipient was altogether engaged in purely unremunerative scientific work up to the time of his last short illness.

Many years ago he was in communication with Mr. John Murray with respect to an account of his travels, part of which is in manuscript, but incomplete. It was his intention also to supplement his "Hepaticæ Amazonicæ et Andinæ" with another work on geographical distribution and other matters, which would have been as large as its predecessor. This is about half done.

Having had the honour and privilege of being on terms of intimate friendship with Dr. Spruce for over a quarter of a century, I may be allowed to offer a few observations of a more personal nature. The treatment of his friends carried out the advice he gave to others, in the words of old Polonius :—

> "The friends thou hast and their adoption tried,
> Grapple them to thy heart with hooks of steel."

When young he was tall and spare, with dark hair. In his latter days his beard and hair were grey, the latter rather long. In his room everything was in the strictest order, and Mr. A. R. Wallace, who met with him and remained with him for some time in the basin of the Amazon, remarks that he was equally orderly when he was exploring the virgin forests of that district. He was also one of the most methodical of men. In his botanical work he seems to have thought that if anything was worth noticing it was worth recording. He seems never to have examined and noticed anything without making a note of it, and in his later years he would readily turn to notes, all carefully numbered, on plants which he had made in his early days, and rely on his conclusions with as much certainty as if they had been made on the previous day. All his work was well and thoroughly done. At the same time he worked quickly. He was also very systematic in the time for working. For many years all his writing was done with black lead pencil, reclining on a couch with the paper on a board. Dr. Spruce had considerable aptitude for learning languages. He spoke and wrote French, Spanish, and Portuguese. He was widely read in general literature, and a copy of Shakespeare's Works was one of his companions in crossing the Continent of South America. He was always courteous and gentlemanly in his bearing, and ever affectionate, kind, and sympathising as a friend. He had a considerable vein of humour in his nature, and could relish and tell an amusing story or make a good pun. As an hepaticologist he might justly be placed in the foremost rank, and this being the case he was in communication, previous to his death, with nearly every hepaticologist of note in the world. He understood the theory of music, and was naturally very musical, possessing a true ear and a good voice.

He was never married; he died from an attack of influenza, which his already weakened body could not overcome. He was interred on the last day of the year 1893 at Terrington, beside his father and mother, in accordance with directions given several years before his death to Mr. M. B. Slater, of Malton, his sole executor.

LIST OF PAPERS, ETC., BY DR. RICHARD SPRUCE.

1. A List of Mosses and Hepaticæ collected in Eskdale, Yorkshire.—Phytologist, i., 540–544 (1844).

2. On the Branch-bearing Leaves of *Jungermannia juniperina*, Sw.—Phytologist, ii., 85, 86 (1845).

3. A List of Musci and Hepaticæ of Yorkshire.—Phytologist ii., 147–157 (1845).

4. The Musci and Hepaticæ of Teesdale.—Trans. Bot. Soc. Edin., ii., 65–89 (1846).

5. The Musci and Hepaticæ of the Pyrenees.—Annals and Magazine of Nat. History, 2nd series, iii., 81–106, 269–293, 358–380, 478–503; iv., 104–120, t. i.–iii. (1849). Trans. Bot. Soc. Edin., 103–216, t. i., ii., xiv. (1850).

6. On Anomoclada, a new Genus of Hepaticæ, and its allies, Odontoschisma and Adelanthus.—Jour. of Bot., xix., 33–40 (1881).

7. On *Marsupella Stableri* (n. sp.) and some Allied Species of European Hepaticæ.—Revue Bryologique, viii., 89–104 (1881).
8. On Cephalozia, its Sub-genera and some Allied Genera.—8vo, pp. 99 (Malton, 1882).
9. Hepaticæ Amazonicæ et Andinæ.—Trans. Bot. Soc. Edin., xv., 1–590, t. i.–xxii. (1885).
10. *Lejeunea Holtii*, a new Hepatic from Killarney.—Jour. of Bot., xxv., 33–39, 72–82, t. cclxxii. (1887).
11. On a new Irish Hepatic (*Radula Holtii*).—Jour. of Bot., xxv., 209–211 (1887).
12. Hepaticæ in Provincia Rio Janeiro a Glazion lectæ.—Revue Bryologique, xv., 33–34 (1888). (List only.)
13. Hepaticæ Paraguayensis, Balansa lectæ.—Revue Bryologique, xxv., 34–35 (1888). (List only.)
14. *Lejeunea Rossettiana*, Mass.—Jour. of Bot., xxvii., 337, 338 (1889).
15. Hepaticæ Bolivianæ, in Andibus Boliviæ Orientalis, annis 1885–6. A cl. H. H. Rusby lectæ.—Mem. Torrey Bot. Club, i., 113–140 (1890).
16. Hepaticæ Novæ Americanæ, tropicæ et aliæ.—Bull. Soc. Bot. de France, xxxvi., cxxxix.–ccvi. (1889).
17. Hepaticæ Spruceanæ. Amazonicæ et Andinæ, annis 1849–1860 lectæ.—(Malton, 1892). (Specimens.)
18. Bescherelle et Spruce.—Hepatiques nouvelles de Colonies Francaises.—Bull. de la Soc. Bot. de France, xxxvi., clxxvi.–clxxxix., pl. xiii.–xvii. (1889). (New species from Guadaloupe, French Guiana, New Caledonia, and Reunion Island.)
19. On several Mosses new to the British Flora.—London Jour. of Bot., vol. iv. (April 1845).
20. Notes on the Botany of the Pyrenees, in a letter addressed to the editor of Sir W. J. Hooker's London Journal of Botany, dated 3rd Jan. 1846, Bagnéres de Bigorre, Hautes Pyrénées, and 1846 (England).
21. On the Mode of Branching of some Amazonian Trees. By Richard Spruce. (Written from) Ambato, near Quito, 25th May 1859. —Jour. of the Proceedings of the Linnean Soc., vol. v., p. 14.
22. On Five New Plants from Eastern Peru. By R. Spruce.—Jour. of the Proceedings of the Linn. Soc. (April 1859).
23. Mosses of the Amazon and Andes. By Richard Spruce.—Jour. of the Proceedings of the Linn. Soc. Bot., vol. v. (An *Andreæa*, an *Acroschisma*, and three *Taylorias*—all new except *T. erythrodonta*).
24. Notes on Papayaceæ. By Joaquim Correa de Mello and Richard Spruce. Signed R. S., 3rd Jan. 1867. pp. 15. Linn. Soc. Jour. of Bot., vol. x.
25. Notes on some Insect and other Migrations observed in Equatorial America. By Richard Spruce.—Linn. Soc. Jour. (Zoology), vol. iv.
26. Catalogus Muscorum fere omnium quos in Terris Amazonicis et Andinis, per annos 1849–1860, legit R. Spruce. Londini, 1867, p. 22. Extends to No. 1518.
27. Notes on the Valleys of Piura and Chira, in Northern Peru, and on the Cultivation of Cotton therein. By R. Spruce.—London: for Her Majesty's Stationery Office, 1864. p. 81.

28. Voyage de R. Spruce dans Amerique Equitoriale, pendant 1849–1864.—Revue Bryologique, No. 4, 1886.

29. Musci Præteriti. By R. Spruce.—Jour. of Bot., Dec. 1880, No. 216, and Feb. 1881, No. 218.

30. Ant Agency in Plant Structure. By R. Spruce. Communicated to the Linn. Soc. by Charles Darwin.

31. The Morphology of the Leaf of Fissidens. By R. Spruce.—Jour. of Bot., No. 220 (April 1881).

32. List of the Flora of the Malton District, 1837. By R. Spruce.—(It is in MS. I doubt it being published.)

33. Personal Experiences of Venomous Reptiles and Insects in South America. By R. Spruce.

34. On some Remarkable Narcotics of the Amazon Valley and Orinoco. by R. Spruce.

Note.—Nos. 33 and 34—MSS. in G. Stabler's possession. Do not know where they were published.

35. Report on the Expedition to procure Seeds and Plants of the *Chinchona succirubra*, Pavon., or Red-Bark Tree. R. Spruce.—(Eyre & Spottiswood, I think.)

36. Extracts from Letters from R. Spruce, written during Botanical Explorations on the Amazon, in Hooker's Journal of Botany:—For May 1851, Nov. 1851, Oct. 1852, Nov. 1852, July 1853, Aug. 1853, Feb. 1854, April 1854.

37. Palmæ Amazonicæ, sive enumeratio Palmarum in itinere suo per regiones Americæ Æquatoriales lectarum. 183 pp. Auctore, Ricardo Spruce, Ph.D., F.R.G.S.—Linnean Society's Journal (Botany), vol. xi.

Note on Angræcum sesquipedule, Thouars. By William Sanderson.

This Orchid is a native of Madagascar, and was introduced into this country by the Rev. W. Ellis. Though by no means a rare plant, it is one not commonly met with in average collections, as it is rather difficult to grow unless in a suitable situation.

The photograph which you see is of a plant which I acquired in February 1887: it was an imported piece, and had then only four or five leaves; it first flowered in my garden at Talbot House, Ferry Road, February 1888, and has continued to flower annually ever since, the number of blooms being usually from six to eight; this season it has surpassed itself, and carried eight spikes, six of two blooms each, and two of three blooms each, in all eighteen flowers, all perfect and all expanded at the same time.

I am indebted to Professor Bayley Balfour for some information regarding plants with many flowers which have been recorded previously. In 1890 a plant at Messrs. Seeger & Tropp's nursery, East Dulwich, had ten blooms (Gard. Chron., 3rd series, vii., 1890, p. 11); in 1873, in the garden of Mr. W. Terry, Peterbrough House, Fulham, a plant showed twelve blooms (Gard. Chron., 1873, p. 254, fig. 53); at Davenham in 1892 a plant bore thirteen flowers (Gard. Chron., 3rd series, xi., 1892, p. 84); in 1874, in the garden of Mr. R. Miln, Arbroath, a plant had seventeen flowers (Gard. Chron., 1874, p. 346, fig. 79). The figure of Mr. Miln's plant shows it to have had a single stem, and this presumably was the character of all the other plants referred to, as it is of my plant. A plant is also noticed (Gard. Chron., 3rd series, xii., 1892, p. 123) from the garden of Mr. A. S. Kimball, Rochester, New York, which had twenty-three flowers in July, the period of flowering in this country being from December to March. But from Ferguslie, Paisley, a plant is recorded in Gard. Chron., 2nd series, xxv., 1886, p. 170, with five growths 2–3 feet high, bearing thirteen spikes with thirty-six flowers, of which twenty-four were expanded. He adds that so far as he can learn my plant is the one with the greatest number of flowers on a single stem that has been recorded in Britain.

While in its native country this orchid is found growing on trees, this plant has been grown in a pot filled with alternate layers of crocks and sphagnum, close to the back wall of a house, along with Vandas, Dendrobiums, Cypripediums, etc. It is a plant of slow growth, making only a single pair of leaves annually, it seems to enjoy sunshine and a fair amount of water, but it must have efficient drainage.

SCOTTISH UTRICULARIAS. By REV. E. F. LINTON.

The following notes are submitted for the purpose of directing the attention of botanists who have opportunities of visiting the localities mentioned, or other places where species of *Utricularia* may be found, to some difficulties in the way of determination of the species, and in the hope that they may be willing to co-operate in their elucidation.

Utricularia Bremii, Heer., has often been suspected, but its existence in Britain is still, I believe, not absolutely proved (but see a valuable paper on this in Jour. Bot., 1876, 142, etc.).

Differences from *U. minor*, L., to be looked for are—(1) robuster habit, (2) a more decided spur, which in *U. minor* is scarcely longer than broad, and (3) an orbicular lower lip.

Some suspected localities are "Moss of Inshoch, Nairn, and Loch of Spynie"—Bab. Man., ed. viii., 288. The Loch of Spynie is near Elgin. "Near Glenluce"—on a label, Hb. Edinb. B. G. Culdoch Moor, Kirkcudbright. Loch Feoir, Assynt. Mr. F. M. Webb (*l.c.*) considered the Loch of Spynie plant to be *U. Bremii*, and "certainly not *U. minor*."

In the Loch of Spynie a slender form of *U. vulgaris*, L., should be looked for, and observed while fresh. The specimen in Hb. Edinb. B. G. does not look typical.

An interesting species has been gathered on Gordon Moss by Prof. Dickson in 1882, allied to *U. neglecta*, Lehm., and possibly a form of that species, which deserves study. There are three sheets in Herb. Edinb. B. G., beautifully preserved, but unfortunately flowerless.

A plant somewhat similar to the one from Gordon Moss has been sent me (by the Rev. E. S. Marshall, and may be rightly named) as *U. neglecta*, from peaty bogs of Loch Gannich, Rannoch Muir, Argyll. No flowers.

Long Moss, near Faldonside, Selkirkshire, produces a plant which is probably *U. neglecta*, but I have only seen flowerless specimens.

The difficulty in determining the species of this genus usually arises from the absence of flowers, or their poor state of preservation when present. They are frequently flowerless in rainy districts; while, on the other hand, the season of 1893 has given me abundant proof that a warm, dry season favours the production of flowers. Having a suitable locality for their development near at hand—a shallow bog with a sunny exposure—I am willing to try and persuade to flower any critical or curious unnamed forms which usually are flowerless in their native stations that may be sent me. They are most easily transplanted in the winter-bud condition, when they may be posted either in a small bottle or tube of water, or in wet rag secured from evaporation; but, with care in the supply of moisture, they will probably bear transplantation at any season.

CONTRIBUTIONS TOWARDS A FLORA OF WEST ROSS. By G. CLARIDGE DRUCE, M.A., F.L.S.

The first notice which I am acquainted with of any plants occurring in the vice-county of West Ross (No. 105 of Watson's "Topographical Botany") is to be found in the two volumes of Lightfoot's "Flora Scotica," which is dated 1777. The Ross-shire plants mentioned in it, which appear to belong to the western watershed, are as follows:—*Circæa alpina*, *Cynosurus cæruleus* (*Sesleria cærulea*), *Chenopodium maritimum* (*Sueda maritima*), *Cornus suecica*, *Vaccinium uliginosum*, *Juncus trifidus*, *Epilobium alpinum*, *Arbutus alpina* (*Arctostaphylos alpina*), *Pyrola minor*, *P. secunda*, *Satyrium repens* (*Goodyera repens*), *Ophrys cordata*, (*Listera cordata*), *Ophrys corallorhiza* (*Corallorhiza innata*), *Dryas octopetala*, *Draba incana*, *Asplenium viride*, *Polypodium Lonchitis* (*Polystichum Lonchitis*), *Hieracium alpinum*, *Tanacetum vulgare*, *Sparganium natans*, *Poa maritima* (*Glyceria maritima*), *Pinus sylvestris*, *Trichomanes tunbridgenses* (*Hymenophyllum unilaterale*), *Osmunda Lunaria* (*Botrychium Lunaria*). *Betula nana* is given as growing on the moors of Loch Glass, but these I believe drain into the Eastern Sea. Of the foregoing plants the exact identity of *Sparganium natans*, and *Hieracium alpinum* is doubtful. Up to the present time, so far as I am aware, *Sesleria*, *Goodyera*, and *Corallorhiza* have not since been found, they probably will be rediscovered.

In "English Botany," 1809, *Stachys ambigua* is reported on the authority of W. Borrer and W. J. Hooker from the side of Loch Carron. The plate in "English Botany" is numbered 2089.

In Hooker's "Flora Scotica," 1821, we have two additional species put on record, *i.e.* *Hypericum Androsæmum*, Loch Maree, G. Anderson [*Lycopus europæus*, margin of Loch Aichaltie, near Craigdarroch (W. Stables), is in East Ross], and *Pinguicula lusitanica*. The station for *Stachys ambigua* is given more precisely "near Jeantown," where it still occurs.

In the "New Botanists' Guide," 1835, a considerable number of plants from Ross are given, principally on the authority of Mr. G. Gordon. Most of the unlocalised ones were subsequently placed in the vice-county of East Ross by Mr. H. C. Watson. *Orobanche rubra* is an addition to the West Ross flora; it was found on a small island not far from the mainland, Gairloch, by R. B. Bowman.

In Murray's "Northern Flora," 1836, several plants are mentioned as growing in Ross-shire, but as they are unlocalised they cannot be precisely placed in either division of the county. These include *Veronica scutellata*, *Eriophorum angustifolium*, *Triodia*, *Knautia arvensis*, *Galium boreale*, *Alchemilla alpina*, *Azalea procumbens*, *Hedera Helix*, etc. Mr. Watson subsequently placed most of them to East Ross.

In Gordon's "Collectanea for a Flora of Moray, 1839." *Scirpus maritimus* is noted from Kintail, and *Eriophorum pubescens* from Plockton (Mr. Stables), which are additions. *Saussurea alpina* and *Cryptogramme crispa* are recorded in the same work by Mr. G. C. Smith from Ben-lea-mohr-guislee, which Mr. Arthur Bennett suggested might be Bienn Liath Mohr in Strathcarron, *i.e.* in West Ross. Mr. W. Douglas suggests with greater probability that by this name was intended Bienn Liath Mōhr a Ghuibhais Li (2464 feet), which lies about six miles north of Loch Luichart station, *i.e.* in East Ross.

In the "Geographical Distribution of British Plants," the author, H. C. Watson, records a few plants, such as *Ranunculus Ficaria*, *R. Flammula*, and *Nymphæa alba* for Ross, but these again cannot be precisely put to the western portion of the county.

Anderson, in "The Guide to the Highlands and Islands of Scotland," mentions that *Atropa Belladonna* grows in the churchyard of Gairloch, where, of course, it was not a native plant.

In the "Phytologist," vol. i., p. 147, 1842, *Lycopodium annotinum* is said to have been gathered by Mr. G. C. Smith in West Ross, and given to Mr. Stables.

Some time prior to 1873, Professor Churchill Babington visited the county, and recorded the discovery of *Rubus Chamæmorus, Rosa spinosissima, Antennaria dioica, Cnicus heterophyllus, Hieracium anglicum, Utricularia intermedia, Juncus triglumis, Rhyncospora alba, Avena pubescens, Galeopsis versicolor*, and *Schœnus nigricans*.

In the first edition of "Topographical Botany," published 1873–74, Mr. Watson includes for West Ross *Silene acaulis*, on the authority of Mr. Graham; *Alchemilla alpina* and *Salix Lapponum*, on Mr. Campbell's authority; and *Galium boreale*, recorded by Mr. G. C. Smith. In the same work sixteen species appear to be first definitely recorded for the vice-county, but they are without personal authority for their occurrence. They are as follows:—*Thalictrum alpinum, Subularia aquatica, Cherleria sedoides, Radiola, Sibbaldia, Vicia sylvatica, Saussurea, Lobelia Dortmanna, Azalea procumbens, Gentiana Amarella, Arbutus Uva-ursi, Salix herbacea, Tofieldia, Malaxis, Blysmus rufus*, and *Lycopodium inundatum*. *Betula nana* is also given, but this is probably included on the erroneous idea that Loch Glass is in West Ross. Several species recorded by Lightfoot, Churchill, Babington, and others are also included.

In the "Scotch Naturalist," vol. ii., 1873–74, pp. 74–78, Mr. Davidson commenced a paper on the Flora of Ross, but which only treated of the Phanerogams as far as the Caprifoliaceæ. This flora is not of great service to us since necessarily Mr. Watson's divisions of the county were not adopted, and the absence of precise localities prevent us from taking the authority for the occurrence of the species in the western watershed. The terms "common" or "very common" almost certainly refer to Eastern Ross. It must be borne in mind that the two divisions of the county are based on a natural separation by the watershed, east and west, so that the flora of the two divisions of the county perhaps differ more from each other than that of East Ross does from Northern Easterness, or that of West Ross does from Northern Westerness. The unlocalised records of Mr. Davidson's are therefore neglected in the following list.

The localised records (assuming that the plants are correctly named), which appear to be new to the vice-county, are *Ranunculus Lingua*, Kintail and Gairloch. (Not yet seen by me in the county. Large forms of *R. Flammula* are sometimes so named.) *Trollius europæus*, West Ross! *Corydalis claviculata*, Melvaig, by Gairloch. *Arabis petræa*, Gairloch. (Can this be correct? It is a mountain plant, but is occasionally brought down to low level by mountain streams. It occurs on hills at the head of Loch Maree.) *Draba rupestris*, Ben Sleugach. (If correctly named, an interesting record, but small forms of *D. incana* are sometimes mistaken for it.) *Lepidium Smithii* and *Drosera anglica*, Gairloch! *Hypericum calycinum*, Balmacarra (planted, of course). *Rubus corylifolius*, Glen Shiel. *Rosa involuta*, Gairloch. *Pyrus Aria*, "rare, Loch Carron." *Sedum Rhodiola*, "Baios Bhein, Gairloch." *Sedum Telephium*, "not common, Gairloch" (a doubtful native). *S. anglicum*, "rare, Gairloch" (so far as my observation goes, it is a common plant by the coast). *Cicuta virosa*, Glen Shiel. (I saw *Œnanthe crocata* there, but *Cicuta* is recorded from the Hebrides, so it may be correct.) *Helosciadium nodiflorum*, Gairloch. *Œnanthe Lachenalii*, Gairloch. *Linnæa borealis*, "in an island in Loch Maree." Neither of the last three plants have so far been observed by me in West Ross.

The foregoing records are the only ones I have been able to find that relate to West Ross, but my search has not been of an exhaustive character, and I may have overlooked some paper or work in which the subject has been dealt with.

After the publication of Mr. H. C. Watson's "Topographical Botany," in which nine counties had no list of common plants recorded, Mr. Watson asked me to visit West Ross, which was one of these, in order to compile a list of its plants. In the August of 1880 I made my first acquaintance with what proved to be really "a land of mountain and flood." I began my expedition at Achnasheen, where (as its name implies) all the winds and a good deal of the wet of heaven meet, and walked through a heavy rain to Kinlochewe, gathering *Malaxis* and noting about a hundred plants on my way. Two days were spent at

Kinlochewe in climbing the Slioch, and examining the shores of Loch Maree, but torrents of rain made the task anything but a pleasant one. The plants gathered included, *Isoetes lacustris, Myriophyllum alterniflorum, Hydrocotyle, Littorella, Lobelia Dortmanna, Pinguicula lusitanica, Nitella opaca, Drosera obovata, Carex pauciflora, C. Hornshuchiana, Equisetum sylvaticum, Habenaria bifolia, Gnaphalium sylvaticum, Thalictrum alpinum, Potentilla Sibbaldi, Epilobium alpinum, Cornus suecica, Juniperus nana, Arctostaphyllos Uva-ursi, Tofieldia, Luzula spicata, Juncus trifidus, Lathyrus pratensis,* and *Lycopodium alpinum.* A walk was next taken from Kinlochewe to Achnashellach by Loch Clare, the chief plants seen being *Carex remota, Scirpus fluitans, Rosa Sabini, Rubus villicaulis, Eleocharis palustris,* and *Nymphæa alba.* Another wet day was spent about Strome on Loch Carron, when *Hymenophyllum unilaterale, Aspidium lobatum, Aira caryophyllea, Arenaria peploides, Buda media, Poa nemoralis, Arenaria serpyllifolia, Veronica agrestis, Vicia hirsuta, Epilobium obscurum, Sedum anglicum, Viburnum Opulus, Asperula odorata, Hieracium anglicum, H. murorum, Triglochin maritimum, Juncus Gerardi, Allium ursinum,* etc., were noted. I next walked from Strome to Loch Alsh, and then ferried over Loch Duich, walking by the southern side of that lovely loch to Shiel House, and then on the same day ascended Sgurr Fhuaran, 3505 feet; from the summit a most gorgeous view was obtained, the rays of the setting sun lighting up a great expanse of eastern Scotland, while the knife-edge ridges of the hills about Loch Hourn were singularly magnificent. To the west, the peaks of Skye were almost obliterated by the richly coloured clouds. The day, of which the latter part had been fine, yielded a considerable number of plants including *Petasites vulgaris, Comarum palustre, Carex curta, Botrychium Lunaria,* etc., Sgurr Fhuaran was rather barren, but I had but little time to explore it. *Gnaphalium supinum, Hieracium chrysanthum, Juncus trifidus, Oxyria, Carex rigida, C. pallescens, Cryptogramme crispa,* etc., were gathered on it. The next day opened badly, with a drizzling rain, which increased as the day went on to a steady downpour (if the word steady can be properly applied to a rain which, never ceasing, came in violent gusts again and again), but I struggled through it from Shiel House to Kintail and then ascended A Glas-bheine, and afterwards visited the celebrated Falls of Glomak, retracing my way back to Kintail and continuing by the northern side of Loch Duich to Dornie, where I meant to have slept, but where I found the accommodation so limited that it only extended to a single bed, half of which was bespoke by an itinerant pedlar, so that I had to trudge my weary way on to Strome—making a journey of nearly forty miles. My gathering included *Mimulus guttatus*, which was quite naturalized in Kintail. A Glas-bheine afforded a large flowered variety of *Pinguicula vulgaris, Saxifraga oppositifolia, S. hypnoides, Silene acaulis, Cerastium triviale*, var. *alpinum*, Koch., *Saussurea*, etc. On the rocks about the falls of Glomak *Geranium sylvaticum* and *Rhodiola* occurred. The north sides of Loch Duich afforded *Hieracium crocatum, H. Pilosella, Œnanthe crocata, Sparganium minimum, Scirpus lacustris, S. maritimus, Chenopodium Bonus-henricus, Aira caryophyllea*, etc.

The result of my visit was that I found on this journey 23 species already on record (of which 16 were without personal authority), in Topographical Botany, 314 Phanerogams, and 28 Cryptogams, which were new county records. In addition to these, 16 varieties and 14 more or less naturalized plants were noticed. Among the latter were *Barbarea vulgaris, Acer Pseudoplatanus, Ulex europæus, Rosa rubiginosa, Doronicum Pardalianches, Ligustrum vulgare, Ulmus campestris, Fagus sylvatica, Populus nigra, Salix rubra, Avena fatua, Lolium italicum*, and *Ribes Grossularia*. Of the 314 Phanerogams, *Juncus compressus, Sagina maritima, Festuca arenaria*, Osb., and *Melampyrum sylvaticum* require verification. The specimens, so named by a well-known botanist, were not in good condition, so that in two or three cases the identity may not be accurate. Deducting these four from the list, we find that 338 species were added as native plants, and 14 as more or less naturalised plants to the county; while 23 species, on somewhat doubtful or old authority, were verified—a total of 365 species.

The second edition of "Topographical Botany" added nothing to the published knowledge of West Ross plants except *Viburnum Opulus,* which was noticed by me in 1879, but accidentally omitted from my list. In the Report of the Record Club for 1881–82, my record of *Veronica humifusa* is included. In the 1883 report, Mr. C. Bailey records as additional species *Thalictrum maritimum* (*T. dunense*), *Anthyllis Vulneraria, Myosotis repens, Habenaria conopsea, Chara fragilis,* and the variety *gracilis* of *Euphrasis officinalis.* I added *Carex vaginata* from the Slioch. In the 1885 report, the Rev. E. F. Linton adds *Sherardia arvensis, Trifolium hybridum, Geum intermedium, Rosa dumalis, Lastrea Filix-mas,* var. *Borreri,* with some few plants already on record. The Rev. W. R. Linton records *Melica nutans* and *Rosa mollis,* var. *glabrata.* Mr. C. Bailey records *Rosa marginata,* which must be a glandular variety of *R. canina* or *R. coriifolia,* or a hybrid of these species, with *R. tomentosa* or *mollis,* and not the true *R. marginata,* which is a hybrid, having the continental *R. gallica* for one of its parents.

In 1886, Mr. Arthur Bennett records the occurrence of *Carex lævigata, Thymus Serpyllum,* var. *prostata,* and *Equisetum sylvaticum* in "The Scotch Naturalist" as having been found by Mr. Grieve, but the latter was already on record. In the same year—1886—some members of the Summer Camp visited Applecross; the results of the investigations were published by Mr. John Allan in the Transactions of the Botanical Society of Edinburgh, pp. 117–120. In their explorations about Applecross and Loch Torridon, 286 species of plants were noticed, of which 50 were claimed as additions, but of these 23 had already been noticed. The actual additions (if correctly named) are *Lepigonum salinum, Vicia sepium, Ligusticum, Daucus Carota, Gentiana campestris, Myosotis palustris* (?), *Salicornia, Eleocharis palustris* (gathered, but not recorded, by me in 1880), *Asplenium marinum, Potamogeton natans, Equisetum maximum, Chara aspera, Anagallis tenella, Habenaria viridis, H. chloroleuca,* and *Epilobium angustifolium.*

The following species require verification :—*Viola canina* (this has been found in East Ross), *Potentilla argentea* (a misnomer, or casual), *Callitriche verna* (the occurrence of the segregate is improbable—the aggregate species is already on record), *Scabiosa Columbaria* (a misnomer or casual), *Artemisia Absinthium* (a misnomer or an escape from cultivation), *Arctium majus* (my Loch Torridon plant has been pronounced to be *A. intermedium*), *Symphytum officinale* (I have seen the prickly comfrey as an escape, but not the true *S. officinale* in West Ross), *Veronica alpina* (very doubtful; if correct, an interesting record), *Rumex maritimus* (a sea-side *Rumex*, not the true plant), *Salix phylicifolia* (likely to occur, but I have not seen it in the county; forms of *S. cinerea* are often mistaken for it), *Juniperus communis* (*J. nanus* is common, also an intermediate plant). The above records, I am afraid, show that implicit reliance cannot be placed on the naming of the plants in the foregoing list. Two plants, however, that are mentioned in the text are additions—*Melampyrum pratense* (probably the *M. sylvaticum* of my 1880 list was the yellow-flowered form of this species) and *Scolopendrium*.

In 1886, "Gairloch," by J. H. Dixon, was published. This excellent account of the Parish of Gairloch contains a list of 368 plants, compiled by the author with the assistance of Lady Mackenzie, Mrs. Fowler, Mr. O. Mackenzie, Mr. A. Davidson, etc. This list probably precedes the records just referred to in the Applecross list. The Gairloch list, which includes many plants not previously recorded, however, contains so many errors that in a scientific point of view it will be safer to ignore it, at any rate it will be necessary to verify the occurrence of each plant recorded. Some of them are probable enough, others are wildly improbable, if referring to native species. *Ranunculus aquatilis*, *R. hederaceus*, and *R. bulbosus* (the latter a very rare plant in the north-west of Scotland—Davidson says it is common in Ross), *Papaver Rhœas*, *Cakile* (very likely to occur), *Coronopus didyma* (very improbable), *Arabis hirsuta*, *Cochlearia anglica* and *danica*, *Sisymbrium Thalianum*, *Sagina subulata*, *Hypericum perforatum*, *Geranium sanguineum*, *G. lucidum*, *Malva moschata*, *M. sylvestris* (not native), *Erodium cicutarium* (since verified by me), *Prunus Cerasus* (not native), *Potentilla reptans* (probably only a form of *P. Tormentilla*), *Rubus saxatilis* (since found by me), *Pyrus Aria* (if correctly named probably only planted—Davidson says a tree grows in Strathcarron), *Epilobium angustifolium*, *E. alsinæfolium*, *Sedum reflexum* (I have seen this as a planted species), *S. glaucum* (doubtful in name), *Chrysosplenium alternifolium* (doubtful, *oppositifolium* is not rare), *Anthriscus sylvestris* (since found by me), *Scandix Pecten-veneris* (also verified), *Myrrhis odorata*, *Daucus maritimus* (a form of *D. Carota*), *Ligusticum* (verified), *Meum Athamanticum*, *Crithmum*, *Ægopodium* (found by me), *Galium verum* (verified), *G. uliginosum*, *Valeriana dioica* (most improbable), as are *Scabiosa Columbaria*, and *Matricaria Chamomilla*, *Anthemis maritima* (a misnomer), *Campanula rapunculoides* (? planted), *C. hederacea* (it occurs in Argyll), *Scrophularia aquatica* (a misnomer most likely for *S. nodosa*), *Mimulus luteus* (an escape, a variety is already on record), *Mentha sylvestris* and *M. piperita* (most improbable as native plants), *M. sativa* (verified by me), *Nepeta Cataria* (most improbable), *Lamium album* (very unlikely, perhaps a white-flowered form of *purpureum* or *intermedium*), *Ajuga pyramidalis*, possible, as is *Lithospermum maritimum*, *Myosotis collina*, verified by me, as also *Utricularia minor; Trientalis europæa* (a plant likely to be found), *Plantago Coronopus* (also probable), *Chenopodium urbicum* and *C. murale* (certainly erroneous), *Salicornia* (confirmed by me), *Polygonum viviparum* (seen by me in another district), *P. maritimum* (impossible), *Mercurialis perennis* (seen by me), *Salix pentandra* and *S. reticulata* (both rather doubtful), *S. alba* (planted), *S. nigricans* and *S. angustifolia* (the names are very doubtful), *Habenaria albida* and *H. chlorantha* (both verified by me), *Epipactis ensifolia* (this means *Cephalanthera ensifolia*, which has been found in north-west Scotland), *Listera ovata* (found by me), *Allium oleraceum*, *Ophioglossum vulgatum*, *Potamogeton lucens*, *Asplenium marinum*, *A. septentrionale*, and *Scolopendrium*.

In the year 1887 I again visited the county for a few days, until the wet weather and the midges drove me away from Kinlochewe. Glen Torridon, Ben Eay, and the Slioch were explored, and yielded the following plants:—*Lepidium heterophyllum*, var. *canescens*, *Erophila vulgaris*, *Arabis petræa*, *Viola tricolor*, *V. arvensis*, *Lychnis Githago*

Trifolium minus (a plant of cultivation), *Prunus Padus*, *Rosa tomentosa*, var. *sylvestris*, *Sedum acre*, *Hieracium tenellum* (Backh.), *H. nigrescens*, *Arctium intermedium*, *Centaurea Cyanus*, *Aster Tripolium*, *Arctostaphylos alpina* (confirmatory), *Lamium intermedium*, *Myosotis collina*, *Polygonum Convolvulus*, *Euphorbia Helioscopia*, *E. Peplus*, *Salix repens*, *Sparganium affine*, *Scirpus setaceus*, *Agrostis canina*, *Festuca sciuroides*, *Polystichum Lonchitis*, *Vicia sativa* (introduced), *Circæa alpina* (confirmatory), *Hieracium holosericeum*, *H. lingulatum*, *Salix rugosa*, *S. herbacea* (confirmatory), *Carex xanthocarpa*, and *Listera cordata* (confirmatory), as well as some varieties.

Mr. C. Bailey adds *Cerastium tetrandrum* from Gairloch.

In 1889 I again visited Kinlochewe in order to clear up a difficulty respecting a form of *Agrostis canina*, gathered the previous year on Ben Eay, which in some respects approached *A. rubra*, Wahl. A large series of specimens collected this year from the same mountain, and also from the Slioch, were sent to Professor Hackel, who named them *Agrostis canina*, var. *scotica* (see "Scotch Naturalist," 1889–90, p. 239). The following additional plants were also observed :—*Rubus saxatilis* (in Dixon's list), *Viola sabulosa*, *Prunus avium* (? planted), *Hieracium globosum* (?), *H. melanocephalum* (?), *H. eximium* (?), *Campanula rotundifolia*, *Pyrola media*, *Myosotis repens*, *Mercurialis perennis*, *Carex paniculata*, *Scirpus maritimus*, var. *conglobatus*, and a large number of varieties.

A hawkweed, gathered by me at Kinlochewe in 1889, proved to be *H. praelongum*, an interesting addition. In the same year I verified the occurrence of *Arenaria sedoides*. Mr. Sewell adds *Carex pulla*.

In the "Scotch Naturalist," 1891, p. 186, Mr. Arthur Bennett cites the Jour. Bot., 1890, p. 40, for six additions to the flora, but four of the plants are already on record, and the other two — *Drosera intermedia* and *Elymus arenarius* — had not been observed by me. *Cladium Mariscus* (*C. jamaicense*) is given on the authority of Mr. A. Evans. In the same Journal for 1892, p. 125, eleven species are given on the authority of Mr. P. Ewing. Of these *Stachys arvensis*, *Plantago Coronopus*, *Urtica urens*, *Carex filiformis*, and *Isoetes echinospora* are additions to the flora.

The year 1893 once again saw me in West Ross, but this time I chose fresh ground. My route was by the road from Garve to Ullapool by the Dirie More and Braemore. As this was done through streaming rain, but few plants were added to the list. On the following day, which was beautifully fine, I retraced my steps to Braemore, with its magnificent gorge and falls, and explored the sides of Loch Broom. *Elymus arenarius* occurred sparingly on the shingle, the true *Solidago Virgaurca*, var. *angustifolia*, *Bromus ramosus*, *Rubus mucronatus*, *R. fissus*, *R. Radula*, *R. incurvatus*, etc., were gathered. The beach at Ullapool afforded a plant which I had long been looking for — the glabrous-fruited form of *Sisymbrium officinarum*, Crantz. Here it was the prevailing form, but at Jeantown the typical form alone occurred. *Ranunculus vulgatus* grew in the shingle with *Cochlearia grœnlandica*, *Galium verum*, *Buda media*, and *Fumaria Boraei*. The cultivated fields contained two varieties of *Veronica agrestis*, *Fumaria officinalis*, the yellow-flowered form of *Raphanus Raphanistrum*, and great abundance of *Spergula sativa* (the only form noticed); it was so abundant as to give a heavy valerianaceous odour to the air. At the head of Loch Broom *Hieracium sparsifolium* grew by the river, and at Ullapool *Hieracium reticulatum*, *H. auratum*, and *H. rubicundum* occurred. Near Ullapool, on the road to Loch Achall, some limestone rocks are exposed. These yielded some interesting plants, such as *Habenaria viridis*, *Orchis mascula*, *Anthyllis Vulneraria*, *Melica nutans*, *Pyrola secunda*, *Gentiana Amarella*, *Avena pubescens*, var. *Listera ovata* and *cordata*, and *Habenaria albida*. Most of these grew on the steep banks of the river, which for a short way cuts its course through the limestone. *Hieracium iricum* was conspicuous, as it was on the limestone of Kishorn. In Loch Achall we found *Lobelia Dortmanna*, *Callitriche hamulata*, *Chara fragilis*, etc.

One day we sailed by the Summer Islands to a little stretch of sandy beach near Polglass, where we found *Carex arenaria*, *Ligusticum scoticum*, *Agropyron junceum*, and *Daucus Carota*. A visit was paid to Dundonnell at the head of Little Loch Broom. We ferried over Loch Broom and climbed the moorland road by Loch na h' Airbhe, in which grew *Ranunculus petiolaris*, *Carex rostrata*, etc. About Dundonnell we gathered *Viola tricolor* and *Raphanus* in the corn fields, and *Habenaria chloroleuca* in the grass fields near the shooting lodge. We then ascended the Glas Mheall Mor and the shoulder of An Teallach, but the rain and mist prevented the climb from being successful, if, indeed, there had been time to do much botanising. We gathered *Hieracium lingulatum*, *Epilobium alpinum*, *Vaccinium uliginosum*, *Salix herbacea*, *Rubus Chamæmorus*, *Arctostaphylos alpina*, etc., on the mountain, which we climbed to something over 3000 feet, when the mist and rain hindered further work. On our way back we found, near Dundonnell, *Rubus pyramidalis* and *R. fissus*. By the time we reached Loch Broom the rain had cleared off, so that the passage across the lake was one of rare beauty, the sea being without a ripple, reflecting all the colours of a magnificent sunset. Before we left Ullapool we found *Œnanthe crocata*, *Coronopus procumbens*, *Buda marina*, *Ægopodium Podagraria*, etc.

My next stopping place was Strathcarron, at the head of the loch of that name. Here we found *Ruppia*, *Scirpus rufus*, *Salicornia*, *Arenaria peploides*, *Carex extensa*, *C. chrysites*. The corn fields afforded *Bromus secalinus*, *Viola segetalis*, and *Buda rubra*. On the shingly margin of the river, *Galium verum*, *Silene maritima*, *Lepidium heterophyllum*, var. *canescens*, *Anthyllis Vulneraria*, *Hieracium auratum*, and *H. duriceps*. *Rumex domesticus*, and *conspersus* were gathered near the station. A grass field contained several plants of *Galium erectum*. On the shingle near Jeantown we found *Caucalis Anthriscus*, *Malva sylvestris*, *Volvulus sepium*, *Arctium intermedium* and several garden stragglers, if indeed the *Malva* and *Volvulus* do not belong to that class.

In a picturesque ravine near Jeantown we saw *Osmunda*, *Festuca sylvatica*, *Allium ursinum*, *Bromus ramosus*, *Brachypodium gracile*, *Agropyron caninum*, *Potentilla Fragariastrum*, *Asplenium viride*, *Polystichum aculeatum*, *Hieracium anglicum*, etc. An extremely hot day was occupied in ascending a mountain north of the Strath, but we found it very bare and the plants much dried up. On the rocks at about a 1000 feet *Juncus trifidus* occurred, with a large form of *Salix herbacea.* We also gathered *Hieracium lingulatum*, and on the higher shoulder *Arctostaphylos alpina* and *Loiseleuria procumbens* dried up by the hot sun. The base of the mountain yielded a very small form of *Chara fragilis, Scirpus fluitans,* and *Arenaria serpyllifolia,* the two former growing in a pool, the latter by the road-side. Another visit to Jeantown afforded *Stachys ambigua* growing with its assumed parents *S. palustris* and *S. sylvatica.* This locality is given for it in Hooker's Flora Scotica, *Æthusa Cynapium* grew in cultivated ground. Another day we went from Carron by Jeantown to Kishorn during a violent storm of thunder and rain, which accompanied us over the celebrated Beallach na bo Pass to Applecross. The beach at Applecross with its curious limestone pavement gave *Sagina nodosa*, and *Epilobium parviflorum*, which grew in the fissures in the rock. *Rubus corylifolius* was not uncommon on clay. A small fresh water loch near the sea, called Loch a Mhuilinn, had *Nymphæa alba, Utricularia neglecta* and *minor, Potamogeton natans, Scirpus lacustris, Carex rostrata, Veronica scutellata, Chara fragilis,* and *Subularia aquatica.* In the woods grew *Equisetum maximum* and *Hieracium corymbosum* (*H. Eupatorium*). By the shingle, *Atriplex Babingtonii*, var. *virescens* was common, *Agropyron junceum, Sedum acre,* native, *Erodium cicutarium, Geranium dissectum*, white-fruited *Rubus idaeus, Erophila vulgaris, Cerastium tetrandum,* etc. A handsome subcristate rose was common, it does not answer to any of our varieties, M. Crepin considers it to be a glandular variety of *R. glauca. Rosa coriifolia,* in varied forms also occurred.

The return journey over the Beallach na bo Pass yielded *Juncus trifidus, J. triglumis, Saxifraga hypnoides, Saussurea, Epilobium alpinum, Cryptogramme crispa, Hieracium murorum*, var. *ciliatum, Rhodiola, Gnaphalium supinum, Silene acaulis, Thalictrum alpinum, Luzula spicata,* etc. In a pool at the top of the pass (2050 feet) *Subularia, Isoetes lacustris,* var. *falcata* and *Callitriche hamulata* occurred. By Loch Kishorn we gathered *Scirpus maritimus,* and about Kishorn on the limestone, *Hieracium iricum, Habenaria conopsea,* *Scolopendrium*, *Veronica anagallis*, var. *anagalliformis*, *Salix repens*, and *S. ambigua*, *Festuca elatior*, etc.

My visit to West Ross in 1893 was a very pleasant one, seven out of the ten days I spent there being fine; the preceding drought had, however, been prejudicial to vegetation, the sedges especially being in bad condition. My marked catalogue shows that I noted nearly 480 species, of which about 75 were additions to the flora, and 15 more were species more or less naturalised, which had not been previously noted, and 3 more without personal authority in "Topographical Botany," were now verified. A large number of varieties were also observed. The total number of plants on record for the county is now over 570. The following is a complete list of the county plants so far as are at present known to me. In naming the critical forms I have had the kind help of Professor Hackel, M. Crepin, Rev. W. Moyle Rogers, Rev. E. Marshall, Messrs. F. J. Hanbury, H. and J. Groves, and my kind friend Arthur Bennett, who has in many ways rendered assistance, and especially in looking over my rough notes and generously adding some of his own. I must also thank Mr. Mackenzie, of the Caledonian Hotel at Ullapool, for much kind attention during my agreeable sojourn at his house.

In 1894 I paid a flying visit to Ullapool towards the end of June, but the season was rather backwards, the *Rubi*, *Rosæ*, and *Hieracia*, with few exceptions, not being sufficiently advanced to determine, while the spell of unusually hot weather which set in did not make walking more enjoyable. My object was to visit the limestone rock, called by Lightfoot "Creg ach no caen, upon the boundaries of Coygach and Assynt, just on the confines of Ross-shire and Sutherland, about ten miles from Loch Broom, on the road to Lead-beg." On the geological ordnance chart, No. 101, the limestone rocks are marked as thinning out before the Ross boundary is touched on the hill, which is there called Cnoc an t-Sasunnaich (1258 feet high), and which has a fine range of cliffs exposed on the western side. The high road to Inchnadamph runs at their base at an elevation of between 700 and 800 feet above sea-level. On the Sutherland portion the limestone occurs even as low as 400 feet, and the fields in the village of Elphin were blue with *Polygala vulgaris*, or showed the feathery fruits of *Dryas*, while the profusion of *Trollius* and *Orchis latifolia*, the latter in superb colour, must be seen to be appreciated. From the summit of the hill a magnificent view is to be obtained of the grand Ben More of Coigach, of Canisp, An Stac, Suilven, and Ben More of Assynt. A close examination led me to believe that the limestone rocks, which rise at a gentle angle from north to south, must extend into Ross, since *Dryas* was found beyond the boundary, but at a much higher level (over 1000 feet) than in Sutherland, and at the top of the fucoid beds. With *Dryas* also occurred *Draba incana*, and a patch of the local *Carex rupestris* was also noticed. A solitary tuft of *Adoxa Moschatellina* was also observed. *Epilobium angustifolium* occurred as an undoubted native plant. *Polygala vulgaris* was very beautiful. *Allium ursinum* was seen in one place, but not observed in Sutherland, while *Silene acaulis*, which occurred nearly down to the road level in Sutherland, was not noted in Ross. *Thalictrum alpinum*, *Polygonum viviparum*, *Polystichum Lonchitis*, *Asplenium viride* were rather common. *Phegopteris polypodioides* and *P. Dryopteris* also occurred, but the latter was not quite typical, reverting in leaf cutting somewhat to *P. Robertiana*. *Alchemilla vulgaris* occurred both as the glabrous and as the pubescent plant. *Rubus saxatilis* in flower (with a hawthorn like odour). *Luzula maxima* and *Carex pilulifera*, the latter as the acute glumed form, were gathered. A form of *Poa subcœrulea* also was noticed on the rocks, but no *Geranium sylvaticum*, *Rhodiola*, or *Oxyria* was observed. A form of *Poa* and a few other critical plants are still under observation.

Another day was spent at Dundonnell endeavouring to refind Lightfoot's plants (it will be observed that all his records from the limestone rocks were verified), but without success. Considerable alteration has taken place at Dundonnell since the time of his visit, and the woods, I am told, have been much cleared. The visit, however, gave additional localities for *Festuca sylvatica*, *Asperula odorata*, *Carex remota*, *C. pallescens*, *Allium ursinum*, and other interesting plants. The scenery towards the head of the glen is of a very interesting character. Near Dundonnell, in a swampy, shady place, occurred a plant which, I have little doubt, is identical with Forster's *Caltha radicans.* It rooted freely from the nodes, and formed an interlacing mass. The flowers were decidedly smaller than in *C. palustris,* and the sepals narrower, and therefore not contiguous. The shape of the radical leaves varied. Sometimes they were almost as deltoid as the one figured in "English Botany;" at others, they were scarcely different from the type. The serration also varied very considerably. The leaves on the stem above the first rooting point were almost invariably of a bluntly, triangular form. It would be interesting to learn if Don's plant had the actual root leaves as well as the leaves of the stem at its first rooting point of this deltoid shape. I may say that the plant occurred in several places, and was uniformly rooting in its habit. All the flowers which I observed had narrower and rather smaller sepals. The creeping stems were very brittle, and it was not quite easy for that reason to get perfect specimens.

A day spent on An Teallach was toilsome, and not productive, the season being backward and the ground barren. *Lycopodium annotinum* was gathered, and *Arctostaphylos alpina* was rather frequent on the lower shoulders of the hill. *Lycopodium alpinum,* var. *decipiens, Juncus trifidus, Carex rigida, Armeria, Rhodiola, Luzula spicata, Loiscleuria, Cornus suecica, Rubus Chamæmorus,* and *Vaccinium uliginosum* (the latter in flower) were noticed.

A day was spent in walking to Rhidorroch by Loch Achall, but the only addition made to the flora was *Sagina subulata,* which occurred in the path near the shooting lodge. *Habernaria albida, H. viridis, H. conopsca, H. bifolia, Orchis incarnata, Listera cordata, Melica nutans,* and *Carex pallescens* were seen.

Another day or two was spent at Strome, where, between the station and Plockton, *Corydalis claviculata, Rubus rhamnifolius, Myosotis repens, Hypericum Androsæmum,* and *Oxyria* were noted, but the intense heat made botanising a toil. The results of this visit were rather meagre, five additional species and five confirmatory records only being made ; but the few *Hieracia* gathered, now in Mr. Hanbury's hands, will, it is hoped, yield another record.

The sign (*) means that the Author, it is believed, is the first recorder of the plant for the county; the sign (:) means that the plant is not a native.

THALICTRUM ALPINUM, L.—On the mountains near Strathcarron ; plentiful on Meall Gorm and Sgurr na Caorach ; in a barren state on Sgurr Fhuaran ; probably not a rare plant on the higher hills. It also comes down to 900 feet on the fucoid rocks of Cnochan.

T. DUNENSE, Dumort.—On the sand at Gairloch (Mr. C. Bailey), 1883.

* ANEMONE NEMOROSA, L.—In many wooded situations, as on Loch Maree side, Dundonnell, etc.

(? RANUNCULUS HEDERACEUS, L.—Gairloch, in Dixon's list, requires verification ; it is likely to occur as it is reported from Skye. *R. aquatilis* is also given in the same list.)

(R. LINGUA, L.—"Kintail and Gairloch not uncommon" (Davidson). I have not seen it. Was the large form of *R. Flammula* mistaken for it ?)

* R. FLAMMULA, L.—Common ; it is a variable plant. The variety *pseudoreptans* is frequent on the gravelly margin of lochs, etc.

* R. PETIOLARIS, Marshall.—This occurs in Loch Achall at 265 feet, in Loch na h' Airbhe at 700 feet, and in a small mountain loch on a mountain in Strathcarron at over 2000 feet. In the latter situation it appeared to grade into the type. I should be content to give it varietal rank, notwithstanding its *Littorella*-like radical leaves. It is probably widely distributed.

* R. ACRIS, L., var. VULGATUS, Jord.—A common plant, widely distributed ; from the sea-level to 4000 feet. A very hairy form occurred on the beach at Ullapool, but this and other forms I defer naming till I have had the opinion of Herr Freyn. *R. acris*, L. (*R. Boræanus*, Jord.), near Braemore.

* R. REPENS, L.—Not uncommon on low ground. A curious form occurred on the shingly margin of the river

Carron; it has the leaves much more finely cut, and the plant unusually small.

(? R. BULBOSUS, L.—Only in Dixon's list of Gairloch plants; possibly an error, although Davidson says it is common in Ross.)

* R. FICARIA, L.—Attadale; rare, or my visits made too late in the season to observe it. Seen at Dundonnell in 1894.

* CALTHA PALUSTRIS, L.—Common; but the var. *minor* appears much less frequent in Ross than on the Cairngorms or Breadalbane hills. I saw it on An Teallach at about 2000 feet.

* C. RADICANS, Forster.—In shady, marshy situations at the head of Little Loch Broom, near Dundonnell.

TROLLIUS EUROPÆUS, L.—Not unfrequent, and widely distributed. I saw some plants at an elevation of upwards of 2000 feet in Strathcarron. West Ross not localised (Davidson).

: BERBERIS VULGARIS, L.—Occurs as a planted shrub at Ullapool and Braemore, and, according to Mr. Dixon, at Gairloch.

* NYMPHÆA ALBA, L.—In Loch Coulin and Loch a Mhuilinn.

: PAPAVER SOMNIFERUM, L.—On the shingle at Jeantown and Applecross; probably a garden escape.

(? P. RHŒAS, L.—In Dixon's list, which also gives *P. dubium*. The latter has a more northern range than this species, which has not been observed by me in West Ross.)

* P. DUBIUM, L.—Rare, and only of casual occurrence, as at Kinlochewe, Dornie, and Gairloch—in the latter place on the authority of Mr. Dixon. In 1893–94 I did not see a single poppy in the county. The Kinlochewe plant was the var. *P. Lamottei*.

* P. ARGEMONE, L.—Like the foregoing, scarcely naturalised. I saw it by the rail side near Strome in 1880.

CORYDALIS CLAVICULATA, DC.—Rare. Kintail, and between Strome Ferry and Plockton. It is given in the Gairloch list, probably on the authority of Mr. Davidson, who records it in "Scotch Naturalist," vol. ii., from Melvaig, near Gairloch.

* FUMARIA BORÆI, Jord.—On shingle at Ullapool, where

it also grew in potato fields. Mr. Dixon includes *F. capreolata* in the Gairloch list, which probably means this.

* F. OFFICINALIS, E.—Rare, in cultivated fields at Ullapool and Dundonnell.

* NASTURTIUM OFFICINALE, Br. (*Roripa Nasturtium*, Beck).—Near Ullapool and Applecross; probably overlooked.

* BARBAREA VULGARIS, Br.—Rare, and probably not native. In the Gairloch list I saw it at Strome.

* ARABIS PETRÆA, Lamk.—On the quartzite slopes of Ben Eay, at an elevation of 2000 to 2800 feet, only as the glabrous plant; it has flowers rather larger than the plant from the Cairngorms, but not so large as those of the var. *grandifolia* from Ben Laiogh, in Argyll. Davidson records it from Gairloch, but it is not usually a plant of the lowlands. Is Mr. Davidson's record correct?

(? A. HIRSUTA, Br.—Given in Mr. Dixon's list. It probably occurs as it has been found in Skye and East Ross.)

* CARDAMINE PRATENSIS, L.—Common; usually as the plant with lilac flowers and pedicelled leaflets; figured in "English Botany," 776, which appears, according to Kerner, to be the *C. palustris*, Petermann. At Applecross I saw the true *C. pratensis*—the plant with white flowers and sessile leaflets which is figured in "Flora Danica," No. 1039 (1790).

* C. HIRSUTA, L.—Not rare. At Loch Carron, Ullapool, and Applecross.

* C. FLEXUOSA, With.—Not uncommon, as at Jeantown, Kintail, Strome, Ullapool, and at Applecross; also as the var. *umbrosa*, Gren. et Godr., by a waterfall at Jeantown.

DRABA INCANA, L.—On Creg ach no caen, near Ledbeg (Lightfoot 1777). It occurs on the limestone rocks at that place in both counties, and near Gairloch.

(?D. RUPESTRIS, Br.—Ben Sleugach (Davidson). If correct, very interesting; was it not a small form of *D. incana*?)

* EROPHILA VULGARIS, DC.—In the Gairloch list. Seen by me at Kinlochewe, and by the roadside at Applecross; it is most likely not uncommon.

* COCHLEARIA OFFICINALIS, L.—Common on the coasts, and as the var. *alpina*, Wats., on some of the hills, as on An Teallach, and on A Glas-bheine, in Kintail.

* C. grœnlandica, L.—On the coast at Ullapool, very fine specimens.

(C. danica, L., and C. anglica, L., are both given in Dixon's list.)

: Hesperis matronalis, L.—Naturalised about the ruins of a kirk near Jeantown.

Sisymbrium Thalianum, Gay.—Given in Dixon's list, and likely correctly; my visits have been made rather late in the season.

* S. officinarum, Crantz.—On the shingle and in cultivated ground at Jeantown, as the type plant with pubescent siliquas. At Ullapool the form with glabrous siliquas alone occurred, it is the var. *leiocarpum*, DC., which I had long sought for in Britain, and which I had once seen at Meran, in Austria.

Subularia aquatica, L.—In a small loch near the summit level of the Beallach na bo Pass, at a little over 2000 feet, and in Loch a Mhuilinn, near the sea-level, caulescent and acaulescent forms occurred.

: Brassica Napus, L.—As a weed of cultivation on the shingle at Jeantown.

* B. sinapistrum, Boiss.—Kinlochewe, Strome, etc. (Colonist).

* B. alba, Boiss.—Loch Alsh, Ullapool, and Applecross (Colonist).

* Bursa pastoris, Wib.—Common about Ullapool, etc.

* Coronopus procumbens, Gilib.—On the grassy margin of Loch Broom at Ullapool.

(? C. didyma, Sm.—In Dixon's Gairloch list, almost certainly incorrect.)

Lepidium heterophyllum, Benth., var. canescens, Gren. et Godr.—On the shores of Loch Torridon, near Loch Maree, and on the stony border of the river Carron. The older name appears to be *L. heterophyllum*, var. *campestre*, F. Schultz, in Fl. Gall. et Germ., Exs. 3 et 4, Introd. p. 3, 1840. It is the *L. Smithii*, Hook. Davidson records it from Gairloch.

Cakile maritima, L.—Gairloch (Dixon). Likely to be found.

* Raphanus Raphanistrum, L.—Abundant among the oat crops at Dundonnell and Applecross and Ullapool, always as the yellow flowered form.

* Viola palustris, L.—Common.

(V. canina, L.—Given in the Applecross list, but requires verification.)

* V. Riviniana, Reich.—Common. I suspect it is the "*V. canina,* L.," of the Applecross and Gairloch lists.

* V. tricolor, L.—In a field near Loch Torridon, and in oat fields at Dundonnell. Dixon has it in his list.

* V. arvensis, Murray.—Near Torridon and Ullapool, and a form identical with *V. segetalis,* Jord., at Strathcarron.

* V. lutea, Huds.—Near Braemore.

* V. sabulosa, Jord.—Loch Torridon side, Strathcarron, Applecross, etc. A plant very near to, if not identical with, *V. Curtisii,* Forst.

* Polygala vulgaris, L.—Not common, Sgurr Fhuaran, Sgurr na Caorach, and in beautiful condition on the Cnochan rocks.

* P. serpyllacea, Weihe.—Common and widely distributed.

* Silene Cucubalus, Wibel.—Rare, and perhaps only of casual origin. I saw it at Strome in 1880.

* S. maritima, With.—Rather common, not only on the coast, but also on the shingly margin of Loch Maree, and the River Carron, etc.

S. acaulis, Jacq. (see "Topographical Botany").—I have gathered it on Ben Eay, but it appears to be rather a scarce plant on the Ross mountains.

* Lychnis dioica, L.—Locally common, abundant about Jeantown, and of very rich crimson colour.

* L. alba, Mill.—Rare and only a colonist, if, indeed, it is more than a casual. I saw it at Dornie, at Ullapool, Jeantown, Strome Ferry, etc.

* L. Flos-cuculi, L.—Frequent.

* L. Githago, Scop.—Little more than a casual. A solitary specimen in an oat field at Kinlochewe. Dixon includes it in his list, but does not consider it a native. Davidson says it is too common in Ross-shire.

Cerastium tetrandrum, Curt.—Gairloch (Mr. C. Bailey), sparingly on the course sand at the head of Applecross Bay, 1893; Ullapool, 1894.

* C. glomeratum, Thuill.—Common, also as the var. *apetalum,* Dum. at Applecross, Braemore, and Dundonnell.

* C. TRIVIALE, Link.—Common and widely distributed. The var. *alpinum*, Koch., in its typical form on A Glasbheine in Kintail, on An Teallach and on Meall Gorm of Applecross. Boswell Syme said the specimen from the former locality was the true plant, his var. *alpestre*, Lind.

* STELLARIA MEDIA, Cyr.—Abundant. The var. *major*, Koch., at Linlochewe and Inverlael.

* S. HOLOSTEA, L.—Local. Near Attadale, Jeantown, Kishorn, Rhidorroch, etc.

* S. GRAMINEA, L.—Not rare. Keppoch, Braemore, Dundonnell, Kintail.

* S. ULIGINOSA, Murr.—Common.

* ARENARIA SEDOIDES, Schultz.—"Topographical Botany" without personal authority. Apparently scarce. I saw it on Slioch at 1800 feet, and also as the var. *apetala*.

* A. SERPYLLIFOLIA, L.—Rare, but possibly native. By the railway at Strome, and dry roadside at Strathcarron, also near Applecross.

* A. PEPLOIDES, L.—Locally abundant on the coast, as at Torridon, Ullapool, Jeantown, Applecross. At Ullapool the var. *diffusa*, Horn., occurred with the type.

(SAGINA MARITIMA, Don.—A specimen which I gathered by Loch Duich was so named by a botanical referee. I have not been able to refind it in the county, but it is a plant which is likely to be found, as it occurs in East Ross and Caithness.)

* S. PROCUMBENS, L.—Not uncommon, and variable.

* S. NODOSA, E. Mey.—Local. I have only seen it in the crevices of the limestone pavement at Applecross; it was the glabrous plant.

S. SUBULATA, Presl.—Given in Dixon's list. I found a solitary patch on the shingle path near Rhidorroch Lodge in 1894.

* SPERGULA SATIVA, Boenngh.—Abundant in many corn fields, and about Ullapool, Dundonnell, Applecross, so profuse as to give a heavy-valerianaceous odour to the air, especially in the evening. *S. sativa* alone occurred; although I examined many scores of specimens, I was unable to find one with papillate seeds.

* BUDA RUBRA, Dum. (ARENARIA RUBRA, L.)—Rare. A few plants at Strathcarron, and in dry fields at Kishorn.

*B. MEDIA, Dum. (SPERGULARIA MARGINATA, Syme).—Rather common on the coast, as at Loch Carron, Applecross, Polglass, etc.

*B. MARINA, Dum. (SPERGULARIA NEGLECTA, Syme).—Rare. Morefields, near Ullapool, and shores of Little Loch Broom. (*Lepigonum salinum*, Applecross, Mr. Allan.)

*B. RUPESTRIS (SPERGULARIA RUPESTRIS, Lebel.)—Loch Carron, 1880. I did not see it in 1893. Boswell Syme so named my specimen, and Mr. Arthur Bennett says he has a note, that he saw one from me.

*MONTIA FONTANA, L.—Rather common. The var. *major*, Allione (*M. rivularis*, Gmel.), at Lochalsh, Braemore, and Applecross.

HYPERICUM ANDROSÆMUM, L. — Rare. Loch Maree (Hooker), Kintail, Glenelg, Duncraig.

(H. PERFORATUM, L.—In Dixon's list only.)

: H. CALYCINUM, L.—Balmacarra (Davidson). Planted, of course, but the recorder gives no particulars.

*H. PULCHRUM, L.—Common. The var. *procumbens*, Rostrup, in Coigach.

(: MALVA MOSCHATA, L.—In Dixon's list; he does not consider it native.)

: M. SYLVESTRIS, L.—Dixon thinks this is not a native. It is plentiful on the shingle in Jeantown, but it is also cultivated there, so that it is very likely only a straggler from the gardens.

: TILIA PLATYPHYLLOS, Scop.—Planted at Braemore.

: T. VULGARIS, Hayne.—Planted at Braemore, Kishorn, etc.

(RADIOLA LINOIDES, Roth. (*Millegrana minima*).—In Dixon's list. It is given in "Topographical Botany" for 105 Ross West, "Ross Cat.," probably by the authors confusing Ross's list of Mid Ebudes plants with mine from West Ross. This opinion is confirmed by seeing on p. 598 of that work that Mr. Ross is credited with supplying the list of Mull and West Ross plants in Rep. of Rec. Club, whereas he only compiled the list of Mull plants, in which he records *Radiola Millegrana*. It is very likely to occur, as it is usually overlooked.)

*LINUM CATHARTICUM, L.—Common.

: L. USITATISSIMUM, L.—A casual on the beach at Jeantown.

(? Geranium sanguineum, L.—In Mr. Dixon's list only.)

* G. sylvaticum, L.—Rare. I have only seen it on the steep rocks about the falls of Glomak.

* G. molle, L.—Not common. Strome, Applecross, Kinlochewe, Ullapool, Kishorn.

* G. dissectum, L.—Rare. Only seen at Applecross.

(? G. lucidum, L.—In Dixon's list. If correctly named, was it wild ?)

* G. Robertianum, L.—Glen Docharty, Jeantown, Dundonnell, etc.; var. *album*, at Inverlael and Applecross.

* Oxalis Acetosella, L.—Local; on the base of Slioch, at Strome, Kishorn, Dundonnell, etc.

* Erodium cicutarium, L'Her.—In Dixon's list. I saw it on one station at Applecross in 1893.

* Ilex Aquifolium, L.—Not uncommon, and native, as in Glen Docharty, on the sides of Slioch, in Coigach, Dundonnell, etc.

: Acer Pseudoplatanus, L.—Loch Duich, Loch Carron, etc. Planted, and in some cases self-sown plants.

: Ulex europæus, L.—Extensively planted as a cover for game, but not, I think, native.

* Cytisus scoparius, Link.—Not very common, but possibly native. Strome, Ullapool, Kishorn.

: Medicago lupulina, L.—A relic of cultivation, at Kinlochewe. Dixon gives it in his list.

* Trifolium pratense, L.—Common, and generally distributed in the low lands.

: T. hybridum, L.—As a relic of cultivation. Strome Ferry (E. F. Linton), field borders, Dundonnell, Jeantown, etc.

* T. repens, L.—Common, and generally distributed in the low lands.

* T. procumbens, L.—Strome, Ullapool; rare.

* T. dubium, Sibth.—Kinlochewe, Applecross, Strathcarron, etc.; and, as the var. *pygmaeum*, Soy.-Will., at Ullapool.

. Anthyllis Vulneraria, L. (Gairloch, C. Bailey).—Appears where the limestone rocks are exposed, as near Ullapool, Kishorn, and Cnochan. Also on river shingle, as at Kinlochewe and Carron.

* Lotus corniculatus, L.—Common; often as a larger

flowered form than the mid-English plant, and sometimes, especially by the coast, as the var. *crassifolius*, Pers. Var. *villosus*, Ullapool.

* Vicia hirsuta, Koch.—Strome, Carron, Jeantown, Kishorn.

* V. Cracca, L.—Common, especially as a corn field plant. The var. *incana*, Thuill, at Ullapool, on the shingle.

V. sylvatica, L.—Uncommon. Keppoch. It was given in "Topographical Botany" without personal authority. I did not see it at Ullapool, Applecross, or Strathcarron.

V. sepium, L.—Kinlochewe, Braemore, Applecross, etc. Not uncommon, and in two forms.

: V. sativa, L.—Occurs as an outcast or straggler from cultivation, as at Kinlochewe.

* V. angustifolia, L.—Rare. Ullapool and Strathcarron.

* Lathyrus pratensis, L.—Not uncommon; usually as the glabrous plant.

* L. montanus, Bernh.—Braemore, Dundonnell, Kishorn, etc.; also the var. *tenuifolius*, at Braemore.

* Prunus spinosa, L.—On my first visit I thought this was planted in West Ross, but now I think it may be native in Strathcarron and at Applecross; there were some old bushes by the river at Ullapool.

: P. institia, L.—Doubtfully wild at Applecross, etc.

: P. domestica, L.—Most likely the result of planting in Strathcarron, etc.

(P. Cerasus, L.—In Dixon's list, probably an error, the next species may have been intended.)

: P. avium, L.—Glenelg, Strathcarron, Dundonnell, in what was an old hedgerow. A doubtful native.

* P. Padus, L.—Applecross, Kishorn, Inverlael, Kinlochewe, etc.

: Spiræa salicifolia, L.—Inverlael. Certainly planted.

* S. Ulmaria, L.—Not uncommon. So far as I noticed always as the plant with the leaves white underneath, var. *discolor*, Kod.

* Rubus idæus, L.—Not common, but I think native. It grew by the side of Loch Coulin, at Braemore, and a Applecross, as the var. *leucocarpus*. It is possible that the latter plant may be the result of ancient cultivation.

* R. NESSENSIS, Hall.—Inverlael.

* R. FISSUS, Lindl.—Near Ullapool, in several stations.

* R. PLICATUS, W. and N.—Near the shooting lodge at Dundonnell.

* R. RHAMNIFOLIUS, W. and N.—Strome Ferry.

* R. INCURVATUS, Bab.—A plant from Ullapool and Inverlael, the Rev. Moyle Rogers puts under this name.

* R. LEUCOSTACHYS, Sm.—Rare, Ullapool.

* R. PYRAMIDALIS, Kalt.—Ullapool, and in very fine condition at Dundonnell.

* R. VILLICAULIS, Koel., var. *Selmeri* (Lindeb.).—Strathcarron, Ullapool, Kinlochewe.

* R. MACROPHYLLUS, W. and N.—Inverlael.

* R. PULCHERRIMUS, Neum.—Jeantown.

* R. MUCRONATUS, Blox.—Not rare. About the side of Loch Broom, Braemore, etc.

* R. RADULA, W. and N.—Large, handsome plants at Ullapool.

R. CORYLIFOLIUS, Sm.—Near Ullapool, and on limestone at Applecross and Kishorn. A small form. Davidson records it from Glen Shiel.

* R. SAXATILIS, L.—In Dixon's list. I saw it on Slioch at about 2800 feet. It occurred on Meall Gorm of Applecross, on Cnochan rocks and An Teallach, and as the var. *setodermis*, Borb. (in Baenitz. Herb. Europ.), near the sea level at Jeantown.

R. CHAMÆMORUS, L. ("Topographical Botany").—I saw it on Slioch in 1889, and in fine fruit on An Teallach in 1893.

DRYAS OCTOPETALA, L.—"On a limestone rock called Creg ach no caen, upon the boundaries of Coygach and Assynt, just on the confines of Ross-shire and Sutherland" (Dr. Lightfoot). I saw it on the Ross-shire side of the boundary in 1894.

* GEUM URBANUM, L.—Not uncommon, as at Loch Carron and Kinlochewe.

G. INTERMEDIUM, Ehrh.—Strome (Linton 1885), Jeantown.

* G. RIVALE, L.—Rather common. Loch Long, Braemore, Dundonnell, Jeantown, in splendid flower at about 2000 feet on a mountain in Strathcarron, and on the Cnochan rocks.

* FRAGARIA VESCA, L.—Rather common.

* POTENTILLA FRAGARIASTRUM, Ehrh.—Apparently rare. I saw it only by the waterfall at Jeantown, and at Applecross.

* P. TORMENTILLA, Neck.—Abundant and generally distributed.

(? P. REPTANS, L.—In Dixon's list. A misnomer? It is a rare plant in the north.)

* P. ANSERINA, L.—An abundant and luxuriant shore weed on the shingle, as at Jeantown, Applecross, etc. It usually occurred with the leaves green above, the var. *sericea*, Koch., with leaves silvery on both sides being rare; it was noticed at Ullapool.

(? P. ARGENTEA, L.—One of the plants recorded by the Summer Camp from Applecross. The true plant is most unlikely to be found native so far north; perhaps it was a slip of the pen for the preceding species, but it was given as a new record, while I recorded *P. Anserina* in 1880.)

P. SIBBALDI, Hall. f.—"Topographical Botany." Rare. Slioch.

* ALCHEMILLA ARVENSIS, Scop.—Rather rare or overlooked. Dornie.

* A. VULGARIS, L.—Rather common. Large plants of the var. *glabra*, W. et Gr., occurred in the shingly margin of the river Carron, but it varied into forms with more pubescent foliage. The glabrous form grew in the stony bed of the stream that descends from Ben Eay. On the hills a small pubescent form is common, especially between Kishorn and Applecross, but I should not call it *A. montana*, Willd. The two plants grew together, and kept fairly distinct on the Cnochan rocks.

A. ALPINA, L.—See "Topographical Botany." Common.

ROSA SPINOSISSIMA, L.—See "Topographical Botany." I have not seen it in Ross.

* R. INVOLUTA, Sm., Gairloch (Davidson), and as *R. Sabini*, Woods.—By the side of Loch Clare, and by Loch Maree. This, M. Crepin says, is a hybrid of the former with *R. tomentosa*.

* R. MOLLIS, Sm.—Not unfrequent in the lower wooded straths, as at Loch Maree, Ullapool, Dundonnell, Applecross, Kishorn, Kintail, etc. The var. *cærulea*, Bak., I

have seen at Kinlochewe, etc. The var. *glabrata*, Fries. (E. F. Linton), Strome Ferry, 1886, not previously noticed in Britain.

* R. tomentosa, Sm.—Common in the lower glens, and very variable. Of the named forms I have collected *R. scabriuscula*, Sm., at Applecross and Ullapool; the var. *R. sylvestris*, Woods, at Kinlochewe and Ullapool; var. *cuspidatoides*, Lej., at Achnashellach. The latter collected by Rev. H. E. Fox in 1893.

* R. canina, L.—The aggregate plant is common in the low lands. Of the named British forms I have gathered *R. lutetiana*, Lem., in many localities. The flowers of this and other varieties of the dog rose are often darker than our Midland plants. *R. dumalis*, Bechst., see Rep. of Rec. Club (Lintons, Bailey), Gairloch and Strome Ferry. It is one of the common forms of the non-cristate *canina*. I noted it in 1880 at Loch Alsh, in 1887 at Kinlochewe, and this year I found it commonly at Ullapool. *R. urbica*, Lem.—Applecross and Strathcarron. *R. tomentella*, Lem.—Ullapool. *R. glauca*, Vill.—Common and variable. M. Crepin writes to me "that *R. glauca* and *R. coriifolia*, Fries., have not been sufficiently studied in Britain. These two secondary species may be met with at lower levels, but they prefer higher situations or else more or less northern lands. A complete series of their variations will doubtless be found in Scotland." A plant which, in the opinion of our British authorities, would be called var. *subcristata*, M. Crepin refers to *R. glauca*, of which he considers it to be a form with compound teeth, and smooth sepals. A conspicuous rose at Applecross, which is, I think, a distinct variety from any of our named forms, M. Crepin says is a variety of *R. glauca*, with simple teeth and glandular pedicels and sepals. It may be worth distinguishing as var. *glandulosa*. *R. coriifolia*, Fries.—This is a common Ross rose. A very pubescent form occurred at Ullapool; in fact, were it not for its subcristate sepals, it would now come under *R. tomentella*, according to our insular ideas. M. Crepin keenly remarks "that as we go northwards forms of *R. canina* are replaced by forms of *R. glauca* and *R. coriifolia*." A very curious rose from Ullapool, which I half thought might be a form of *R. decipiens*, is

commented on by Rev. Moyle Rogers thus: "This puzzles me greatly. Can it be *R. Bakeri*, which I do not understand? The strongly hooked prickles seem against it. Those long, narrow leaflets seem to me to put *decipiens* out of court." M. Crepin would rather refer it to *R. coriifolia*, of which he "thinks it is a form with pubescent petioles, and slightly glandular pedicels." In the Rep. Rec. Club, 1884–86, Mr. C. Bailey records *R. marginata*, Wallr., from opposite the hotel at Gairloch. This is probably not correct, since the true *marginata*, which is a hybrid of *R. gallica*, is not likely to be British. It is doubtful whether we have the true plant in Britain. The var. *Watsoni* occurred at Jeantown.

* R. rubiginosa, L.—Kinlochewe and Applecross. I am not quite convinced of the indigenity of this rose in the county.

(Pyrus Aria, Sm.—In Dixon's list, erroneously named, or planted. Davidson says it is rare by Loch Carron.)

* P. Aucuparia, L.—Native; not uncommon. Strome, Kinlochewe, etc.

* P. Malus, L.—Strome, Dundonnell, etc.; possibly native.

* Crataegus Oxyacantha, L.—Possibly native. Dornie, Jeantown, Applecross.

* Saxifraga oppositifolia, L.—Rare. A Glas-bheine, in Kintail, Ben Eay.

* S. stellaris, L.—Rather common, as on the Slioch, Sgurr Fhuaran, Meall Gorm, and An Teallach. A very large form on the rocky bed of a stream which descends from Ben Eay. On Sgurr na Caorach a form was found similar to the plants met with on Aonach Mhor in Westerness, that is with a leafy stem and without the basal rosette of leaves. As in the former case it was associated with *Epilobium alpinum*, and *Bartramia*. It is a form, not a variety, induced by shade and the drip from moist overhanging rocks.

* S. aizoides, L.—Abundant, and usually as the plant with ciliate leaves (*S. autumnalis*, L.). Flowers with various tints of orange have been seen, but the dark orange-brown flowered plant which is found in Norway has not been observed.

*S. HYPNOIDES, L.—Rather rare. On A Glas-bheine, and on Meall Gorm. I also saw this plant in a rocky piece of ground opposite the mansion-house of Kishorn, where it was probably planted.

*CHRYSOSPLENIUM OPPOSITIFOLIUM, L.—Not rare, Loch Beag side, Talladale, Applecross, Jeantown, etc.

(C. ALTERNIFOLIUM L.—In Dixon's list only.)

*PARNASSIA PALUSTRIS, L.—Moilan, Gairloch.

: RIBES GROSSULARIA, L.—Strome, Jeantown, etc., not native.

: R. RUBRUM, L.—Near Ullapool; an escape from cultivation.

: R. NIGRUM, L.—Near Braemore; sown by birds, but fruiting freely.

SEDUM ROSEUM, Scop. (RHODIOLA ROSEA).—Plentiful on the precipices about the Falls of Glomak, also seen on mountains in Strathcarron, on An Teallach, in the Beallach na bo Pass, and on Slioch. Davidson says it occurs on Baios Bhein, Gairloch.

S. TELEPHIUM, L.—"Not common, Gairloch" (Davidson). A doubtful native.

S. ANGLICUM, L.—Common on the low rocks near the sea. Davidson says it is rare at Gairloch.

*S. ACRE, L.—Kinlochewe, and certainly native at Applecross, where a large form was seen.

: S. REFLEXUM, L.—In a rocky plantation opposite the mansion-house of Kishorn. This and *S. glaucum* (whatever that may be) are given in Dixon's list.

*DROSERA ROTUNDIFOLIA, L.—Abundant, and in the sunny summer of 1893 in plentiful flower.

*D. OBOVATA, Mert. and Koch.—In several localities in Glen Torridon, by Loch Coulin, Loch Maree, and in Kintail. I now think it is a hybrid of *D. rotundifolia* and *anglica*.

D. ANGLICA, Huds.—Gairloch (Davidson). Rather common in the wetter bogs, and in many places even more plentiful than *D. rotundifolia*, and, like that plant, profusely flowering in 1893.

(D. LONGIFOLIA, L. = D. INTERMEDIA, Hayne. — The reference in "Scottish Naturalist," 1891, p. 186, to the occurrence of this species is a misprint for *D. obovata*.)

*MYRIOPHYLLUM ALTERNIFOLIUM, DC.—Loch Maree, River Carron, Loch Coulin, Loch Achall, and common in most of the fresh water lochs.

(CALLITRICHE VERNA.—A misnomer in the Applecross list.)

* C. STAGNALIS, Scop.—Common; and as the var. *platycarpa*.

* C. HAMULATA, Kuetz.—In a pool near Loch Alsh; a drawn-out form in Loch Achall; in a pool near the summit level of the Beallach na bo Pass, at about 2000 feet; and as a small condensed form in Loch a Mhuilinn.

EPILOBIUM ANGUSTIFOLIUM, L.—Given in the Applecross list, and also in Dixon's list of Gairloch plants. On the Cnochan rocks, undoubtedly native.

* E. PARVIFLORUM, Schreb.—On the limestone pavement, and in other places about Applecross; and about Kishorn, also on limestone.

* E. MONTANUM, L.—Not uncommon; and as the var. *minor*, Haussn., at Kinlochewe and Inverlael; and as the hybrid *E. montanum* × *obscurum* at Kinlochewe and Ullapool.

* E. OBSCURUM, Schreb.—Not rare. Strome, Kishorn, Kinlochewe, Dundonnell, Braemore, etc.; and rather common about Applecross as the upright plant, which suggests *E. tetragonum;* also as the hybrid *obscurum* × *palustre* at Applecross and Kinlochewe. *E. obscurum* × *parviflorum* was also seen at Kinlochewe.

* E. PALUSTRE, L.—Abundant, and as the var. *fontanum*, in the Beallach na bo Pass.

E. ALPINUM, L.—Rather rare. Mountains near Little Loch Broom (Dr. Lightfoot). I saw it on An Teallach, and in the Beallach na bo Pass, on the Slioch, and on Ben Eay and Lieuthgoch.

(E. ALSINÆFOLIUM, Vill.—Given in Dixon's list, and I have an impression that I saw it on Ben Eay, but it should be verified.)

CIRCÆA ALPINA, L.—At the foot of the mountains about Loch Broom (Dr. Lightfoot). Still there, and not unfrequent by Loch Maree, on the sea beach at Applecross, about Dundonnell, and in Strathcarron. On the shore of Loch Maree it was very dwarfed.

* HYDROCOTYLE VULGARIS, L.—Not at all common. By Loch Maree, and as the floating form. In 1893 I only noticed it at Applecross.

* SANICULA EUROPÆA, L.—Strome, Loch Maree side, Ullapool, Jeantown, Applecross, etc.

: ÆGOPODIUM PODAGRARIA, L.—Near habitations at Jeantown, Ullapool, and Applecross.

APIUM NODIFLORUM, Reichb.—Gairloch (Davidson).

* CONOPODIUM DENUDATUM, Koch.—Locally common.

: MYRRHIS ODORATA, Scop.—In Dixon's list, how far naturalised I cannot say, as I have not seen it in the county.

* CHÆROPHYLLUM TEMULUM, L.—Rare. Loch Duich side, and near Jeantown, a doubtful native.

CICUTA VIROSA, L.—Glen Shiel (Davidson). I saw *Œnanthe crocata* there; but *Cicuta* occurs in the Hebrides, so the record may be correct.

* SCANDIX PECTEN-VENERIS, L.—Colonist, or perhaps not more than a casual. A few specimens near Strathcarron. Dixon gives it in his list.

* ANTHRISCUS SYLVESTRIS, Hoffm.—Very local. So far as my observation goes, it is confined to the limestone of Kishorn and Applecross. Dixon gives it in his list, but I have not seen it by Loch Maree.

(CRITHMUM MARITIMUM, L.—Given, like so many other plants in Dixon's list, on, I am afraid, very slender evidence. Probably *Salicornia* was meant.)

* ŒNANTHE CROCATA, L.—Local. Loch Duich and Loch Alsh, near Ullapool, and at Applecross and Kishorn not unfrequent.

(Œ. LACHENALII, Gmel.—Gairloch (Davidson.)

* ÆTHUSA CYNAPIUM, L.—Colonist or casual. Rare. Between Jeantown and Strathcarron, and at Kishorn. In Dixon's list.

(MEUM ATHAMANTICUM, Jacq.—Only in Dixon's list.)

LIGUSTICUM SCOTICUM, L.—Given in the Applecross and Gairloch lists. I only saw it on a small tract of sand near Polglas, in Coigach.

* ANGELICA SYLVESTRIS, L.—Common, and widely distributed.

* HERACLEUM SPHONDYLIUM, L.—Attadale, Applecross, etc.

DAUCUS CAROTA, L.—In the Applecross list. It is apparently scarce. I saw it on the small tract of sand near Polglass. It is probably the *D. maritimus* of Mr. Dixon's list.

* CAUCALIS ANTHRISCUS, Huds.—About Jeantown and Applecross; rare.

* HEDERA HELIX, L.—Rare. On the Slioch, Strathcarron. Native.

(LINNÆA BOREALIS, L.—In one of the islands in Loch Maree (Davidson). Needs confirmation.)

: * SAMBUCUS NIGRA, L.—Strome, Jeantown, etc.; a very doubtful native.

* VIBURNUM OPULUS, L.—Seen by me at Strome and Kinlochewe in 1880, but accidentally omitted from my list. Recorded in ed. ii. of "Topographical Botany" on the authority of Mr. Stables. I have seen it near Ullapool, Applecross, and Kishorn.

* ADOXA MOSCHATELLINA, L.—Very rare. Cnochan rocks, 1894.

* LONICERA PERICLYMENUM, L.—On the slopes of Slioch, at Ullapool, Strathcarron, etc. Not uncommon.

CORNUS SUECICA, L.—Loch Broom mountains (Lightfoot), plentiful on Slioch, also on An Teallach and in Strathcarron.

GALIUM BOREALE, L.—"Topographical Botany" (G. C. Smith).—Sgurr Fhuaran, Beallachnabo, An Teallach, Ben More, Rhidorroch, etc.

* G. VERUM, L.—Local, and absent from a large area of the county. It was not unfrequent on the shingle at Ullapool, at Applecross, and in a few localities at Strathcarron. On the limestone near Loch Achall, and at Kishorn.

* G. HERCYNICUM, Weig. (*G. saxatile*, L. Sp. Pl. ed. ii., not of ed. i.).—Very common. An unusually large form at Dundonnell.

: * G. ERECTUM, Huds.—In a grass field near Strathcarron; possibly introduced with grass seeds.

* G. PALUSTRE, L.—Rather common. Var. *Witheringii*, Sm., at Braemore, etc. A small, thick-leaved form occurred on shingle at Torridon; it is probably the var. *microphyllum*, Lange.

(G. ULIGINOSUM, L.—In Dixon's list.)

* G. APARINE, L.—Rather rare. Strome, Ullapool, Applecross.

* Asperula odorata, L.—Strome, Ullapool, Jeantown, Dundonnell.

Sherardia arvensis, L.—Strome Ferry (E. F. Linton). Probably a colonist or casual. Also at Kinlochewe. See Journ. Bot., 1888, p. 21, as the type plant, not the var. *Wallravenii.*

(Valeriana dioica, L. — In Dixon's list. Almost certainly an error.)

* V. officinalis, L.—Common as the var. *sambucifolia.* It is especially abundant about the ravine of Braemore, and is also found at a considerable elevation on mountain cliffs.

* Scabiosa Succisa, L.—Common, and generally distributed, ascending to nearly 3000 feet.

(S. Columbaria, L.—Given in the Applecross and in Dixon's list of Gairloch plants; in both cases probably a misnomer.)

: S. arvensis, L.—Very rare, and probably a casual or colonist, as at Dornie and Kinlochewe.

* Solidago Virgaurea, L.—Abundant, and generally distributed. The var. *cambrica* (Huds.) is also frequent. The var. *angustifolia,* Gaudin, also occurs, as on Slioch, and in very fine condition by the river at the head of Loch Broom.

* Bellis perennis, L.—Not uncommon.

* Aster Tripolium, L.—Loch Torridon (Journ. Bot., 1888, p. 21), Strathcarron, Jeantown, and Applecross. One or two specimens of the form *discoidea* also were seen.

Antennaria dioica, Br. ("Topographical Botany," Ch. Babington).—Not uncommon. The var. *pedicellata* occurred on mountains by Strathcarron, etc.

* Gnaphalium uliginosum, L.—Rare. Kishorn.

* G. sylvaticum, L.—Courthill, Kishorn. Rare.

* G. supinum, L.—Not common. On Sgurr Fhuaran, Beinn Fhada, Beallach na bo, Beinn Eigh.

* Achillea Millefolium, L.—Common, and generally distributed. The var. *rubra* at Kishorn, and a very downy form in Glen Bianasdail.

* A. Ptarmica, L.—Common, and widely distributed.

* Chrysanthemum segetum, L.—Locally abundant in corn fields, but probably introduced at no very distant period.

* C. LEUCANTHEMUM, L.—Not common. Attadale, Ullapool, Applecross, and Kishorn, etc.

* MATRICARIA INODORA, L.—Common, and as a very large flowered plant.

(M. CHAMOMILLA, L.—Given in Dixon's list.)

: TANACETUM VULGARE, L.—Side of Gairloch (Dr. Lightfoot). Given in Dixon's list. I saw it as a garden escape at Jeantown.

(ANTHEMIS MARITIMA, L., is given in Dixon's list; probably *Matricaria inodora* was intended.)

(ARTEMISIA ABSINTHIUM, L.—Given in the Applecross list, but very likely *A. vulgaris* was mistaken for it. If the former really occurred it was not a native.)

* TUSSILAGO FARFARA, L.—Not common. Kinlochewe, Dundonnell, Ullapool, Kishorn, etc.

* PETASITES OFFICINALIS, Mœnch.—Rare. South side of Loch Duich.

: DORONICUM PARDALIANCHES, L.—Shiel. A garden straggler.

* SENECIO VULGARIS, L.—Not common. Kinlochewe, Ullapool, Jeantown, etc.

* S. SYLVATICUS, L.—Local and rather rare. Often on cottage roofs at Ullapool and Jeantown.

* S. JACOBÆA, L.—Very common. A short-rayed form also occurred.

* S. AQUATICUS, Huds.—Common.

(? ARCTIUM MAJUS, Schk.—In the Applecross list. My Torridon plant was a form of *intermedium.*)

* A. INTERMEDIUM, Lange.—Kinlochewe, Torridon, and Jeantown.

* A. MINUS, Schk.—Mollan, Ullapool, Jeantown.

(CARDUUS NUTANS, L.—In Dixon's list. Probably an error.)

* CNICUS LANCEOLATUS, Willd. Abundant. The var. *nemorale*, Reichb., occurred at Kinlochewe.

* C. PALUSTRIS, Willd.—Abundant. Sometimes with whitish flowers.

C. HETEROPHYLLUS, Willd.—Not very common. Loch Maree side, Ullapool, etc. See "Top. Bot.," ed. i.

* C. ARVENSIS, Willd.—Common, and occasionally with white flowers. The var. *mitis*, Koch., was seen at

Jeantown, and the var. *horridus*, Koch., at Strathcarron, Kishorn, etc.

SAUSSUREA ALPINA, DC.—Rare. On Sgurr Fhuaran, Sgurr na Caorach. No personal authority for this plant is given in "Topographical Botany." The flowers have a powerful heliotrope odour.

* CENTAUREA NIGRA, L.—Common, and widely distributed.

* C. CYANUS, L.—Rare, and perhaps only a casual. Kinlochewe. Dixon gives it in his list of Gairloch plants.

* LAPSANA COMMUNIS, L.—In scattered localities through the county, and indubitably native. A more pubescent form was found on the shingle at Ullapool.

* CREPIS VIRENS, L.—Strome, Ullapool, Applecross, etc. The var. *agrestis*, Kit., occurred at Ullapool and Jeantown. Dixon gives *C. tectorum*, L., as well as *C. virens* in his list, but *C. tectorum* is not a British plant.

* C. PALUDOSA, Mœnch.—Common, and widely distributed.

* HIERACIUM PILOSELLA, L.—Not common. North side of Loch Duich.

* H. MELANOCEPHALUM, Tausch. (*H. alpinum*, L.).—Ben Eay. Rare. The specimens were much over flower.

* H. HOLOSERICEUM, Backh.—Rare. Ben Eay.

(?* H. GLOBOSUM, Backh.—Some specimens of apparently this species occurred on Ben Eay, but they were too far gone over to be identified with certainty.)

* H. CHRYSANTHUM, Backh.—On Ben Eay, Sgurr Fhuaran, An Teallach, etc.

* H. EXIMIUM, Backh., var. TENELLUM, Backh.—Ben Eay. Rare. Specimens much gone over, of what were probably the type plant, were seen on Ben Eay.

* H. LINGULATUM, Backh.—A rather frequent montane hawkweed, as on Ben Eay, the Slioch, An Teallach, Meall Gorm, Sgurr na Caorach, etc. It reached nearly 3000 feet on the Slioch.

* H. NIGRESCENS, Willd.—Ben Eay and the Slioch.

* H. ANGLICUM, Fr.—Common on the mountains, and in the ravines in sub-alpine districts. Var. *longibracteatum*, Hanb.—Loch Broom side near Ullapool, and Beallach na bo.

* H. IRICUM, Fr.—Apparently rare or local, and only

noticed by me on the limestone, as at Kishorn; by the river in the limestone gorge at Ullapool; and on the Cnochan rocks.

(? H. PALLIDUM, Fr.—A plant, in seed, of what is probably this species was seen by the river north of Ullapool.)

* H. MURORUM, L.—Not uncommon, as at Strome, Ullapool, Braemore, Dundonnell, Kishorn, Jeantown, etc. A very handsome form occurred by the ravine of Braemore. Var. *ciliatum*, Almq.—Beallach na bo Pass.

* H. CAESIUM, Fr.—Sgurr Fhuaran. The specimen was so named by Boswell Syme.

* H. VULGATUM, Fr.—Abundant, and generally distributed.

* H. RUBICUNDUM, Hanb.—Near Ullapool.

* H. DURICEPS, Hanb.—Strathcarron, but scarcely typical.

* H. SPARSIFOLIUM, Lindb.—Rare. By the river Broom at the head of Loch Broom; and the form with blotched leaves "f. *aberrans cruentata*."

* H. CROCATUM, Fr.—North side of Loch Duich, near Loch Torridon.

* H. AURATUM, Fries.—Banks of the river at Ullapool, and by the river Carron.

* H. RETICULATUM, Lindb.—Rare. By the river at Ullapool.

* H. EUPATORIUM, Griseb.—By the stream at Applecross, a form approaching *H. reticulatum*.

* H. PRÆLONGUM, Lindb.—Rare. By a stream near Kinlochewe.

* HYPOCHÆRIS RADICATA, L.—Abundant and variable. As I came down the Beallach na bo Pass, I saw across the bay of Kishorn a bright band of yellow flowers below the mansion-house; since I could not understand what it was I visited the place, and found it to be caused by a quantity of *Hypochæris*, which grew at the junction of the limestone with a bed of clay.

* LEONTODON AUTUMNALIS, L.—Abundant; var. *pratensis*, Koch., also common. A form with deeply cut leaves occurred by the roadside near Broom and also at Dundonnell. The form with woolly involucres is by no means confined to the mountains, it grew by the sea near Ullapool. The alpine form, with black, woolly involucres, is common on the higher mountains.

* Taraxacum officinale, Web.—Common. Var. *palustre*, DC., not unfrequent.

* Sonchus oleraceus, L.—Loch Carron side, Kinlochewe.

* S. asper, All.—A very prickly form grew on the shingle at Ullapool, it is probably the var. *pinnatifidus*, Peterm.

* S. arvensis, L.—Rare, and probably only a colonist. Dornie and Dundonnell.

Lobelia Dortmanna, L.—See "Topographical Botany." Not rare in the lochs, as Achall, Clare, etc.

(? Wahlenbergia hederacea, Reichb.—Given as a doubtful native in Dixon's list. Was it rightly named ?)

(Campanula rapunculoides, L.—Included in Dixon's list.)

* C. rotundifolia, L.—Very rare, and local. Kintail, v. s. Not seen about Ullapool, Strathcarron, or Applecross.

* Vaccinium Oxycoccos, L.—Very rare, moorland above Loch Long. The cranberry is given in Dixon's list.

* V. Vitis-idæa, L.—Not uncommon, as on the lower slopes of Slioch, Ben More, Braemore, etc. This is the "cranberry" of northern Scotland.

V. uliginosum, L.—Loch Broom mountains (Lightfoot). On Sgurr Fhuaran, An Teallach, in good flower, Ben Eay, Meall Gorm, and probably occurs on most of the higher mountains.

* V. Myrtillus, L.—Not uncommon.

Arctostaphylos alpina, Spreng.—"To the south of Little Loch Broom, and between that lake and Loch Mari, Coygach, Bennaish" (Lightfoot). I have found this plant in many situations between 1600 and 2000 feet on the rather bare and exposed shoulders of mountains, as on Ben Eay, An Teallach, and on the mountains on the northern side of Strathcarron, where it was very profuse on one ridge at about 2000 feet, but quite burnt up by the hot sun of the abnormal year 1893; it was associated with *Loiseleuria procumbens*.

* A. Uva-ursi, Spreng.—Lieuthgoch, Ben Eay, Slioch, An Teallach, etc. Var. *angustifolia*, a form with much narrower leaves, occurred on An Teallach.

* Calluna Erica, DC.,—Too abundant; ground covered with heather or bracken afford little variety of plants to

the botanist. The var. *incana* also occurs. The form with white flowers was rather common on the lower slopes of Ben Eay and in one of the Summer islands.

* Erica Tetralix, L.—Abundant on the moorlands and bogs, also with white flowers.

* E. cinerea, L.—Common, rarely with white flowers, as in Glen Torridon.

Loiseleuria procumbens, Desv.—"Topographical Botany;" see also Murray's "Northern Flora, Hills of Ross-shire" (G. C. Smith). It is rather frequent on the higher hills, as Sgurr Fhuaran, An Teallach, etc.

* Pyrola media, Sw.—Glenelg, v. sp.

P. minor, L. ("Topographical Botany").—Doubtless on the authority of Lightfoot, who records it from Little Loch Broom. Dixon includes it in his list.

P. secunda, L.—Recorded by Lightfoot "from a wood called Ca-buch . . . , near Little Loch Broom, and about Loch Mari." I found it on some limestone rocks by the river Ullapool.

* Armeria maritima, Willd.—Common on the coast in many places, also on the higher hills, as Meall Gorm, An Teallach. A small, narrow-leaved form was seen near Applecross, but it was not *A. sibirica*, Turc. On the Slioch the var. *planifolia* occurred.

* Primula acaulis, L.—Not unfrequent in the wooded straths.

* Lysimachia nemorum, L.—Loch Maree side, Braemore, Applecross, Dundonnell, etc.

Trientalis europæa, L.—Mentioned in Dixon's list. It is a plant which is very likely to be found, but it must be very local, as so far it has eluded me. My journeys have been made rather late in the year.

* Glaux maritima, L.—In many places on the coast, as by Loch Torridon, Loch Carron, Applecross, and Ullapool.

Anagallis tenella, L.—Given in the Applecross and Gairloch lists. It must be local, since I have not observed it.

* Fraxinus excelsior, L.—Not rare, and undoubtedly native.

: Ligustrum vulgare, L.—Probably planted, as at Strome, etc.

* Gentiana Amarella, L. ("Topographical Botany").—Apparently rare. On the limestone near Loch Dearg as a branched form, the f. *multicaulis*, Lange.

* G. campestris, L.—Local and rare. Near Loch Torridon.

* Menyanthes trifoliata, L.—Loch Maree, Ullapool, Applecross, etc.

(? Symphytum officinale, L.—Given in the Applecross list; if correctly named it is probably only an escape from cultivation.)

: S. peregrinum, Led.—The fodder plant which has been thus named occurred as a straggler from cultivation near Inverlael.

* Lycopsis arvensis, L.—In cultivated ground at Dundonnell and Ullapool.

* Mertensia maritima, Gray.—Side of Loch Duich, v. s. Given in Dixon's list.

* Myosotis maritima, Fries. (*M. cæspitosa*, Schultz.).—Common.

M. repens, Don.—Near Kinlochewe (C. Bailey, in the Rep. of Record Club, 1883). Strathcarron, Applecross, Duncraig.

(? M. palustris, With., is given in the Applecross list. It may possibly be correct, but more likely is a misnomer for *M. cæspitosa* or *M. repens*.)

* M. scorpioides, L. (*M. arvensis*, Roth.).—Kinlochewe, Ullapool, Applecross, Jeantown, etc.

* M. collina, Roth. (*M. hispida*, Schlecht.).—Kinlochewe, Ullapool.

* M. versicolor, Roth.—Not uncommon. The var. *Balbisiana*, Jord., with all the flowers yellow, occurred at Lubavadie.

: Volvulus sepium, Jung.—On the shingle about Jeantown, principally as the var. *colorata* (Lange). Most likely of garden origin.

: Atropa Belladonna, L.—Given in Dixon's list. It is stated in Anderson's "Guide to the Highlands and Islands of Scotland" to grow in one of the islands in Loch Maree. It is not native.

: Linaria Cymbalaria, L.—On a wall in Ullapool, planted.

(SCROPHULARIA AQUATICA, L.—Given in Dixon's list; doubtless an error.)

* S. NODOSA, L.—Achnashellach, Kinlochewe, Inverlael, Applecross, Dundonnell, Duncraig, etc.

: MIMULUS LUTEUS, DC.—In the Gairloch list. The var. *guttatus*, DC., I found by a small stream near Lienassie, and not near any houses.

* DIGITALIS PURPUREA, L.—Widely distributed.

(VERONICA HEDERÆFOLIA, L.—Given in Dixon's list. So far I have not seen it.)

* V. DIDYMA, Ten. (*V. polita*, Fries.). — Jeantown. Colonist or casual.

* V. AGRESTIS, L.—Kinlochewe, near Ullapool, in the latter locality in two forms.

* V. ARVENSIS, L.—Rather rare. Loch Broom side, Kinlochewe, Strome.

* V. SERPYLLIFOLIA, L.—Not uncommon.

* V. HUMIFUSA, Dicks.—A Glas-Bheine. Also on the Slioch.

* V. OFFICINALIS, L.—Glen Docharty, Kishorn, Braemore, not uncommon.

* V. CHAMÆDRYS. L.—Common.

* V. SCUTELLATA, L.—Loch Clare, Ullapool, Applecross, etc., but always as the glabrous plant.

* V. ANAGALLIS-AQUATICA, L.—Rare. Only noticed at Kishorn, near Courthill, as the var. *anagalliformis*, Boreau, which has the inflorescence covered with glandular hairs.

* V. BECCABUNGA, L.—Rather rare. Dornie, Ullapool, Jeantown, and Applecross. The flowers appear to be rather deeper in tint than those of the Midland plant.

* EUPHRASIA OFFICINALIS, L.—The aggregate plant is common. Var. *Rostkoviana*, Hayne, f. *borealis*, Townsend.—Glen Torridon, Ullapool, Applecross, etc. Koch in Synopsis Fl., Germ., ed. ii., reduced *E. Rostkoviana* to var. *pratensis*. Var. *gracilis*, Fries.—Glen Bianasdail, also at Slattadale (see Rep. of Rec. Club (C. Bailey), 1883).

* BARTSIA ODONTITES, Huds.—Loch Duich, Jeantown, Applecross, and Kishorn. Local, and always as the var. *Odontites verna*, Reichb.

* PEDICULARIS PALUSTRIS, L.—Common.

* P. SYLVATICA, L.—Common. I saw it flourishing on

the turf-covered top of a wall by Braemore. The white-flowered form was not uncommon on the moorland near the Falls of Glomak.

MELAMPYRUM PRATENSE, L.—Loch Maree side, Braemore, Dundonnell, Drumroonie, etc., but not so common in Western Ross as in some of the other Scotch counties. The var. *montanum*, Johnston, occurred on An Teallach, etc.

(? M. SYLVATICUM, L.—Doubtfully recorded by me from a wooded rock near Strome, but it may have been a yellow-flowered form of *M. pratense*, *i.e.* var. *hians*. Dixon records it in his list of Gairloch plants.)

* RHINANTHUS CRISTA-GALLI, L.—Not uncommon, and usually as the var. *angustifolia*, Koch. The mountain form, var. *Drummond-Hayi*, Buch. White, occurred on the Slioch, An Teallach, etc.

OROBANCHE RUBRA, Sm. (*O. Epithymum*, DC.).—In an island near the mainland at Gairloch (Bowman) in "New Botanical Guide." It is included in the Gairloch list.

* UTRICULARIA NEGLECTA, Lehm. — Rare. In Loch a Mhuilinn.

* U. MINOR, L.—With the above, not in flower.

U. INTERMEDIA, Hayne.—In "Topographical Botany" (Churchill Babington). I saw it in Glen Torridon.

* PINGUICULA VULGARIS, L. — Common. The var. *alpicola*, Reichb., which is a very large-flowered form with more contiguous petals, occurred on the north-western slopes of A Glas-bheine, in Kintail. Boswell Syme said he had never seen any British specimen like it before.

P. LUSITANICA, L.—Recorded in Hooker's "Flora Scotica" and "New Botanical Guide." It is not rare. It occurs in Gairloch, Kintail, Ullapool, etc.

(MENTHA LONGIFOLIA, Huds. (*M. sylvestris*, L.), is given in Dixon's list. An almost certain error.)

: M. VIRIDIS, L.—On the beach at Jeantown as an outcast from gardens.

(M. PIPERITA, Huds. — Another misnomer, which is recorded in the Gairloch list.)

* M. HIRSUTA, Huds.—Glen Docharty, Ullapool, Applecross, Kishorn, etc.

* M. SATIVA, L.—Rare. Applecross. It is given in Dixon's list, but probably not correct.

* M. ARVENSIS, L.—Loch Duich side. Rare.

* LYCOPUS EUROPÆUS, L.—Kintail, 1880.

* THYMUS SERPYLLUM, L.—Common, and generally distributed. The so-called var. *prostatum*, Hornem., Glen Torridon, 1886 (teste, Mr. Arth. Bennett). I saw it in the Beallach na bo Pass, it is probably not uncommon.

(NEPETA CATARIA, L.—Another of the misnomers of the Gairloch list).

* N. GLECHOMA, Benth.—Ullapool, Applecross, Dundonnell, not common.

* SCUTELLARIA GALERICULATA, L.—Strome, Jeantown, and Applecross. The flowers are rather more brightly blue than those of our Midland plant, the calyx is densely hairy.

* PRUNELLA VULGARIS, L.—Common. The flowers are distinctly larger than those of our Midland plants.

* STACHYS PALUSTRIS, L.—Not uncommon. The var. *canescens*, Lange., occurred at Kinlochewe and Ullapool, in corn fields.

S. AMBIGUA, Sm.—Near Jeantown (Hooker's "Flora Scotica"). I gathered it in very fine condition in Jeantown, growing with both the assumed parents, in 1893.

* S. SYLVATICA, L.—Not common. Kinlochewe, Applecross, and Jeantown.

S. ARVENSIS, L.—Found by Mr. Ewing in 1887. It was rather plentiful in a few corn fields and garden ground at Ullapool.

GALEOPSIS SPECIOSA, Mill.—Discovered by Churchill Babington, and included in Dixon's list, but I have not seen it in the county.

* G. TETRAHIT, L.—Dornie, Kinlochewe, Ullapool, Dundonnell, Applecross, Jeantown, etc. The var. *bifida*, Bœnn., is also not rare, or rather is the prevailing plant.

* LAMIUM AMPLEXICAULE, L.—Rare. Coulna Craig, Ullapool.

* L. INTERMEDIUM, Fries.—Not uncommon.

* L. PURPUREUM, L.—Rare. Dornie, Strathcarron. Dixon also includes it in his list.

(L. ALBUM, L.—Given in Dixon's list, but probably a misnomer—a white-flowered form of *intermedium* may have been mistaken for it).

* TEUCRIUM SCORODONIA, L.—Common.

* AJUGA REPTANS, L.—Not uncommon. Kinlochewe, Strathcarron, Jeantown, Applecross, etc.

(A. PYRAMIDALIS, L.—Given in Dixon's list, and it is a likely plant to occur).

* PLANTAGO MAJOR, L.—Common, often as the var. *P. intermedia*, Gilib.

* P. LANCEOLATA, L.—Common and variable. As the var. *capitata*, Presl., and var. *repens*, Lange, on rocks near Jeantown; and the var. *eriophylla*, Dcne.

* P. MARITIMA, L.—Common, not only by the coast, but also inland, and ascending to a considerable height on the hills. Two or three forms occur, one of them the var. *pygmæa*, Lange.

P. CORONOPUS, L.—Found by Mr. Ewing in 1887; it is also included in the Gairloch list, but so far I have not met with it.

* LITTORELLA JUNCEA, Bergh.—Not uncommon by the loch borders, as in Loch Maree, Mhuilinn, Achall, etc.

* SCLERANTHUS ANNUUS, L.—Kinlochewe. Rare, and only a colonist or casual, so far as my observation goes.

* CHENOPODIUM ALBUM, L.—Not uncommon in cultivated fields and waste places. The var. *C. candicans*, Lamk. (var. *incanum*, Moq. Tand.), was seen at Ullapool, Strathcarron, etc. The var. *C. paganum*, Reichb. (var. *cymosum*, Chev.), also occurred at Ullapool, Dundonnell, Jeantown, etc.

(? C. MURALE and C. URBICUM, L., are erroneous records given in Dixon's list.)

* C. BONUS-HENRICUS, L.—Rare. Dornie, not far from houses.

* ATRIPLEX PATULA, L.—In cultivated ground, as at Jeantown, Ullapool, etc. Var. *angustifolia* (Sm.). Apparently rare, Ullapool.

* A. HASTATA, L.—Strome and Ullapool.

* A. BABINGTONII, Bab.—Very common as a shore weed, and often as the var. *virescens*, Lange, as at Torridon, Ullapool, Loch Broom.

SALICORNIA HERBACEA, L.—Found by Mr. Ewing in 1887. Plentiful by Loch Carron below Jeantown, also seen at Applecross.

SUEDA MARITIMA, Dum.—Recorded from Loch Broom by Lightfoot as *Chenopodium maritimum*. It also occurs by

Loch Carron as the var. *erecta*, Moq. Tand., and as the var. *vulgaris*, Moq. Tand. The latter is the more frequent form. Applecross, Kishorn, and Little Loch Broom also yield it.

(SALSOLA KALI, L.—Given in Dixon's list, and very likely to occur.)

* POLYGONUM CONVOLVULUS, L.—Rare, and little more than a casual. Kinlochewe. It is also marked in Dixon's list.

* P. AVICULARE, L.—Not uncommon. The varieties *agrestinum*, *vulgatum*, *arenastrum*, *rurivagum*, and *litorale* have been noticed by me in the county.

(P. MARITIMUM, L.—Is given in Dixon's list, evidently in error, a maritime form or variety of *aviculare* having doubtless been mistaken for it.)

* P. HYDROPIPER, L.—Rather common.

* P. PERSICARIA, L.—Widely distributed.

* P. LAPATHIFOLIUM, L.—In several corn fields, as at Ullapool, Dornie, Kinlochewe, Jeantown, Applecross, etc.

* P. AMPHIBIUM, L.—Rare. The land form at Dornie alone noticed.

P. VIVIPARUM, L.—Given in Dixon's list, but this common plant of sub-alpine pastures I did not see till 1894, when I found it on the Cnochan rocks.

* OXYRIA DIGYNA, Hill.—On many of the higher hills, and often brought down by mountain streams to low levels. I have seen it on Sgurr Fhuaran, An Teallach, Meall Gorm, the Slioch Beinn Eigh (Ben Eay), on the sea-beach at Applecross, and near Duncraig Castle, close to the sea-level.

* RUMEX CONGLOMERATUS, Murr.—Scattered through the county.

* R. OBTUSIFOLIUS, L.—About houses, as at Strathcarron, Jeantown, Dornie, Ullapool, Achnashellach.

* R. ACUTUS, L.—Rare. Strathcarron.

* R. CRISPUS, L.—Common. As the var. *trigranulatus* (Syme), at Jeantown and Ullapool.

* R. DOMESTICUS, Hartm.—Local, occurs in the neighbourhood of the station at Strathcarron, with a plant which is probably *R. propinquus*, Aresch.

* R. CONSPERSUS, Hartm.—Strathcarron.

* R. ACETOSA, L.—Common, and widely distributed.

* R. ACETOSELLA, L.—Common, and generally distributed.

* EUPHORBIA HELIOSCOPIA, L.—Rare, and only a colonist. Kinlochewe, Dundonnell.

* E. PEPLUS, L.—Colonist. Garden ground at Kinlochewe and Strathcarron.

* MERCURIALIS PERENNIS, L.—Rare. Kintail.

* ULMUS CAMPESTRIS, L. (*U. montana*, Sm.).—Probably native. Loch Duich, Strathcarron, Applecross, and Dundonnell.

* U. SUBEROSA, Ehrh.—Planted in many places.

* URTICA DIOICA, L.—Usually about houses; widely distributed.

U. URENS, L.—Recorded by Mr. Ewing in 1887. Common about Ullapool and Jeantown.

* MYRICA GALE, L.—Common.

* BETULA ALBA, L.—Not uncommon. Loch Duich, Kinlochewe, Applecross, etc.

* B. GLUTINOSA, Fries. (*B. odorata*, Bechst.).—In the Straths. Var. *parvifolia*, Wimm.—Kinlochewe, Strathcarron, Rhidorroch.

(? B. NANA, L.—Loch Glass (Dr. Lightfoot). Loch Glass is, however, in East Ross. It is included in Dixon's list, and is given in "Topographical Botany" without personal voucher.)

* ALNUS GLUTINOSA, Gaertn.—Common in the valleys.

* CORYLUS AVELLANA, L.—Not common. Strome, Kinlochewe, Loch Broom, etc.

* QUERCUS ROBUR, L., var. FŒMINA, Mill.—Kinlochewe, Dundonnell, Jeantown, Applecross.

Q. PEDUNCULATA, Ehrh., was not noticed by me, but the oak is so frequently barren in Ross that I may have overlooked this variety.

: FAGUS SYLVATICA, L.—Occurs only as a planted tree.

(SALIX PENTANDRA, L.—Given in Dixon's list, but I have not observed it.)

: * S. ALBA, L.—Occurs as a planted tree at Jeantown, etc.

* S. RUBRA, Huds.—Probably as a planted tree. I noticed it at Kinlochewe and Inverlael.

* S. VIMINALIS, L.—Possibly native. Strome, Loch Broom, Jeantown, etc.

* S. SMITHIANA, Willd.—Loch Broom, but very likely planted.

* S. RUGOSA, Leefe.—Probably planted. At Kinlochewe.

* S. CINEREA, L.—Common and variable.

* S. AURITA, L.—Rather frequent, sometimes as the var. *minor*, Sond.

* S. CAPREA, L.—Not uncommon, but much less frequent than *S. cinerea*.

(S. NIGRICANS, Sm., is given in Dixon's list, and it may probably be correct, but it evidently is not common, as I have been unable so far to detect it.

(S. PHYLICIFOLIA, L., is given in the Applecross list. I was unable to see it on either of my visits to the county. It had better be queried, since forms of *S. cinerea* are frequently mistaken for it.)

* S. AMBIGUA, Ehrh. (*S. aurita* × *repens*).—Rare. Near Kishorn. It is given in Dixon's list, but this Gairloch record will have to be verified.

* S. REPENS, L.—Rather scarce. Ben Eay, Kishorn.

S. LAPPONUM, L.—In "Topographical Botany" on the authority of Mr. Campbell. I have not seen it in the vice-county.

S. HERBACEA, L.—Given in "Topographical Botany" without personal authority. It occurs on most of the higher mountains, as Ben Eay, the Slioch, An Teallach, Meall Gorm, and on a mountain in Strathcarron at about 2000 feet, with very much larger leaves.

(S. RETICULATA, L.—Included in the Gairloch list, but the record must be verified. *S. aurita* was probably the plant seen.)

* POPULUS TREMULA, L.—Native, and widely distributed; and as the var. *glabra*.

*: P. NIGRA, L.—Planted, as at Ullapool, Jeantown, Loch Duich, etc.

* EMPETRUM NIGRUM, L.—Abundant.

JUNIPERUS COMMUNIS, L.—Given in the lists of Mr. Dixon and Mr. Allan, but I have no memorandum of having seen it in the vice-county.

* J. NANA, Willd.—On the Slioch, Ben Eay, Ullapool, Strathcarron, etc., also as a form approaching *J. communis*.

PINUS SYLVESTRIS, L.—Undoubtedly native. Remains of ancient trees are to be seen in many of the peat bogs. Lightfoot recorded it from Loch Maree in the "Flora Scotica," where it still occurs. This tree probably supplied the ancient iron-works with fuel.

Malaxis paludosa, Sw.—See "Topographical Botany" without personal authority. In Glen Docharty growing with *Hypnum revolvens*, rather common on the shores of Loch Maree.

Corallorhiza innata, Br.—"In a moist, hanging wood, on the south side, near the head of Little Loch Broom." (Lightfoot in "Flora Scotica," p. 523).

Listera cordata, Br.—About Little Loch Broom (Lightfoot). I saw this by Loch Maree and on the limestone near Ullapool, and near Dundonnell in Lightfoot's locality; also at Rhidorroch. *Peramium* appears to be the older generic name.

*L. ovata, Br.—Not common, and only noticed on limestone, as at Ullapool, Applecross, Kishorn, and Cnochan.

Goodyera repens, Br.—Recorded by Lightfoot as "*Satyrium repens*, growing amongst the Hypna, in an old, shady, moist, hanging birch wood, called Ca-bue or Yellow-hill, facing the house of Mr. Mackenzie, of Dundonald, about two miles from the head of Little Loch Broom."

Cephalanthera ensifolia, Rich.—Dixon in his list of Gairloch plants states that Dr. Mackenzie, writing of the first quarter of the century, says "the braes and wooded hillocks of Gairloch were a perfect jungle of every kind of loveable shrub and wild flower . . . some of the *Epipactis* tribe being everywhere a lovely drug." "The *Epipactis ensifolia*," says Dixon, "formerly abundant, is now almost unknown. In June 1883 I discovered one plant on a stony bank by water. In 1885 two plants were at the same place."

*Orchis mascula, L.—Strome, Ullapool, Rhidorroch, Cnochan, and Jeantown.

*O. incarnata, L.—Loch Duich, Rhidorroch, etc.

*O. latifolia, L.—Near the sea at Ullapool, Drumroonie, Dundonnell.

*O. maculata, L.—Abundant. Usually with darker coloured flowers than those of the plant from the Midlands.

(? Ophrys muscifera, Huds.—Mr. B. S. Ogle brought a root of an orchis, which he found near Achnashellach, to his garden in Oxfordshire. He believes a plant of the fly orchis, which has flowered there, to be from the Ross-shire root. Confirmatory evidence of its occurrence in the county is needed.)

(HERMINIUM MONORCHIS, Br.—One of the impossible plants of Dixon's list.)

* HABENARIA ALBIDA, Br.—Apparently rare. I saw it on the limestone at Ullapool, and rather plentiful near Rhidorroch.

H. CONOPSEA, Reich.—Recorded by Mr. C. Bailey from Gairloch in 1883. I have seen it at Kishorn, Rhidorroch, Cnochan, Strome, etc.

H. VIRIDIS, Br.—Recorded in the Applecross list. I saw it at Ullapool, Cnochan, and Kishorn on the limestone, also a plant with branched spike.

* H. BIFOLIA, Br.—Loch Torridon, Strome, Loch Duich, Rhidorroch, Duncraig, Dundonnell, etc.

H. CHLOROLEUCA, Ridley.—Recorded in the Gairloch and Applecross lists. I saw it in grass fields near Dundonnell.

* IRIS PSEUDACORUS, L.—Achmore, Ullapool, Kishorn, Applecross, Jeantown, etc.

(ALLIUM OLERACEUM, L.—In the Gairloch list, doubtful.)

* A. URSINUM, L.—Rare. Strome, on steep rocks by the waterfall at Jeantown, and on the Cnochan rocks.

* SCILLA NUTANS, Sm.—Widely distributed.

* NARTHECIUM OSSIFRAGUM, L.—Abundant. The flowers have a perfume like the clove-pink.

TOFIELDIA PALUSTRIS, Huds. — Recorded in "Topographical Botany." I have seen it on the Slioch and Ben Eay.

* JUNCUS BUFONIUS, L.—Common, and as the var. *fascicularis*, Koch.

J. TRIFIDUS, L. — Mountains near Little Loch Broom (Dr. Lightfoot). In "Topographical Botany," without personal authority. It is plentiful on the ridge of Ben Eay, on the Slioch, Ben More, An Teallach, Sgurr Fhuaran, and Meall Gorm. It descends to 1000 feet on a mountain in Strathcarron.

(J. COMPRESSUS, Jacq.—Some specimens which I gathered at Attadale in 1879 were so named by Dr. Boswell Syme, but they were rather young, and I believe them to have been *J. Gerardi.* At anyrate, confirmatory evidence is needed of the occurrence of true *J. compressus* in West Ross.)

*J. Gerardi, Lois.—Common on the sides of Loch Carron by the mouth of the river, at Ullapool, at Kishorn, and Dundonnell.

*J. effusus, L.—Widely distributed.

*J. conglomeratus, L.—Abundant, and generally distributed.

*J. supinus, Mœnch. (*J. bulbosus*, L.).—Common, and generally distributed. Var. *Kochii,* Syme.—Strome Ferry (Rev. E. F. Linton), 1885. Var. *fluitans*, Fries.—Loch a Mhuilinn, etc. Var. *uliginosus,* Roth.—Glen Docharty, Ullapool.

*J. lampocarpus, Ehrh.—Common. Var. *nigritellus,* Don.—Margins of Loch Maree.

*J. sylvaticus, Reich. (*J. articulatus*, L. pp.).—Not uncommon.

J. triglumis, L. — Recorded by Churchill Babington in "Topographical Botany." It is much less frequent on the Ross mountains than on the Cairngorms or the Breadalbane mountains. I saw it on An Teallach, Sgurr Fhuaran, Meall Gorm, etc.

*Luzula vernalis, DC.—Not frequent. Glen Docharty.

*L. maxima, DC.—Widely distributed; plentiful on mountain cliffs and by waterfalls.

L. spicata, DC.—Without personal voucher in "Topographical Botany." On the Slioch, Ben Eay, Ben More, An Teallach, Meall Gorm it has been noticed by me.

*L. campestris, DC.—Common.

*L. erecta, Desf.—Common, and more frequently as the var. *congesta,* Koch. The var. *pallescens,* Koch., was noticed near Braemore.

*Sparganium erectum, L.—Rare. Dornie.

*S. simplex, Huds.—Loch Maree.

*S. affine, Schnizl. (*S. natans*, Hooker et auct. var.).—In some small mountain lochs on Ben Eay; also at 2200 feet on the Slioch. Probably this was Dr. Lightfoot's *S. natans,* seen in lochs between Little Loch Broom and Ledbeg.

*S. MINIMUM, Fries. (*S. natans*, L. herb.).—In a small marshy place near Loch Alsh. I saw no *Sparganiums* in 1893 in Ross.

*LEMNA MINOR, L.—Rare. Kinlochewe. Not seen in 1893.

*TRIGLOCHIN PALUSTRE, L.—Glen Docharty, Ullapool, etc.

*T. MARITIMUM, L.—Common on the shores of Loch Carron, Little Loch Broom, etc.

*POTAMOGETON NATANS, L.—Recorded in the Applecross and Gairloch lists, but how far correctly I cannot say. It is much rarer than the next species, which the above record may have probably intended. The true *P. natans*, L., occurs in Loch a Mhuilinn.

*P. POLYGONIFOLIUS, Pourr.—Abundant both as the ericetal form and as the floating plant.

*P. GRAMINEUS, L. (*P. heterophyllus*, Schreb.).—In Loch a Mhuilinn. The unusual drought made the level of the water much lower, so that some of the plants were growing on the muddy margin of the loch as the form *terrestris* Meyer.

(P. LUCENS, L.—Gairloch, Dixon. Very doubtful; probably the foregoing species.)

*RUPPIA ROSTELLATA, Koch.—In brackish ditches at the head of Loch Carron. *Var. *nana*, Bosw.—Loch Carron, near Jeantown.

(? ELEOCHARIS ACICULARIS, Sm.—Kinlochewe. I should like to have this reaffirmed.)

*E. PALUSTRIS, R. Br.—Loch Clare. Recorded in the Applecross list. I saw it also in a loch on the moorland between Ullapool and Dundonnell, and in Strathcarron.

*E. MULTICAULIS, Sm.—Common, and widely distributed.

*SCIRPUS PAUCIFLORUS, Lightf.—Frequent.

*S. FLUITANS, L.—Loch Coulin, and in a small stream in Loch Carron.

*S. CÆSPITOSUS, L.—Abundant, and generally distributed.

*S. SETACEUS, L.—Kinlochewe 1887, Ullapool, Strathcarron, Applecross, etc., not rare.

S. LACUSTRIS, L. — Glencarron (Mr. Sewell). I have not seen this in the west watershed in Strathcarron; it is not rare in East Ross. It occurs in West Ross at Applecross, in Loch a Mhuilinn and Loch Coulin, and by Loch Duich.

S. MARITIMUS, L.—Kintail ("Collectanea for a Flora of Moray," by Dr. Gordon, 1836, p. 3). I have seen it there as the var. *conglobatus*, Gray. It also occurs at Kishorn with the variety mentioned.

* S. RUFUS, Wahlb.—Plentiful in two or three places on the shores of Loch Carron. The var. *bifolius* (*Blysmus rufus*, var. *bifolius*, Wallroth) also occurred, and appeared to gradually merge into the type.

* ERIOPHORUM VAGINATUM, L.—Abundant, and generally distributed.

* E. POLYSTACHION, L. (*E. angustifolium*, Roth.)—Abundant, and generally distributed. The var. *minus*, Koch, was seen on Slioch, etc. Var. *Vaillantianum*, Poit. et Turp.—Kinlochewe.

E. LATIFOLIUM, Hoppe.—"Topographical Botany," on faith of a specimen sent by Churchill Babington. I have not seen it in West Ross. There is an earlier record, Mr. Arth. Bennett points out, viz. Plockton, 6 miles W.S.W. of Strome Ferry (Mr. Stables). See "Gordon Coll.," p. 3, 1836.

RHYNCOSPORA ALBA, Vahl.—Recorded by Churchill Babington in "Topographical Botany." It is locally common, as in Glen Torridon, Strathcarron, near Dundonnell, etc.

SCHŒNUS NIGRICANS, L. — "Topographical Botany (Churchill Babington)." Frequent. Especially abundant about Loch Broom side, Strathcarron, Applecross, etc.; also as the var. *nanus*, Lange, in Strathcarron.

CLADIUM JAMAICENSE, Crantz. (*C. germanicum*, Schrad.)—A. Evans 1890, see "Scotch Naturalist," 1891, p. 186. I have not seen it in the county.

* CAREX DIOICA, L.—Not uncommon, and widely distributed; but much less frequent than *C. pulicaris*, L.

* C. PULICARIS, L.—Abundant, and generally distributed.

* C. RUPESTRIS, L.—A scrappy specimen gathered by me in 1880 near Glen Shiel may belong to this species. It occurs very sparingly on the Cnochan rocks in West Ross, and is not uncommon on the same rocks at a low altitude in West Sutherland.

* C. PAUCIFLORA, Lightf.—Lower slopes of Ben Eay,

moorland in Glen Torridon, and moorland between the two Loch Brooms.

* C. ARENARIA, L.—Very local. I only saw it on a small piece of sandy coast near Polglass.

* C. PANICULATA, L.—Rare. In Gleann Bianasdail.

* C. ECHINATA, Murr.—Abundant.

* C. REMOTA, L.—Loch Coulin side, Dundonnell. Local and rare. The starved form *C. tenella*, Sm. (non Schk.), occurred by Loch Duich.

* C. CANESCENS, L.—Local and rare. Loch Alsh.

* C. LEPORINA, L.—Glen Shiel, Braemore, Dundonnell, Applecross, Kishorn, etc.

* C. RIGIDA, Good.—The Slioch, Ben Eay, An Teallach, Sgurr Fhuaran, etc. Common on the higher hills.

* C. GOODENOWII, J. Gay.—Common and variable. The var. *C. juncella*, Fries., occurred at Kinlochewe, and at Loch Achall, etc. The var. *melæna*, Wimm., at An Teallach and Ben Eay; it is simply a diseased state.

* C. FLACCA, Schreb. (*C. glauca*, Murr.).—Common and variable.

* C. PILULIFERA, L.—Common, and generally distributed. The var. *longibracteata* occurred on Ben Eay, An Teallach, and Cnochan.

* C. PALLESCENS, L.—Base of Sgurr Fhuaran, Braemore, Dundonnell, Applecross, Duncraig, Rhidorroch.

* C. PANICEA, L.—Common, and generally distributed.

* C. VAGINATA, Tausch.—Rare. The Slioch.

* C. SYLVATICA, Huds.—Strome, Braemore, Dundonnell, Applecross, Kishorn, etc.

* C. BINERVIS, Sm.—Abundant and variable. On the higher hills it occurs with much darker fruit and glumes —var. or f. *nigrescens*. On the moorlands as in Glen Torridon, Braemore, etc., it is sometimes four feet high, and has large, rather conical than cylindric spikelets. This form (*elatior*) is sometimes confused with *C. lævigata*.

C. LÆVIGATA, Sm.—On the authority of Mr. Grieve. I have not seen it in the county.

* C. HORNSCHUCHIANA, Hoppe.—Rather common.

* C. FULVA, Good.—Glen Torridon, Strathcarron. Var. *C. xanthocarpa*, Dègl.—Kinlochewe, Applecross, near Loch Clare 1888, Dundonnell 1894.

* C. extensa, Good.—Near Jeantown by the shores of Loch Carron, and as the var. *pumila*, And.

* C. flava, L.—Common. Var. *oederi*, Lilj.—Strathcarron, Applecross, etc.

* C. chrysites, Link. (*C. œderi*, auct. var. non Ehrh).—Rare. At the upper end of Loch Carron.

C. filiformis, L.—Found by Mr. P. Ewing in 1887. So far I have not met with it.

* C. rostrata, Stokes.—Common.

C. saxatilis, L.—Found by Mr. Sewell on Sgurr Ruadh at about 3000 feet.

* Phalaris arundinacea, L.—Dornie, Applecross. Not common.

* Anthoxanthum odoratum, L.—Common, and generally distributed.

* Alopecurus geniculatus, L.—Kinlochewe, Ullapool, Applecross, etc.

* A. pratensis, L.—Dornie, Jeantown, Applecross, Ullapool, etc. Some very robust forms by Loch Carron in cultivated fields.

* Phleum pratense, L.—Kinlochewe. Very robust form at Jeantown, Dundonnell.

* Agrostis canina, L.—Common. Abundant on the moorland in Glen Torridon as the f. *grandiflora*, Hack.; and on Ben Eay and the Slioch, from 1500 feet upwards to 3000 feet, as the var. *Scotica*, Hackel, which approaches *A rubra*, Wahl. It occurs also as the sub-var. *mutica*. True *A. rubra* has *flat* radical leaves without runners. See Journ. Bot., 1890, p. 45–6.

* A. alba, L.—Abundant and variable. As the var. *coarctata*, Hoffm., at Kinlochewe, Strathcarron, Ullapool, Torridon, etc. Var. *maritima*, Meyer.—Jeantown, Polglass, etc. Var. *patula*, Gaud.—Ullapool.

* A. vulgaris, With.—Common. Var. *pumila*, L.—Not uncommon. An Teallach, Meall Gorm, etc.

Aira caryophyllea, L.—Found by Mr. Ewing in 1887; it is not very common. I saw it in Strathcarron and Ullapool.

* A. præcox, L.—Ullapool, Keppoch, Braemore, Kinlochewe, etc.

* Deschampsia cæspitosa, Beauv.—Abundant and

generally distributed. Var. *alpina*, Gaud.—An Teallach, Meall Gorm. Var. *pallida*, Koch.—Applecross, Strathcarron, Kinlochewe.

* D. FLEXUOSA. Trin.—Common, and widely distributed. Var. *montana* (Huds.).—An Teallach, Meall Gorm, Ben Eay.

AVENA PUBESCENS, Huds. — "Topographical Botany" (Churchill Babington). On the limestone at Ullapool, and as the var. *glaberrima*, Borb., in Bænitz. Herb. Europ. =Var. *alpina*, Reichb., Fl. Excurs. 52, there and at Cnochan.

* A. FATUA, L.—Strome

* HOLCUS MOLLIS, L.—Strome, Ullapool, Jeantown.

* H. LANATUS, L.—Abundant and generally distributed. A common montane grass on Slioch.

* ARRHENATHERUM AVENACEUM, Beauv.—Attadale, Strome, Ullapool, etc. The var. *A. bulbosum* is the frequent plant at Ullapool, etc. I think it is a distinct sub-species.

* SIEGLINGIA DECUMBENS, Bernh.—Craigmore, Braemore, etc. Common.

* PHRAGMITES COMMUNIS, Trin.—Rather rare. Loch Duich, Glen Torridon, Polglass as the var. *uniflora*, Boreau.

SESLERIA CŒRULEA, Hard.—Recorded by Lightfoot in the "Flora Scotica" as *Cynosurus cœruleus*, growing on wet places on the sides of the mountains about Little Loch Broom. I did not see it on my short visit to An Teallach, but my exploration was stopped by heavy rain and mist, and I did not get as far as a small outcrop of the limestone where Lightfoot may have seen it. I failed to find it in 1894.

* CYNOSURUS CRISTATUS, L.—Kinlochewe, Ullapool, Dundonald, Jeantown, etc.

* MOLINIA VARIA, Schranck.—Abundant, probably the commonest grass in the county. Sometimes on the hills and dry rocks as the var. *depauperata*, Lindl.

MELICA NUTANS, L.—Strome (Rev. W. R. Linton). I saw it in the limestone gorge at Ullapool, by the waterfall at Jeantown, at Dundonnell, and Rhidorroch.

* DACTYLIS GLOMERATA, L.—Kinlochewe, Ullapool, Applecross, Jeantown, etc. Not abundant.

* POA ANNUA, L.—Common, and generally distributed. The var. *supina*, Schrad., on Slioch and An Teallach.

*P. NEMORALIS, L.—Rare. Near Strome. I did not see it anywhere in 1893 or 1894.

*P. PRATENSIS, L.—Common, and widely distributed. The var. *P. subcœrulea*, Sm., on the beach at Ullapool, at Strathcarron, and on limestone rocks at Cnochan.

*P. TRIVIALIS, L.—Common. A large, stout form which occurred at Ullapool is probably the var. *multiflora*, Reichb. The var. *glabra*, Doell.—Near Applecross and Ullapool.

*G. FLUITANS, Br.—Dornie, Ullapool, etc.

G. MARITIMA, Wahl.—Recorded by Lightfoot in "Flora Scotica" as *Poa maritima* from Loch Broom. It is abundant by Loch Carron, and also occurs about Kishorn, Ullapool, Applecross. It is a variable plant.

*FESTUCA SCIUROIDES, Roth. (*F. bromoides*, L.).—Strathcarron, Ullapool, Loch Torridon side.

*F. OVINA, L.—Abundant, and generally distributed from the sea-level to over 3000 feet. The var. *paludosa*, Gaud., is not uncommon. It occurred on a wall top with *Sieglingia*, *Pedicularis sylvatica*, *Carex pulicaris*, *Orchis maculata*, *L. Narthecium ossifragum*, *Carex echinata*, etc., at Braemore. *F. ovina* is frequently viviparous.

*F. RUBRA, L.—Not uncommon, and very variable. The f. *pruinosa*, Hackel, occurred by Loch Torridon, and is frequent as a plant of rocky coasts. Sub.-var. *barbata*, Hack., on An Teallach. A depauperate form occurred by the Abtruinn Bruachaig near Kinlochewe, and a rigid glaucous form by Loch Maree, and a form with much larger spikelets near Duncraig.

*F. SYLVATICA, Vill.—I was pleased to find this handsome species by the waterfall at Jeantown, and in a shady gorge at Dundonnell.

*F. ELATIOR, L.—Rare. On the limestone at Kishorn.

*F. ARUNDINACEA, Schreb.—A plant probably belonging to this species was gathered in a field close to Courthill House at Kishorn.

*BROMUS GIGANTEUS, L.—Rather rare. Strome, Inverlael, Jeantown, Rhidorroch, Dundonnell.

*B. RAMOSUS, Huds.—Rare. Inverlael.

*B. SECALINUS, L.—A rather rare colonist at Strathcarron, Ullapool, and Dundonnell.

*B. RACEMOSUS, L.—Ullapool.

* B. MOLLIS, L.—Not uncommon. The var. *glabrescens*, Coss., at Ullapool.

* B. COMMUTATUS, Schrad.—Ullapool.

* BRACHYPODIUM GRACILE, Beauv.—Local. Applecross, Rhidorroch, and by the waterfall near Jeantown.

* LOLIUM PERENNE, L—Dornie, Kinlochewe, Ullapool, Strathcarron, etc.

: L. ITALICUM, Braun.—Kinlochewe. Planted.

* AGROPYRON CANINUM, Beauv.—By the waterfall at Jeantown, Dundonnell, Rhidorroch.

* A. REPENS, Beauv.—Common, and very variable. As the var. *Leersianum*, Gray, at Ullapool, etc.; as the var. *barbatum* (Duval-Jouve), at Strathcarron; and as a stiff maritime form, var. *maritimum*, Mihi., by the coast at Jeantown. The glaucous form, var. *cæsium*, Döll., also occurred in Strathcarron.

* A. JUNCEUM, Beauv.—On the small bit of sea sand at Polglass.

* NARDUS STRICTA, L.—Rather common, and widely distributed.

* ELYMUS ARENARIUS, L.—On the finer shingle of Loch Broom between Ullapool and Inverlael, and at Polglass on the sand.

HYMENOPHYLLUM UNILATERALE, Bory. — Recorded as *Trichomanes tunbridgenses*, near Loch Mari, by Dr. Lightfoot. In "Topographical Botany," but without personal authority. I saw it by the rail side near Strome Ferry. It is also given in Dixon's list.

* PTERIS AQUILINA, L.—Common, and widely distributed.

* CRYPTOGRAMME CRISPA, Br.—Local. Sgurr Fhuaran, Meall Gorm, and Sgurr na Caorach. In the Beallach Pass it is abundant.

* LOMARIA SPICANT, Desv.—Common, and widely distributed.

* ASPLENIUM ADIANTUM-NIGRUM.—Common, and widely distributed.

A. MARINUM, L.—Given in both the Applecross and Gairloch lists. It occurs in a sea cave near Applecross.

A. VIRIDE, Huds.—Recorded from the Cnochan rocks by Lightfoot in the "Flora Scotica." It is local. I saw it in the limestone gorge near Ullapool, and by the waterfall near Jeantown. It is abundant on the Cnochan rocks.

* A. TRICHOMANES, L.—Common, and widely distributed, especially near the sea.

* A. RUTA-MURARIA, L.—Common The var. *pseudo-germanicum*, Milde., occurred in the limestone gorge near Ullapool, and at Cnochan.

A. SEPTENTRIONALE, L.—Given by Mr. Dixon in the list of Gairloch plants.

* ATHYRIUM FILIX-FŒMINA, Roth.—Common, and as the vars. *convexum*, and *molle*, by Loch Maree, etc.

SCOLOPENDRIUM VULGARE, Symons.—Rare. Recorded in the Applecross list. It occurs near Kishorn, but very rarely.

* CYSTOPTERIS FRAGILIS, Bernh.—Not uncommon, and as the var. *dentata*, Hook.

POLYSTICHUM LONCHITIS, Roth.—Given in the "Flora Scotica" as occurring on the limestone rocks at Cnochan. I found a small specimen on Ben Eay, and it is given in Dixon's list. It is common and luxuriant on the Cnochan rocks.

* P. LOBATUM, Presl.—Rather rare on both sides of Strathcarron, and as the var. *aculeatum*, Syme.

* LASTREA OREOPTERIS, Presl.—Common and widely distributed.

* L. FILIX-MAS, Presl.—Generally distributed. The var. *paleacea*, Moore., at Lieuthgoch, Kinlochewe, etc.; the var. *affinis*, Bab., at Ullapool; and the var. *pumila*, Moore, on An Teallach.

* L. SPINULOSA, Presl.—Glen Shiel, Applecross, Kinlochewe, etc.

* L. DILATATA, Presl.—Common and variable.

* L. ÆMULA, Brack.—Glen Docharty.

* POLYPODIUM VULGARE, L.—Common, and also as the form var. *breves*, Lange.

* PHEGOPTERIS DRYOPTERIS, Fèe.—Not common. Loch Clare side, near Ullapool, Jeantown, Cnochan not typical.

* P. POLYPODIOIDES, Fèe.—Not very common, Strome, Braemore, Ullapool, Cnochan, etc.

* OSMUNDA REGALIS, L.—Duncraig, near Jeantown, Dundonnell, and near Applecross. In one of the islands in Loch Maree.

(Ophioglossum vulgatum, L.—Given in Dixon's list.

Botrychium Lunaria, L. — Recorded by Lightfoot "from Dundonald," near Ullapool, and at the south end of Loch Duich.

Equisetum maximum, Lamk.—Local. Given in the Applecross list. I saw it close to the window of the little inn at Applecross, and it is plentiful in the woods close by.

*E. arvense, L.—Not very common. Kinlochewe, Jeantown, etc. Also as a curious form or variety at Applecross.

*E. sylvaticum, L.—Widely distributed, but not extremely common. The var. *capillare*, Hoffm., at Kinlochewe.

*E. palustre, L.—Not very common. Loch Clare, Ullapool, Jeantown.

*E. limosum, L.—Loch Coulin, Kishorn, Strathcarron, Drumroonie, etc.

*Lycopodium Selago, L.—Not very common. On the Slioch as the var. *recurvum*, Desv., also as the type on Ben Eay. The var. *appressum*, Desv., on a mountain in Strathcarron, on An Teallach.

L. inundatum, L.—See "Topographical Botany." I have a recollection of seeing it recorded from Kinlochewe.

L. annotinum, L.—West Ross (Stables). Sparingly on An Teallach.

*L. clavatum, L.—Carnasoug, Ben Eay, etc., but not common. I did not see it in 1893.

*L. alpinum, L.—Rather common on the higher hills. The var. *decipiens* (*L. complanatum*, L., var. *anceps*, Baenitz., Herb. Europ.).—Rare. Ben Slioch, An Teallach, Ben Eay, etc. In 1893 I saw but few specimens of the *Lycopods* in Ross; in 1894 they were more common.

*Selaginella selaginoides, Gray.—Not unfrequent, as Glen Shiel, Torridon, Strathcarron, Beallach na bo Pass, An Teallach, and Cnochan.

*Isoetes lacustris, L.—Common in Loch Maree. It is found at about 2000 feet on top of the Beallach na bo Pass as the var. *falcata*, Tausch.

I. echinospora, Dur.—Recorded by Mr. Ewing.

Chara fragilis, Desv.—Recorded by Mr. C. Bailey. It is plentiful in Loch a Mhuilinn and Loch Achall, and as the var. *delicatula*, Br., in a small stream in Strathcarron, and at Applecross.

* Nitella opaca, Aghardh.—Loch Maree. Apparently rare.

A few critical plants are still being investigated.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during January 1894. By Robert Lindsay, Curator.

During the past month of January the thermometer fell below the freezing point on nineteen occasions, indicating collectively 121° of frost for the month, as against 100° for the corresponding month last year. The lowest reading was 9°, or 23° of frost, which was registered on the 7th of the month. (The same amount was registered on the 6th of January last year, and was the lowest reading recorded last winter.) Other very low readings were registered on the mornings of the 6th and 8th, when the glass fell to 13° and 15° respectively. The lowest day temperature was 22° on the 6th, and the highest 58° on the 14th. Of the forty selected plants whose dates of flowering are annually recorded to the Society, the following came into flower, viz.:—*Bulbocodium vernum*, on 12th January; *Galanthus nivalis*, 16th; *Leucojum vernum*, 18th; *Eranthis hyemalis*, 19th; *Daphne Mezereum*, 19th; *Scilla præcox*, 22nd; *S. siberica*, 22nd; *Galanthus plicatus*, 22nd; *Rhododendron atrovirens*, 24th.

On the rock-garden 22 plants came into flower during the month, as against 13 last January. Amongst which were the following, viz.:—*Arabis procurrens*, *Helleborus viridis*, *Hepatica triloba*, *H. angulosa*, *Hyacinthus azureus*, *Galanthus Elwesii*, *G. Imperati*, *Iris sophonensis*, *Primula elatior*, *Synthiris reniformis*, *Triteleia uniflora*, etc. Several plants of *Yucca gloriosa* are developing flower-spikes at a very unusual period of the year.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during January 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	26°	35°	39°	17th	38°	40°	48°
2nd	28	33	39	18th	36	38	47
3rd	27	30	36	19th	35	40	49
4th	29	32	36	20th	36	41	47
5th	28	31	36	21st	38	45	52
6th	13	14	22	22nd	31	35	41
7th	9	13	31	23rd	25	27	37
8th	15	21	33	24th	28	41	50
9th	25	35	44	25th	36	38	45
10th	31	32	50	26th	29	30	49
11th	41	47	50	27th	34	47	51
12th	37	44	50	28th	27	32	39
13th	38	45	52	29th	28	32	44
14th	39	43	58	30th	31	33	39
15th	30	33	43	31st	27	30	40
16th	35	47	57				

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of January 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches)
		°	°	°	°					
1	30·408	47·8	31·0	36·2	33·0	N.	Cum.	9	N.	0·000
2	30·350	37·0	30·7	35·1	34·2	N.E.	Cum.	8	N.E.	0·010
3	30·683	38·1	30·1	32·6	30·0	S.E.	Cum.	10	S.E.	0·000
4	30·511	36·0	32·1	35·2	31·2	E.	Cum.	10	E.	0·015
5	30·006	35·8	30·0	33·1	30·0	E.	Cum.	10	E.	0·040
6	29·563	35·8	15·5	16·2	14·9	N.	Cir.	1	S.	0·000
7	29·692	20·8	11·8	14·1	12·9	Calm.	Fog	5	...	0·000
8	29·918	25·2	13·2	21·5	21·1	E.	Fog	5	...	0·010
9	29·581	37·2	21·7	37·2	35·6	E.	Cum.	10	S.	0·010
10	29·358	44·8	35·0	44·8	43·0	S.W.	Cir. St. Cum.	7 1	S. S.W.	0·020
11	29·360	51·9	44·0	49·8	48·2	S.	Nim.	10	S.	0·045
12	29·515	52·8	40·4	47·1	44·1	S.	Cir.	5	S.	0·005
13	29·556	49·8	41·4	48·2	44·2	S.	...	0	...	0·000
14	29·647	50·9	39·7	43·0	42·0	S.	Cum.	10	S.	0·000
15	29·771	45·2	31·2	32·3	32·2	W.	Cum.	5	W.	0·215
16	29·375	47·1	32·6	46·5	44·0	S.	Cir.	4	W.	0·085
17	29·151	51·6	41·6	42·0	40·6	S.W.	Cum.	3	S.W.	0·030
18	29·177	46·7	37·7	39·8	38·9	N.W.	...	0	...	0·005
19	29·540	45·7	36·8	41·2	39·5	S.W.	Cir. St.	10	S.W.	0·115
20	28·898	48·6	41·0	42·8	40·9	S.W.	Cir. Cum.	1 6	W. S.W.	0·020
21	29·389	45·7	41·0	45·1	43·1	W.	Cir. Cum.	4 3	W.	0·315
22	29·174	46·8	36·0	36·0	34·9	W.	...	0	...	0·000
23	29·707	41·5	28·2	29·2	27·9	W.	...	0	...	0·000
24	29·576	42·0	29·0	42·0	40·0	S.W.	Cir. St.	10	W.	0·080
25	29·467	48·9	39·0	39·8	38·1	S.W.	Cir.	1	W.	0·175
26	29·342	43·9	30·8	32·2	31·0	W.	Nim.	10	W.	0·145
27	28·947	49·0	31·9	49·0	47·2	S.W.	Nim.	10	S.W.	0·360
28	28·953	49·8	32·7	34·2	33·0	W.	Cir. St.	10	W.	0·150
29	29·754	36·1	30·1	33·1	32·0	S.W.	...	0	...	0·200
30	29·085	43·6	33·0	37·1	35·1	S.W.	Nim.	10	S.W.	0·235
31	29·087	37·1	31·1	31·9	30·6	W.	...	0	...	0·045

Barometer.—Highest Observed, on the 3rd, = 30·683 inches. Lowest Observed, on the 20th, = 28·898 inches. Difference, or Monthly Range, = 1·785 inch. Mean = 29·566 inches.

S. R. Thermometers.—Highest Observed, on the 12th, = 52°·8. Lowest Observed, on the 7th, = 11°·8. Difference, or Monthly Range, = 41°·0. Mean of all the Highest = 43°·0. Mean of all the lowest = 32°·3. Difference, or Mean Daily Range, = 10°·7. Mean Temperature of Month = 37°·6.

Hygrometer.—Mean of Dry Bulb = 37°·0. Mean of Wet Bulb = 35°·3.

Rainfall.—Number of Days on which Rain fell = 23. Amount of Fall = 2·330 inches. Greatest Fall in 24 hours, on the 27th, = 0·360 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

During the month of January about forty species of plants have produced their flowers in the houses of the Royal Botanic Garden, the majority being inmates of tropical houses. The effect of brighter and longer days is already apparent in these houses by the plants starting into new growth, the new foliage generally presenting a pleasing appearance. This is especially noticeable in the Palm House amongst Cycads, Palms, and ornamental foliage plants. Amongst the most worthy of flowering plants may be noted:—

Clerodendron splendens, G. Don. This is an evergreen species with oblong shining leaves, produced upon a slender climbing stem. Flowers are scarlet, with yellowish green stamens and pistil, and are borne in terminal corymbose panicles sometimes more than six inches across, and thus forming a gorgeous winter-flowering stove climber. It is a native of Sierra Leone, and, although introduced in 1839, is still rarely seen in cultivation in this country.

Vanda Amesiana, Rchb. This is a comparatively recent introduction, first imported by Messrs. Low & Co., of Clapton, from the southern Shan States of Burmah, where it is said to grow at an elevation of from four to five thousand feet. The plant is of a small erect habit, leaves fleshy, rounded, with a grooved upper surface. The racemes of flowers are very fragrant, the sepals and petals being tinged with a slight purple shade, yet this colouring seems to be variable in the species, some plants producing almost pure white flowers which last a considerable time in perfection.

Medinilla javanensis, Blume. A tropical evergreen shrub growing to about four feet in height, with four-angled stems, elliptic sessile leaves, with very prominent venation. It is a floriferous species with terminal panicles, bearing numerous pink white flowers of a waxy appearance, the anthers being dark purple. Messrs. Rollison were the first to introduce this species, at whose nursery it first flowered in 1850, from which a figure was prepared for the "Botanical Magazine," 4569.

Specimens of these and of the following are exhibited:—*Anoiganthus breviflorus*, Baker,—a pretty, spring flowering, bulbous plant from Natal. *Edgworthia Gardnerii*, Meissn.,—a shrubby, deciduous plant belonging to the order Thymelacaceæ, with terminal inflorescences of yellow flowers, inhabiting the regions of the Himalayas and China, often called *E. chrysantha*, Lindl. Others most worthy of note are *Cabomba aquatica*, Aubl.,—a long growing aquatic with finely divided leaves, a native of Mexico; *Lachenalia tricolor*, Linn., and *L. Nelsoni*, Hort.; *Cypripedium villosum*, Lindl., and *C. Hookeræ*, Rchb. fil.,—a Bornean species; *Caraguata Zahnii*, Hook.,—a bromeliad from Central America; *Thunbergia laurifolia*, Lindl.

MEETING OF THE SOCIETY,

Thursday, March 8, 1894.

Professor BOWER, President, in the Chair.

Sir A. BUCHAN HEPBURN, Bart., and Mr. A. THOMSON, were elected Resident Fellows of the Society.

The PRESIDENT informed the Society of the death of ROBERT HUTCHISON and of ALEXANDER GALLETLY, Fellows of the Society, and of JOSEPH WHITTAKER, Associate.

Cut flowers of *Hepatica triloba, Scilla siberica, Narcissus pseudo-narcissus* and *N. Bulbocodium, Berberis Darwinii, Ribes sanguineum,* and *Daphne Mezereum* were exhibited from the open garden of Mr. CAMPBELL, at Ledaig, Argyllshire.

Mr. RUTHERFORD HILL exhibited specimens of the flowers from which Dalmatian insect powder is prepared. These were the flower-heads of the *Pyrethrum cinerariæfolium,* Treviranus, a native of Dalmatia and Montenegro. The flowers imported from Dalmatia were cultivated chiefly at Citta Vecchia and Ragusa, and were also collected from wild plants growing on the hills in Montenegro. The wild flowers were reputed to yield the most powerful insecticide. The plant was now cultivated in Australia, South Africa, California, and near Berlin. It was a comparatively hardy plant, growing at an elevation of from 6000 to 7000 feet. The original insect powder came from Persia, being yielded by two allied species, the *Pyrethrum roseum* and *P. carneum,* Bieberstein. All authorities agreed that the Dalmatian powder was a superior insecticide to the Persian, and this comparative weakness of the latter had been attributed to the fact that the flowers of the Persian

Issued November 1894.

species were more prone to become "double" than those of the Dalmatian. When an insect was exposed to the action of the powder it was speedily paralysed, but in a few minutes seemed to slightly revive again. Soft-bodied insects, such as house flies and bees, were speedily killed, but hard-bodied insects, like beetles and cockroaches, resisted its action for a much longer time, and were not killed till after 50 or 60 hours exposure. Though not dead they were, however, rendered helpless, and could be easily captured and destroyed. The insecticidal properties of the flowers had been attributed to various constituents, and their toxic action was not thoroughly understood. They contained a small percentage of a volatile oil, which gave them their characteristic "tea-like" odour and slightly aromatic taste. It had been stated that the volatile oil was the active constituent, but that had not been proved. Schlagdenhauffen and Reeb found in the flower-heads a poisonous volatile acid, *chrysanthemic acid*, and also a poisonous non-volatile acid, *pyrethrotoxic acid*, to both of which they ascribed the insecticidal properties of the powder.

The specimens shown consisted of the three grades met with in commerce, namely:—

1. The *closed* flower-heads. These were the best quality, and by grinding these the finest and most powerful insect powder was obtained. They were worth, in the wholesale market, about £5, 16s. per cwt.
2. The *half-closed* flower-heads. From these a second grade of insect powder was obtained. They were less aromatic and less powerfully insecticidal than the preceding grade. They were worth about £4 per cwt.
3. The *open* flower-heads. These were the lowest commercial grade, and worth only about £3 per cwt.

Professor BAYLEY BALFOUR directed the attention of the Society to a paper in the "Kew Bulletin," giving an account of the production of citric acid, on a commercial scale, from sugar, by the agency of a form of *Penicillium*.

The following Papers were read:—

The PRESIDENT gave an interesting display of lantern-slides illustrating his views, which he explained, of the progressive sterilisation of cells in sporangia of the *Pteridophyta*.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING FEBRUARY 1894. By ROBERT LINDSAY, Curator.

The past month of February has been remarkable for the excessive rainfall that took place, which was unprecedented for February, and for the stormy, unsettled weather that prevailed throughout the whole month. Gales from the westward or south-westward were frequent. The thermometer was at or below the freezing point on fifteen occasions, indicating collectively for the month 63° of frost, as against 64° for the corresponding month last year. The lowest readings occurred on the 1st, 24°; 14th, 20°; 15th, 22°; 19th, 25°; 22nd, 25°. The lowest day temperature was 36°, on the 17th, and the highest 55,° on the 6th. Vegetation generally is well forward. A large number of spring plants are in blossom. Ribes, thorns, roses, lilacs, and other hardy shrubs are fast starting into growth. Deciduous trees, such as elm, poplar, alder, and hazel are bearing large quantities of flower buds. Very little injury has been done by frost this winter so far as it has gone. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following 11 came into flower, viz. :—*Coryllus Avellana*, on 3rd February; *Rhododendron Nobleanum*, 3rd; *Scilla bifolia*, 5th; *Crocus Susianus*, 6th; *C. vernus*, 12th; *Symplocarpus fœtidus*, 13th; *Nordmannica cordifolia*, 14th; *Iris reticulata*, 19th; *Tussilago nivea*, 19th; *Arabis albida*, 20th; *Mandragora officinalis*, 26th.

On the rock-garden 40 species and varieties came into flower during the month, the same number as for the corresponding month last year. Among the more interesting were—*Colchicum crociflorum*, *Corydalis angustifolius*, *Chionodoxa sardensis, Galanthus Redoutei, Daphne Blagayana, Leucojum carpaticum, Narcissus minimus, Helleborus antiquorum, H. abschasicus, H. orientalis, Rhododendron lapponicum, R. præcox, Saxifraga Burseriana, S. oppositifolia*, etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during February 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	24°	30°	50°	15th	22°	33°	41°
2nd	38	47	53	16th	34	37	43
3rd	36	40	41	17th	34	35	36
4th	35	43	51	18th	31	34	43
5th	33	37	52	19th	25	31	41
6th	36	48	55	20th	32	38	43
7th	35	43	49	21st	36	39	47
8th	36	40	48	22nd	25	35	36
9th	39	40	43	23rd	31	43	49
10th	28	36	43	24th	30	35	39
11th	31	35	49	25th	30	42	50
12th	35	36	42	26th	32	42	51
13th	26	33	41	27th	36	43	49
14th	20	27	41	28th	30	35	46

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of February 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·518	37·1	27·1	31·2	30·6	W.	Cir.	5	N.W.	0·115
2	29·499	48·9	31·7	48·0	46·9	W.	Cum.	10	W.	0·160
3	29·602	52·7	40·2	41·6	39·0	W.	...	0	...	0·060
4	29·993	46·0	37·4	46·0	44·8	W.	Nim.	10	W.	0·010
5	30·199	52·4	34·7	36·9	35·9	S.W.	Cir.	10	...	0·045
6	29·458	49·8	36·8	49·8	46·9	S.W.	Nim.	10	S.W.	0·385
7	29·267	53·8	45·2	45·2	44·9	W.	Nim.	10	W.	0·520
8	29·760	46·8	37·0	41·5	39·2	W.	...	0	...	0·100
9	29·384	46·7	40·8	42·1	40·9	W.	Cir. St.	10	W.	0·490
10	29·144	46·7	34·2	35·8	35·0	N.W.	Cir.	3	N.W.	0·145
11	29·026	38·7	35·1	36·1	35·9	E.	Nim.	10	E.	1·020
12	28·968	49·3	35·3	37·8	35·7	N.W.	Cir.	5	N.W.	0·000
13	29·790	42·4	29·3	32·0	30·6	W.	...	0	...	0·010
14	30·076	39·1	23 9	26·4	24·4	W.	...	0	...	0·000
15	29·999	39·2	26·6	34·6	31·9	E.	Nim.	10	E.	0·165
16	29·880	40·8	33·0	40·1	40·0	E.	Nim.	10	E.	1·650
17	29·960	42·8	36·0	36·1	35·8	S.E.	Nim.	10	S.E.	0·285
18	30·330	36·7	32·1	35·0	32·9	S.E.	Cir.	2	N.W.	0·000
19	30·350	39·0	28·7	31·9	29·2	W.	Cir.	9	N.W.	0·000
20	30·332	39 0	31·2	39·0	37·8	W.	Cir. St. Cum.	5 5	W.	0·000
21	30·144	43·4	38·3	40·2	39·1	S.W.	Cir.	9	N.W.	0·000
22	30·239	45·6	30·0	32·2	31·1	W.	Fog	2	...	0·010
23	29·613	48 0	32·8	43·0	40·1	S.W.	Cir.	5	S.W.	0·482
24	29·279	47·8	32·3	33·2	32·8	W.	...	0	...	0·140
25	29·108	41·8	32·8	41·8	40·1	S.	Nim.	10	W.	0·370
26	29·195	48·9	36·0	43·5	42·2	W.	Nim.	10	S.W.	0·150
27	29·384	50·7	40·0	40·5	36·9	W.	...	0	...	0·085
28	29·539	46·5	34·3	40·0	38·1	N.W.	Cir.	6	S.W.	0·300

Barometer.—Highest Observed, on the 19th, = 30·350 inches. Lowest Observed, on the 12th, = 28·968 inches. Difference, or Monthly Range, = 1·382 inch. Mean = 29·680 inches.

S. R. Thermometers. — Highest Observed, on the 7th, = 53°·8. Lowest Observed, on the 14th, = 23°·9. Difference, or Monthly Range, = 29°·9. Mean of all the Highest = 45°·0. Mean of all the Lowest = 34°·0. Difference, or Mean Daily Range, = 11°·0. Mean Temperature of Month = 39°·5.

Hygrometer.—Mean of Dry Bulb = 38°·6. Mean of Wet Bulb = 37°·1.

Rainfall.—Number of Days on which Rain fell = 22. Amount of Fall = 6·697 inches. Greatest Fall in 24 hours, on the 16th, = 1·650 inch.

A. D. RICHARDSON,
Observer.

III. ON PLANTS IN THE PLANT HOUSES, WITH EXHIBITION OF SPECIMENS. By R. L. HARROW.

About sixty species of plants have flowered in the houses of the Royal Botanic Garden during February, this number being a decided increase upon that of the preceding month. The earlier flowering Acacias have done much, with their numerous heads of usually bright yellow flowers, to give the several houses containing them a bright appearance. Conspicuous amongst them being the well-known *A. dealbata*, Link., so commonly seen in the windows of florists; the greater quantity of the supply for our markets coming from the Riviera, where it is very successfully cultivated out of doors. M. Vilmorin, in a paper read before the Royal Horticultural Society, mentions an artificial process to facilitate the opening of the flowers of this species in that district:—"The flowering branches are cut a week or so before they would bloom in the open, and are submitted, with their butt end steeped in water, to the action of moderately heated steam. The flowers expand in from ten to twenty hours, and last as long afterwards as if cut direct from the tree."

Amongst the others exhibited are *A. discolor*, Willd., a stiff-growing plant with long spikes of flowers lasting for a considerable period, native of New South Wales, and introduced in 1788.

A. melanoxylon, R. Br. From Australia, with large balls of light yellow flowers, the plant being bush-like in habit, bearing rather large leathery phyllodes; the native name being Blackwood.

A. longifolia, Willd. The spikes are thickly crowded with small flowers, the phyllodia being linear lanceolate. It is of an erect habit of growth.

A. Latrobei, Meissn. This is an extremely graceful, free-flowering plant, with small phyllodes; the flower-heads solitary, and produced a good distance from the apex of the shoot.

A. imbricata, F. Mueller. Very similar as regards its flowering, but differing in its more loose mode of branching, and the phyllodes being rather larger.

A. verticillata, Willd. This is a distinct species, with linear phyllodes, and solitary axillary spikes. Introduced in 1780.

The Camellias have also been very showy, the colours ranging from dark red to pure white, about twelve varieties of which we are able to exhibit.

Deherainia smaragdina, Decne. Is one of the small number of plants which bear green flowers. The plant under notice is a member of the order Myrsinaceæ, being a native of Mexico. In habit it is a small, compact-growing shrub with dense foliage, the oblong lanceolate leaves covered with brown hairs. The flowers are borne in clusters towards the apex of the growths, being scarcely discernable amongst the green foliage where they are concealed. The flowers are about two inches in diameter. Formerly known under the name of *Theophrasta smaragdina* it was first introduced in 1876, and this is probably the first time of flowering in this garden, the plant exhibited having been received from Kew during 1893.

Lælia harpophylla, Rchb. fil. A slender-growing plant, till recently rare in cultivation, the flowers having an unusual colour amongst orchids. In Messrs. Veitch's "Manual of Orchidaceous Plants" it is said to have first flowered in 1867, and that, although introduced from Brazil, no record was obtainable as to the locality.

Amongst the others worthy of note are: *Tillandsia splendens*, Brongn.,—a native of British Guiana, with bright purple bracts; *Phyllocladus rhomboidalis*, Rich.,—a coniferous tree, growing to a height of sixty feet in New Zealand; *Illicium floridanum*, a brightly coloured magnoliaceous plant, introduced from Florida in 1771; *Pilocarpus pennatifolius*, Lem.,—a Brazilian plant furnishing the jaborandi of commerce; *Brunsfelsia latifolia*, Benth.; *Cœlogyne testacea*, Lind.; *Dendrobium primulinum*, Linn.; and *Phalænopis Schilleriana*, Rchb. fil.

MEETING OF THE SOCIETY,

Thursday, April 12, 1894.

Dr. William Craig, Vice-President, in the Chair.

The presentation to the Society of a copy of Goodenough's Algae, by Mr. G. W. Traill, was announced.

Miss Madden exhibited a twig in flower of *Stauntonia latifolia* from a plant grown at Royal Terrace, Edinburgh.

Surgeon-Major H. H. Johnston exhibited specimens of cultures of Bacteria from water, and pointed out the inadequacy of most filters to prevent the passage of Bacteria.

Mr. Campbell sent from his open garden at Ledaig, blooms of *Acacia lincarifolia*, *Orchis mascula*, *Erica mediterranca*, and *Pyrus communis*.

The following Papers were read :—

The Influence of Light on the Respiration of Germinating Barley and Wheat. By T. Cuthbert Day.

Introduction.

Though this paper was written as long ago as 1886, still, as far as I am aware, the work is new. I have not come across any communication on the subject since, and the paper I have the honour of bringing before your notice to-night has not been read before any society as yet. The fact is I hardly knew what to do with it. I did not think it suitable for the Chemical Society, as not being nearly chemical enough, though there is a fair amount of chemical work in it. As the paper is fairly in the domain of vege-

Issued November 1894.

table physiology, I thought it might interest the members of this Society, and I trust you may find at least some matter worthy of your attention in it.

From a practical point of view the importance of the subject is really almost nil, but in almost every book on malting the influence of light on germination is mentioned, and in regard to it some fearful and wonderful statements are sometimes put forward. Some maltsters, as I have seen in various places, have adopted blue glass for the windows of the malting floors, under the impression that by admitting the actinic rays of light they favour in some way the germination of the grain, apparently losing sight of the fact that their operations are practically carried on in the dark, as far as germination is concerned, seeing that it is only the upper layer of corns that is exposed to the light. Some other maltsters, prefer having their floors altogether dark, which is often an advantage, because direct sunlight is excluded, and the consequent undue elevation of temperature is avoided, which, of course, would affect the germinative activity to a considerable extent.

Many experiments have been recorded at different times by various authors in connection with the influence of light on the germination of seeds, but the results arrived at have been very conflicting.

The state of uncertainty in which this question still remains has induced me to make a series of experiments, using every means which I could devise to avoid the interference of outside influences, in order to arrive, if possible, at a definite solution of the problem as to whether light retards or accelerates the respiratory functions of such seeds as barley and wheat during the process of germination. My chief purpose in making this communication is rather to place on record the methods employed and their result, than to put forward any particular conclusions that might be deduced from the experiments.

Among the experimenters who have worked on this subject, the following names may be mentioned. They are collected from the historical record of the subject, with references, given by M. A. Pauchon in his memoir, to be alluded to again :—

Miesse (Expériences sur l'Influence de la Lumière sur les Plantes.—Journal de Physique de Rozier, T. 6, Dec. 1775) considered that light has little or no influence on germination.

Sénebier (Memoires Physico-Chimiques, 1782) concluded that light was hurtful to the germination of seeds.

Ingenhousz held the same opinion as Sénebier as to the action of light (Expériences sur la Végétation, 1787–89).

The Abbe Bertholon (Journal de Physique de Rozier, Dec. 1789) criticises previous experiments on the subject, laying special stress on the necessity of equality in the degree of humidity of the seeds experimented upon.

Sénebier (Physiologie Végétale, 1800) in subsequent experiments, called forth by the remarks of the Abbe Bertholon, and taking care to adopt the precautions suggested by the latter, is led to the same conclusion as formerly.

E. Lefébure performed many experiments on the action of light, especially with regard to the action of coloured rays. In the latter inquiry he does not arrive at any definite result. He discovers a retardation of germination under the influence of white light. The experiments were made without regard to small differences of temperature, though considerable trouble was taken to secure similarity in the conditions of moisture (Expériences sur la Germination des Plantes, 1800).

Th. de Saussure (Recherches Chimiques sur la Végétation, 1804) regarded the action of direct sunlight as hurtful to the seeds on account of the heat which accompanies it, but in diffused light, when every precaution was taken to ensure similarity in the conditions of temperature and moisture, he does not perceive any difference in the progress of germination.

A. P. de Candolle (Phys. Végét., 1832) thinks that light has no action on the germinative activity.

Ch. Morren (An. Sc. Nat., 1832) considers that obscurity favours the first period of germination.

Mayen (Neues System der Pflanzen-physiologie, 1837) made experiments with seeds of six different genera of plants, observing equal conditions of heat and moisture

He noticed that the appearance of the radicle and the development of the cotyledons were the same in light as in darkness.

G. Ville (Revue de Cours Scientif., 1865) considers that the action of light is inconsiderable.

M. Faivre (1879), experimenting with seeds of *Tragopogon porrifolius,* noticed that the seeds developed chlorophyll and sap more rapidly under the influence of yellow light than under the influence of blue light.

It will be readily seen, from a perusal of the foregoing resumé, that there is no real concordance in the results obtained by the different experimenters.

There are two serious defects in the methods of experiment followed. The first is a failure to secure *real* identity in the conditions under which the seeds were germinated in light and darkness. Similarity in temperature and moisture is of the most paramount importance; and though at first sight it might appear easy to secure identity in this respect, it is in reality a matter of considerable difficulty. The material used as a shield from the light to one of the vessels containing the seeds operated upon, must make a difference in the amount of heat absorbed or radiated, especially if the vessels are surrounded by air, or if they are situated far apart. If similarity of moisture is secured, in the first place, by steeping the seeds for the same length of time in water at the same temperature, this similarity is destroyed during the experiment if the surface of one of the containing vessels becomes colder than the other; because, in that case, though moisture is condensed on the inner surface of both vessels, the coldest vessel will have the greatest amount of condensation, and the moisture so condensed is derived from the seeds, unless special provision is made to keep the contained air saturated with moisture. The second defect alluded to is the method of judging the progress in germination. The usual plan is to note with as much accuracy as possible the development of the radicle in dicotyledonous seeds, or of the radicle and plumule in monocotyledons. This method is, of course, very crude and uncertain, and much of the variation in the results obtained may be attributed to the employment of it.

In 1880, Dr. A. Pauchon published a memoir (Role de la Lumiére dans la Germination) in which he criticises closely all foregoing experiments on the subject, showing their defects. He performed many experiments, with proper precautions, but judging of the germinative progress in the way above mentioned, in order to show that only doubtful results could be so obtained. He then suggests, as a measure of germinative progress, the amount of oxygen absorbed by the seeds during germination. This method is a decided improvement, since it substitutes a precise and easily observed measurement, for a rough estimation by which an approximate result can hardly be arrived at even with much trouble.

Dr. Pauchon's apparatus consisted of two wide tubes of glass, one of which was covered with folds of black paper to exclude light, the other being left clear. The two tubes were placed upright, side by side, during an experiment, the lower ends being closed by corks pushed in to a certain distance. Above the cork in each tube was placed a small vessel containing concentrated potassa solution, and above this was supported another vessel containing a pad of cotton wool saturated with water, on which the seeds were placed. A narrow tube, bent twice at right angles, issued from the upper end of each of the two wide tubes, and its open extremity was immersed in mercury. The limb of the narrow tube, above the mercury, was graduated into cubic centimetres and parts of a cubic centimetre, and the absorption in each tube was observed by the movement of the mercury column. Fig. 1 gives the appearance of one of the tubes as fitted up.

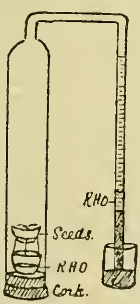


Fig. 1.

The seeds absorbed oxygen and exhaled carbonic anhydride, which was at once fixed by the solution of potassa, producing a partial vacuum; the mercury then rose in the narrow tube, and the absorption of oxygen was measured by taking an observation and making proper allowance for temperature, pressure, and tension of aqueous vapour, and the volume of the solid and liquid contents of each apparatus. An account was also taken of the visible progress in germination made by the seeds during an experiment. The seeds experimented upon were chiefly oleaginous and leguminous, with the exception of Indian corn, which was the only seed which approached in composition the seeds of wheat or barley.

Dr. Pauchon concludes from his experiments:—

1. That light accelerates in a constant manner the absorption of oxygen by germinating seeds in all cases.
2. That a relation exists between the degree of illumination and the quantity of oxygen absorbed.
3. That the respiratory acceleration, exercised by light, persists in obscurity for some hours.
4. That the differences between the amounts of oxygen absorbed in light and in darkness are more considerable at a low than at a high temperature.

According to the experimental record, the first conclusion seems to be well established, and in that case the second would follow almost as a matter of course. The two last conclusions do not appear to me at all clearly warranted, after a careful perusal of the experiments.

There are three possible sources of error in Dr. Pauchon's experiments. The first consists in placing the seeds on a pad of cotton saturated with water. In this case some of the rootlets may come in contact with the pad before others, and this would cause, by itself, a considerable irregularity in germination by the stimulating action of the moisture absorbed. The second source of error is the irregularity in germination caused by selecting seeds, for experiment, in which the radicle has not already burst the seed coats. The third source of error is the manner of securing similarity of temperature. The two glass vessels containing the seeds, one clear and the other covered with black paper, were placed side by side, in the air, with a thermometer between them. It does not seem to me at all certain that the thermometer indicates the actual temperature of the interior of each vessel, for the radiating powers of clear glass and black paper are by no means the same; and any difference in the temperature of the surrounding air, or of near objects, would destroy, if only in a small degree, the equilibrium of temperature in the two vessels, which would affect the germinative activity of the seeds, and vitiate the absorption observations by unequal expansion or contraction of the enclosed air.

If the problem be considered in the light of what we already know of the active influence of light on the green parts of plants in the presence of small quantities of carbonic anhydride, one would be inclined to think that light would probably have an *apparently* retarding effect on the respiratory function of seeds. In this way,—If the seed coats be at all pervious to light, chlorophyll would be developed in the young plumula, and by the action of the light on this substance, in presence of the carbonic anhydride evolved during germination, a portion of the carbonic anhydride would disappear, and the actual quantity produced during germination would be diminished in proportion to the activity of the light. This indirect effect of light could not take place if the carbonic anhydride evolved by the seeds was removed as soon as formed. It will be seen to what extent this idea is confirmed by the test of experiment.

Method of experiment.—In my first series of experiments I made use of an apparatus similar to the one employed in former experiments on germination, and fully described in a previous paper (Chem. Soc. J., Sept. 1880). The only modification introduced is in the form of the vessel containing the seeds experimented upon. This consisted of a piece of combustion tube, worked into the form shown in the figure (Fig. 2). The internal diameter was 13 M.M., and the length, between the two bends, 190 M.M. A tube this size will hold about 3 grams of barley loosely disposed all along the interior. Two tubes of the kind described were used in each experiment, and the rest of the apparatus was in duplicate. The two tubes were placed side by side in a glass trough

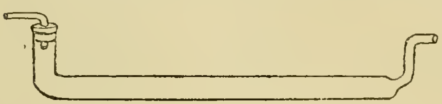


Fig. 2.

filled with water, one of the tubes being closely covered with two or three folds of tinfoil, to exclude the light, while the other was left clear. The carbonic anhydride, evolved in each tube, was collected by absorption in the potash bulbs and weighed.

A few remarks on the respiration of germinating barley will not be out of place at this point.

During germination oxygen is absorbed and carbonic anhydride excreted, the amount of the latter gas produced being very slightly less in volume than that of the oxygen absorbed, showing that a small quantity of oxygen is retained by the corns, and is probably used up in other changes. A certain quantity of water is also produced by respiration; and I have found that a fairly definite relation exists between the weights of the carbonic anhydride and the water. The numbers obtained indicate pretty plainly the splitting up of a carbohydrate by oxidation. The carbohydrate may belong to the cane sugar group represented by the formula $C_{12}\,H_{22}\,O_{11}$, the grape sugar group $C_{12}\,H_{24}\,O_{12}$, or the starch group, $n\,(C_6\,H_{10}\,O_5)$.

The oxidation by respiration of these carbohydrates may be represented by the following equations, and it will be observed that no more oxygen is required than is sufficient to convert the carbon into carbonic anhydride:—

1. Cane Sugar. $C_{12}\,H_{22}\,O_{11} + 24\,O = 12\,CO_2 + 11\,OH_2$
2. Glucose . $C_{12}\,H_{24}\,O_{12} + 24\,O = 12\,CO_2 + 12\,OH_2$
3. Starch . . $C_6\,H_{10}\,O_5 + 12\,O = 6\,CO_2 + 5\,OH_2$

The relation of the carbonic anhydride to the water will be made simpler by taking the molecular weight of carbonic anhydride 44, as a basis, then the ratios will be:—

	CO_2	OH_2
With Cane Sugar	44·0	16·5
,, Glucose	44·0	18·0
,, Starch	44·0	15·0

In one set of experiments on this point, the results of which appeared in the paper referred to above, a ratio of 44 : 18·28 was obtained, while in a later series of experiments, with a different barley, the ratio was 44 : 14·43. The first result points to the splitting up of a glucose, and the last to a splitting up of a starch.

In selecting corns for experiment, a small sample was taken, and all doubtful-looking corns carefully removed. From this, two lots of identical weight, about 3 grams each, were taken, one for each tube. They were steeped in water in small beakers, at the same temperature, for the same length of time, and were again weighed before being introduced into their respective tubes. The amount of moisture absorbed during steep was about 1·7 grams in most cases, and did not vary more than 0·02 grams in each duplicate experiment. The glass trough containing the germination tubes was placed as close as possible to a window having a clear look-out to the north. During the experiment, air saturated with moisture was slowly aspirated through the apparatus, so that the corns might be continually surrounded with fresh air. The germination was usually allowed to proceed for ten days, or until the acrospire had nearly reached the end of the corns. The temperature during the whole course of the experiments ranged between 14°·2 C. and 20°·8 C., and was regulated by means of a thermostat. During the greater number of the experiments the temperature only varied between 15°·5 C. and 16°·6 C.

The potash bulbs were weighed after germination had proceeded for three days, again after another interval of three days, and finally after another interval of four days. The other parts of the apparatus, including the germination tubes, were also weighed at the same time, to show that no moisture was lost or gained by the seeds experimented upon.

[*Continued on next page.*

I will now give the results of seven double experiments, made during March, April, and May 1881:—

Exposed to Light.			In Obscurity.			Result in favour of Light or Obscurity.
Experiment.	Days.	CO_2. C.C.	Experiment.	Days.	CO_2. C.C.	C.C. CO_2.
1A. Saale Barley, 3·014 grams,	3 6 10	25·67 34·50 41·50	1B. Saale Barley, 3·022 grams,	3 6 10	29·27 34·95 44·85	Obscurity, 3·60 Do. 0·45 Do. 3·35
Total,	..	101·67	Total,	..	109·07	Obscurity, 7·40
2A. Saale Barley, 3·037 grams,	3 6 10	40·79 43·48 47·13	2B. Saale Barley, 3·037 grams,	3 6 10	42·06 44·24 49·87	Obscurity, 1·27 Do. 0·76 Do. 2·74
Total,	..	131·40	Total,	..	136·17	Obscurity, 4·77
3A. Saale Barley, 3·040 grams,	3 6 10	40·23 41·70 47·94	3B. Saale Barley, 3·052 grams,	3 6 10	41·04 42·31 49·41	Obscurity, 0·81 Do. 0·61 Do. 1·47
Total,	..	129·87	Total,	..	132·76	Obscurity, 2·89
4A. Saale Barley, 3·029 grams,	3 6 10	43·78 41·75 52·10	4B. Saale Barley, 3·028 grams,	3 6 10	*42·46 *40·28 53·17	Light, . 1·32 Do. . 1·47 Obscurity, 1·07
Total,	..	137·63	Total,	..	135·91	Light, . 1·72
5A. Saale Barley, 3·010 grams,	3 6 10	41·95 41·14 45·56	5B. Saale Barley, 3·018 grams,	3 6 10	40·74 41·29 48·30	Light, . 1·21 Obscurity, 0·15 Do. 2·74
Total,	..	128·65	Total,	..	130·33	Obscurity, 1·68
6A. Saale Barley, 2·956 grams,	3 6 10	41·80 38·76 47·23	6B. Saale Barley, 2·936 grams,	3 6 10	41·40 40·03 46·62	Light, . 0·40 Obscurity, 1·27 Light, . 0·61
Total,	..	127·79	Total,	..	128·05	Obscurity, 0·26
7A. Saale Barley, 3·011 grams,	3 6 10	49·72 46·87 49·31	7B. Saale Barley, 3·094 grams,	3 6 10	50·63 45·81 50·12	Obscurity, 0·91 Light, . 1·06 Obscurity, 0·81
Total,	..	145·90	Total,	..	146·56	Obscurity, 0·66

Taking the totals in each double experiment, the result is as follows:—

	Total CO_2 produced.		Excess of CO_2 in favour of	
Experiment.	Light.	Obscurity.	Light.	Obscurity.
1.	101·67 c.c.	109·07 c.c.	...	7·40 c.c.
2.	131·40 ,,	136·17 ,,	...	4·77 ,,
3.	129·87 ,,	132·76 ,,	...	2·89 ,,
4.	137·63 ,,	135·91 ,,	1·72 c.c.	...
5.	128·65 ,,	130·33 ,,	...	1·68 ,,
6.	127·79 ,,	128·05 ,,	...	0·26 ,,
7.	145·90 ,,	146·56 ,,	...	0·66 ,,
Totals,	902·91 c.c.	918·85 c.c.	1·72 c.c.	17·66 c.c.

Total excess of carbonic anhydride produced in favour of obscurity is 15·94 c.c., or an increase in favour of obscurity of 1·75 per cent. on the mean of the total quantity of carbonic anhydride produced.

Of the seven double experiments, six show an increase in respiration in favour of obscurity, and one only in favour of light.

Out of the twenty-one separate observations made during the course of these experiments, fifteen show the greatest activity in obscurity, and the remaining six point to light as being a stimulating agent. I must remark here that two of the observations recorded in experiment 4B, and marked with an asterisk, are probably vitiated by a leakage which was found at one of the joints in apparatus, which would have the effect of diminishing somewhat the current of air which passed over the germinating barley, and the quantity of carbonic anhydride collected would be lessened in consequence.

Though, as a rule, there appears to be more carbonic anhydride evolved in darkness during germination, yet the increase, as shown by the foregoing experiments, is exceedingly variable in amount, and is altogether so slight that it is more than doubtful whether one is justified in taking the arithmetical mean of so few as seven experiments to express the truth. That identity in the conditions of moisture and temperature were secured in each double experiment can hardly be doubted. The only source of variation which remains is the difference in the samples of barley and in the constitution of individual corns, a difference which it is impossible to detect, much more to avoid. This difference in the samples of barley used, if not great, say about equal in effect at the most, to the retarding influence of light would in some experiments exaggerate the results in favour of obscurity and in others tend to neutralise them altogether, the results varying with the degree of difference between the samples of barley.

At the end of each experiment the corns were all carefully examined. I did not meet with any still or dead corns during all the experiments. There was little or no difference in the outward appearance of two samples, one grown in darkness and the other in strong diffused light, at the end of ten days; but on dissecting the corns it was found that while the interior of the primitive sheath of the plumula was of a pale yellow colour in the corns grown in obscurity, the colour of the same part in the corns grown under the influence of light was a dark green.

Not being satisfied with the results already obtained, I resolved to try a different method of experiment. I thought that if the observations could be made volumetrically as to the amount of carbonic anhydride produced, greater accuracy might be attained. With this object in view I devised and fitted up an apparatus similar in principle to that employed by Dr. Pauchon, and alluded to on a previous page. There is, however, considerable difference in the details and in the manner of experiment.

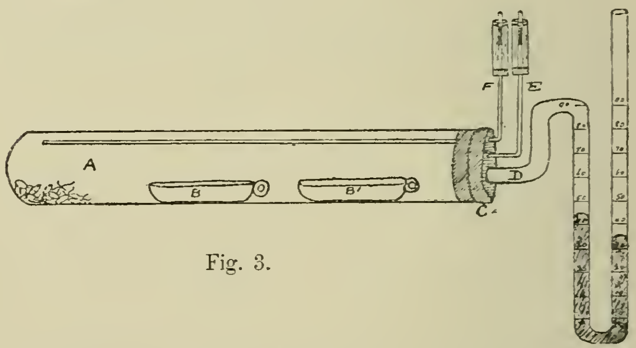


Fig. 3.

DESCRIPTION OF THE APPARATUS, Fig. 3.—A, a large strong glass tube (about 140 C.C. capacity) closed at one end. The open end of the tube is closed by an india-rubber cork, C. This cork is always pushed in to the same distance, shown by marks scratched on the glass tube. The cork has three perforations to carry three tubes, D, E, and F. D has an internal diameter of 8 M.M., and is bent in the form shown in the figure. It is graduated on both limbs from 0 to 90 M.M. E and F are two capillary tubes; F reaches nearly to the end of the tube A, while E is terminated level with the inner surface of the cork. The upper ends of both these tubes are closed by stoppers covered by a water joint. Their use is for replenishing the air in the large tube as often as it is considered necessary. B and B^1 are two porcelain spoon boats; B contains a measured quantity (about 1·3 C.C.) of distilled water, and B^1 about the same amount of potassa solution. The corns experimented upon are placed near the closed end of the tube.

A duplicate to this piece of apparatus, similar in every respect, was prepared, but light was excluded from its interior by an external coating of very thin sheet brass. The two tubes were fixed in an appropriate holder, and the whole was immersed under the surface of water, with only the open upper ends of the graduated tubes and the water joints protruding. The trough itself was placed in strong diffused light in a small greenhouse facing the north. Both pieces of apparatus were carefully calibrated.

Method of Experiment.—A sample of the corn, about 50 grams of barley or wheat, was taken and placed in a beaker. The corn was covered with water from thirty-six to seventy-five hours, changing the water at intervals. The water was then drained off the seeds, and they were placed in a glazed earthenware jar, covered with an opaque plate, and allowed to germinate for periods varying from two to eight days. At the stage fixed on for experiment the jar was opened and the sample turned out. Thirty corns, or thereabout, were then selected for each tube, the greatest pains being taken to ensure similarity in the size, weight, and progress in germination of the two samples. It was hoped by employing this method of selecting the corns to eliminate in some degree the variations caused by differences in the samples employed for experiment. After being weighed, the samples were introduced into their separate tubes, as shown in the figure, and the apparatus was immersed. After a short interval, to establish equilibrium of temperature, readings were taken on the limbs of the tube D, which is half filled with quicksilver, and the volume of the enclosed air was deduced after allowing for temperature, pressure, tension of aqueous vapour, and the volume of the seeds, as well as that of the two boats with their liquid contents. The volume occupied by the corns was ascertained by finding the specific gravity of a separate portion of the same sample. The readings were repeated at suitable intervals. The reduction in volume between each observation gave the amount of oxygen absorbed by the seeds, the carbonic anhydride produced being absorbed, as soon as formed, by the potassa solution in the boat B^1. When it was required to change the air in the tubes, which was usually done immediately after an observation of the absorption, the stoppers of the tubes E and F were removed; F was connected with an aspirator, and E with an apparatus for purifying the air and saturating it with moisture. About 1 litre of air was drawn through each tube at one time, the operation occupying about ten minutes. The stoppers were then replaced, and the volume of the contained air immediately ascertained.

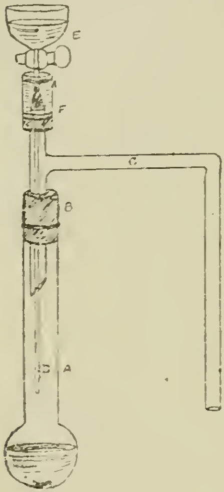


Fig. 4.

The quantity of carbonic anhydride, produced by the seeds, was found at the end of the experiment in the following way:—The contents of the two boats B and B^1, from each of the two tubes, were washed into two small flasks, like A in Fig. 4, with distilled water.

Each flask was, in turn, fitted with an indiarubber cork, B, perforated by the wide tube C, which was connected with a Sprengel's mercury pump. A tap funnel, E, containing recently boiled dilute sulphuric acid tinged with litmus communicated with the interior of the flask by the narrow tube, D, which passes down the axis of the broad tube C. As soon as a vacuum had been obtained, the acid solution in the funnel was *cautiously* run into the flask till the contents were pink in colour. The pump was then worked, and the flask exhausted as far as possible, the carbonic anhydride being collected in a tube over mercury. Gentle heat was then applied to the liquid, which caused it to boil briskly. It was found very advantageous to put a small piece of platinum foil, previously ignited, into the flask to prevent bumping. The source of heat was then withdrawn, and the pump worked till a vacuum was again produced, at which stage heat was applied once more, and the pump was set in action as previously. This operation was repeated until a vacuum was obtained within a few seconds after boiling the liquid. By proper attention to these details, the carbonic anhydride expelled from the liquid can be obtained nearly free from water in the collecting tube. The gas, which consists of carbonic anhydride, with a slight admixture of air, was analysed in the usual way in a Frankland's gas apparatus. A deduction was made from the quantity of carbonic anhydride found, to allow for that which was originally present in the potassa solution employed. The quantity of carbonic anhydride found, subtracted from the total quantity of oxygen absorbed during an experiment, gave the amount of oxygen absorbed and retained by the seeds.

These experiments were conducted at intervals during 1883, 1884, and 1885. Three blank experiments were tried with the apparatus placed in a *dark* room, and fitted up as described. The results thus obtained are tabulated on the next page.

BLANK EXPERIMENTS—IN OBSCURITY.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature.	Interval.	Oxygen utilised.								
			A. Clear Tube.	B. Covered Tube.	Excess in favour of	A. Clear Tube.	B. Covered Tube.	Excess in favour of	A. Clear Tube.	B. Covered Tube.	Excess in favour of
	°C.	Hours.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C C.	C.C.	C.C.
1A. and 1B. White Hungarian Barley, 1882. Weight—{1A., 1·87 grams. {1B., 1·84 ,, 30 Corns each. Germinated 4 days. Steeped 70 hours.	15·1 to 21·7	22¼ 22¼ 24 24¼ 23½	5·52 4·86 4·86 4·52 4·11	5·65 5·03 4·62 4·35 3·83	Covered, . 0·13 Do. . 0·17 Uncovered, 0·24 Do. . 0·17 Do. . 0·28	22·06	22·08	Covered, 0·02	1 81	1·40	Uncovered, 0·41
			23·87	23·48	Uncovered, 0·39						
2A. and 2B. Yellow English Barley, 1882. Weight—{2A., 2·32 grams. {2B., 2·33 ,, 30 Corns each. Steeped 68 hours. Germinated 8 days.	14·5 to 16·5	22½ 23½ 24½	7·22 5·89 7·27	7·31 6·09 7·47	Covered, . 0·09 Do. . 0·20 Do. . 0·20	19·76	20·11	Covered, 0·35	0·62	0·76	Covered, 0·14
			20·38	20·87	Covered, . 0·49						
3A. and 3B. Yellow English Barley, 1882. Weight—{3A., 2·14 grams. {3B., 2·14 ,, 30 Corns each. Steeped 66 hours. Germinated 4 days.	14·3 to 16·0	22 23¾ 23¾ 23¾ 24¼	6·61 6·26 5·84 4·78 5·08	6·80 6·38 5·78 4·56 4·96	Covered, . 0·19 Do. . 0·12 Clear, . 0·06 Do. . 0·22 Do. . 0·12	25·75	25·91	Covered, 0·16	2·82	2·57	Clear, 0·25
			28·57	28·48	Clear, . 0·09						

A glance at the preceding Table shows that there is not much difference in the results obtained in the two tubes, when the whole apparatus is kept in the dark. In the case of "Oxygen utilised," the differences are pretty equally distributed in favour of either tube; but in the case of "Carbonic Anhydride produced" there appears to be a slight increase in favour of the covered tube in each experiment. These results may be more clearly seen by collecting the totals as before:—

	Total Oxygen utilised.		Excess in favour of	
Experiment.	Clear Tube.	Covered Tube.	Clear Tube.	Covered Tube.
1.	23·87 c.c.	23·48 c c.	0·39 c.c.	...
2.	20·38 ,,	20·87 ,,	...	0·49 c.c.
3.	28·57 ,,	28·48 ,,	0·09 ,,	...
Totals,	72·82 c.c.	72·83 c.c.	...	0·01 c.c.

	Total CO_2 produced.		Excess in favour of
Experiment.	Clear Tube.	Covered Tube.	Covered Tube.
1.	22·06 c.c.	22·08 c.c.	0·02 c.c.
2.	19·76 ,,	20·11 ,,	0·35 ,,
3.	25·75 ,,	25·91 ,,	0·16 ,,
Totals,	67·57 c.c.	68·10 c.c.	0·53 c.c.

The total quantity of oxygen utilised by the seeds in the three experiments is nearly identical in both tubes. The totals of carbonic anhydride produced show a small increase of 0·53 c.c. in favour of the covered tube, equal to 0·78 per cent. on the mean of the total quantity of carbonic anhydride formed. There is hardly any doubt that this increase would be considerably lowered if the mean of a larger number of experiments were taken.

Considering these results as a sufficient test of the efficiency of the apparatus, I may now give, in a tabular form, the results obtained when strong diffused light was admitted to the clear tube.

TABLE OF EXPERIMENTAL RESULTS.

Experiment.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature.	Interval.	Oxygen utilised.								
			A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity	Excess in favour of	A. Light.	B. Obscurity	Excess in favour of
	°C.	Hours.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.
1A. and 1B. Saalo Barley, 1880. Weight—{1A., 3·78 grams. 1B., 3·71 " 60 Corns each. Steeped 62 hours. Germinated 1 day.	12·0 to 19·5	12¼	...	3·70	...						
		3¼	...	1·02	...						
		6½	...	2·78	...						
		13	...	5·51	...						
		4½	*Lost.*	2·01	...						
		6		4·27	...	27·59	26·53	Light, 1·06	*Lost*	2·83	...
		12⅓	...	5·72	...						
		4	...	1·84	...						
		5½	...	2·51	...						
			...	29·36	...						
2A. and 2B. English Barley, 1882. Weight—{A., 1·97 grams. B., 1·97 " 30 Corns each. Steeped 70 hours. Germinated 3 days.	11·9 to 18·0	9	2·49	2·22	Light, . 0·27						
		10½	2·47	2·25	Do. . 0·22						
		4	0·94	0·99	Obscurity, 0·05						
		8	1·89	1·80	Light, . 0·09						
		11⅓	2·23	2·27	Obscurity, 0·04						
		4¾	1·26	1·06	Light, . 0·20						
		7¼	1·99	1·86	Do. . 0·13						
		11¼	2·42	2·26	Do. . 0·16	19·72	19·46	Light, 0·26	3·93	2·56	Light, 1·37
		4¾	0·93	0·85	Do. . 0·08						
		6	1·54	1·37	Do. . 0·17						
		13	2·60	2·45	Do. . 0·15						
		4¾	1·11	1·00	Do. . 0·11						
		7¼	1·78	1·64	Do. . 0·14						
			23·65	22·02	Light, . 1·63						

TABLE OF EXPERIMENTAL RESULTS—*continued.*

Experiment.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature.	Interval.	Oxygen utilised. A. Light.	Oxygen utilised. B. Obscurity.	Oxygen utilised. Excess in favour of	A. Light.	B. Obscurity	Excess in favour of	A. Light.	B. Obscurity	Excess in favour of
	°C.	Hours.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.	c.c.
3A. and 3B.	12·5 to 19·6	7½	3·75	3·54	Light, . 0·21	20·77	20·05	Light, 0·72	2·11	1·90	Light, 0·21
English Barley, 1882.		11⅓	3·13	2·95	Do. . 0·18						
Weight—{A., 2·18 grams.		4½	1·21	1·26	Obscurity, 0·05						
{B., 2·11 "		7½	2·12	1·98	Light, . 0·14						
30 corns each.		11½	2·88	2·95	Obscurity, 0·07						
Steeped 72 hours.		4¾	1·13	1·09	Light, . 0·04						
Germinated 4 days.		8¼	2·51	2·33	Do. . 0·18						
		10½	2·94	2·84	Do. . 0·10						
		5	1·27	1·26	Do. . 0·01						
		6	1·94	1·75	Do. . 0·19						
			22·88	21·95	Light, . 0·93						
4A. and 4B.	13·3 to 19·8	12¾	3·81	3·73	Light, . 0·08	20·76	20·52	Light, 0·24	0·61	0·57	Light, 0·04
English Barley, 1882.		10	3·18	3·00	Do. . 0·18						
Weight—{A., 2·12 grams.		15¼	3·47	3·40	Do. . 0·07						
{B., 2·03 "		10¾	2·60	2·55	Do. . 0·05						
30 Corns each.		12	2·13	2·28	Obscurity, 0·17						
Steeped 70 hours.		8¾	2·34	2·27	Light, . 0·07						
Germinated 5 days.		11½	2·36	2·38	Obscurity, 0·02						
		6¾	1·48	1·48	Equal.						
			21·37	21·09	Light, . 0·28						

TABLE OF EXPERIMENTAL RESULTS—*continued.*

Experiment.	Observations during Germination. Temperature.	Interval.	Oxygen utilised. A. Light.	B. Obscurity.	Excess in favour of	Total Carbonic Anhydride produced. A. Light.	B. Obscurity	Excess in favour of	Total Oxygen absorbed and retained. A. Light.	B. Obscurity	Excess in favour of
	°C.	Hours.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.
5A. and 5B. English Barley, 1882. Weight—{A., 2·28 grams. {B., 2·19 ,, 30 Corns each. Steeped 72 hours. Germinated 3 days.	12·8 to 21·0	12	4·71	4·60	Light, . 0·11	25·85	24·11	Light, 1·74	2·37	2·64	Obscurity, 0·27
		9¼	3·93	3·82	Do. . 0·11						
		13¾	4·88	4·66	Do. . 0·22						
		9¾	3·07	2·89	Do. . 0·18						
		13½	2·99	2·79	Do. . 0·20						
		7½	2·12	1·80	Do. . 0·32						
		14¾	3·48	3·24	Do. . 0·24						
		10	3·04	2·95	Do. . 0·09						
			28·22	26·75	Light, . 1·47						
6A. and 6B. English Barley, 1882. Weight—{A., 2·05 grams. {B., 2·10 ,, 30 Corns each. Steeped 72 hours. Germinated 6½ days.	12·5 to 21·2	12½	2·96	3·00	Obscurity, 0·04	21·74	21·58	Light, 0·16	1·19	0·85	Light, 0·34
		9¼	2·18	1·96	Light, . 0·22						
		14½	2·65	2·41	Do. . 0·24						
		13½	2·79	2·78	Do. . 0·01						
		15	2·40	2·38	Do. . 0·02						
		23¾	4·05	4·21	Obscurity, 0·16						
		25	5·90	5·69	Light, . 0·21						
			22·93	22·43	Light, . 0·50						
7A. and 7B. Austrian Barley, 1882. Weight—{A., 2·11 grams. {B., 2·06 ,, 30 Corns each. Steeped 72 hours. Germinated 3 days.	18·5 to 20·6	16¼	6·33	6·25	Light, . 0·08	25·27	25·12	Light, 0·15	1·27	0·99	Light, 0·28
		22¾	7·73	7·46	Do. . 0·27						
		24¾	6·79	6·71	Do. . 0·08						
		23	5·69	5·69	Equal.						
			26·54	26·11	Light, . 0·43						

Table of Experimental Results—*continued.*

Experiment.	Observations during Germination.					Total Carbonic Anhydride produced.			Total Oxygen absorbed and retained.		
	Temperature.	Interval.	Oxygen utilised.								
			A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity	Excess in favour of	A. Light.	B. Obscurity	Excess in favour of
8A. and 8B. Austrian Barley, 1882. Weight—{A., 1·89 grams. {B., 1·97 ,, 30 Corns each. Steeped 75 hours. Germinated 3 days.	°C. 15·9 to 20·0	Hours. 17¼ 23¾ 23¾ 24	c.c. 5·86 8·34 6·78 6·41 27·39	c.c. 5·73 7·92 6·44 6·08 26·17	c.c. Light, . 0·13 Do. . 0·42 Do. . 0·34 Do. . 0·33 Light, . 1·22	c.c. 25·02	c.c. 23·80	c.c. Light, 1·22	c.c. 2·37	c.c. 2·37	c.c. Equal.
9A. and 9B. White Hungarian Barley, 1882. Weight—{A., 1·94 grams. {B., 2·00 ,, 30 Corns each. Steeped 72 hours. Germinated 3 days.	13·8 to 19·0	18¼ 23½ 23 23¾	6·61 6·13 4·94 5·03 22·71	6·26 5·69 4·64 4·79 21·41	Light, . 0·35 Do. . 0·44 Do. . 0·30 Do. . 0·24 Light, . 1·30	20·69	*Lost*	...	2·02	*Lost*	...
10A. and 10B. Yellow English Barley, 1882. Weight—{A., 2·16 grams. {B., 2·20 ,, 30 Corns each. Steeped 60 hours. Germinated 5 days.	17·3 to 22·0	28¼ 24¼ 21½	B. 12·41 6·70 7·86 26·97	A. 12·04 6·31 7·15 25·50	Light, . 0·37 Do. . 0·39 Do. . 0·71 Light, . 1·47	B. 26·13	A. 24·66	Light, 1·47	B. 0·84	A. 0·84	Equal.
11A. and 11B. White Hungarian Barley, 1882. Weight—{A., 1·86 grams. {B., 1·94 ,, 30 Corns each. Steeped 72 hours. Germinated 3 days.	16·0 to 20·0	25½ 28¼ 19¼ 18¼ 27¾	7·75 6·76 3·87 3·66 4·77 26·81	7·05 6·28 3·50 3·22 4·47 24·52	Light, . 0·70 Do. . 0·48 Do. . 0·37 Do. . 0·44 Do. . 0·30 Light, . 2·29	25·16	22·78	Light, 2·38	1·65	1·74	Obscurity, 0·09

In these experiments on different kinds of barley, the large majority of the observations, during germination, as to the amount of oxygen utilised by the corns, points to a small but variable increased activity under the influence of strong diffused light. Of the sixty-six observations recorded on this point, fifty-six are in favour of light, eight in favour of obscurity, and two show an equality.

Of the total quantity of oxygen utilised in each experiment, the results show a small variable increase in favour of light in every case:—

	Total Quantity of Oxygen utilised.		Excess in favour of
Experiment.	Light.	Obscurity.	Light.
2.	23·65 c.c.	22·02 c.c.	1·63 c.c.
3.	22·88 ,,	21·95 ,,	0·93 ,,
4.	21·37 ,,	21·09 ,,	0·28 ,,
5.	28·22 ,,	26·75 ,,	1·47 ,,
6.	22·93 ,,	22·43 ,,	0·50 ,,
7.	26·54 ,,	26·11 ,,	0·43 ,,
8.	27·39 ,,	26·17 ,,	1·22 ,,
9.	22·71 ,,	21·41 ,,	1·30 ,,
10.	26·97 ,,	25·50 ,,	1·47 ,,
11.	26·81 ,,	24·52 ,,	2·29 ,,
Totals,	249·47 c.c.	237·95 c.c.	11·52 c.c.

The *total* excess of oxygen utilised, in favour of light, in all the experiments amounts to 11·52 c.c., or an increase of 4·73 per cent. on the mean of the total quantity of oxygen utilised, 243·71 c.c.

Of the ten experiments in which the carbonic anhydride produced was determined, all show a small variable increase in favour of the corns grown under the influence of light.

	Carbonic Anhydride produced.		Excess in favour of
Experiment.	Light.	Obscurity.	Light.
1.	27·59 c.c.	26·53 c.c.	1·06 c.c.
2.	19·72 ,,	19·46 ,,	1·26 ,,
3.	20·77 ,,	20·05 ,,	0·72 ,,
4.	20·76 ,,	20·52 ,,	0·24 ,,
5.	25·85 ,,	24·11 ,,	1·74 ,,
6.	21·74 ,,	21·58 ,,	0·16 ,,
7.	25·27 ,,	25·12 ,,	0·15 ,,
8.	25·02 ,,	23·80 ,,	1·22 ,,
10.	26·13 ,,	24·66 ,,	1·47 ,,
11.	25·16 ,,	22·78 ,,	2·38 ,,
Totals,	238·01 c.c.	228·61 c.c.	9·40 c.c.

The *total* excess of carbonic anhydride produced, in favour of light, in all the experiments is 9·40 c.c., or an increase of 4·03 per cent. on the mean of the total quantity of carbonic anhydride produced, *i.e.* 233·31 c.c.

The amount of oxygen *absorbed* and *retained* by the seeds varied very much, and indefinitely, in the different experiments. Of the nine double results recorded, five are in favour of light, two in favour of obscurity, and in two equality was observed.

	Oxygen absorbed and retained.		Excess in favour of	
Experiment.	Light.	Obscurity.	Light.	Obscurity.
2.	3·93 c.c.	2·56 c.c.	1·37 c.c.	...
3.	2·11 ,,	1·90 ,,	0·21 ,,	...
4.	0·61 ,,	0·57 ,,	0·04 ,,	...
5.	2·37 ,,	2·64 ,,	...	0·27 c.c.
6.	1·19 ,,	0·85 ,,	0·34 ,,	...
7.	1·27 ,,	0·99 ,,	0·28 ,,	...
8.	2·37 ,,	2·37 ,,	Equal	
10.	0·84 ,,	0·84 ,,	Equal	
11.	1·65 ,,	1·74 ,,	...	0·09 c.c.

On comparing the mean rate of increase in the carbonic anhydride produced in favour of light, as determined by this series of experiments, with the rate obtained in the first series of experiments (where the carbonic anhydride was weighed), it will be at once seen that it is rather more than twice as great, and is, moreover, in the opposite direction. That is to say, in the first series of experiments an excess of carbonic anhydride was produced in favour of obscurity, and in the second series a greater excess of carbonic anhydride was produced in favour of light. I can only account for this discrepancy in the results in the following way:—

In the first series of experiments a larger number of seeds was employed; these were confined in a narrow tube, through which air was slowly aspirated. It is evident that the air present in the tube must be contaminated to a small extent with the carbonic anhydride produced by the germinating seeds. On calculating the amount of this contamination, from the quantities of air aspirated and carbonic anhydride excreted, it was found to vary from 0·58 per cent. to 1·26 per cent. during the different experiments. It is possible that the influence of light on the seeds in the exposed tube, in presence of this small quantity of carbonic anhydride, may have tended, by its partial decomposition, to diminish the observed amount of carbonic anhydride excreted, though the results, when compared with the degree of contamination in each experiment, do not show any corresponding variation in the quantity of carbonic anhydride excreted. If this variation exists, it was overshadowed by the effect of unavoidable differences in the samples of barley, or by some other unknown cause. The main fact remains, that all the experiments show a slight increase of germinative respiration in the samples of barley grown in obscurity.

In the second series of experiments (in which the carbonic anhydride was measured volumetrically) the seeds were placed in a large tube with about 120 c.c. of air, and potassa solution was present in the tube, to absorb the carbonic anhydride as it was produced. The average quantity of carbonic anhydride produced in twenty-four hours throughout the experiments would be about 6 c.c. (varying from 4 to 8 c.c.), which would give 0·25 c.c. per hour, and there can be no doubt that the greater part of this quantity would be absorbed by the potassa solution in the same time, *i.e.* one hour. It is evident, therefore, that the contamination of the air by the presence of unabsorbed carbonic anhydride must be very slight indeed, and far below that which obtained in the first series of experiments, and also that the disturbing effect of such contamination on the results would be absent in the second series.

In order to test this theory, I performed a few additional experiments with the same apparatus used in the second series, but instead of absorbing the carbonic anhydride as it was formed, I allowed it to remain in contact with the seeds. At the end of each experiment, a portion of the air was withdrawn from each tube, and a measured quantity analysed, to determine the quantity of carbonic anhydride produced in each tube. The following are the results obtained in this way:—

Experiment.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
	c.c.	c.c.	c.c.
1A. and 1B. Yellow English Barley, 1882. Weight—{A., 2·11 grams. B., 2·08 ,, 30 Corns each. Steeped 72 hours. Germinated 4 days.	15·24	15·50	Obscurity, 0·26
2A. and 2B. Yellow English Barley, 1882. Weight—{A., 2·23 grams. B., 2·26 ,, 30 Corns each. Steeped 72 hours. Germinated 8 days.	11·33	11·01	Light, . 0·32
3A. and 3B. Yellow English Barley, 1882. Weight—{A., 2·34 grams. B., 2·37 ,, 30 Corns each. Steeped 72 hours. Germinated 8 days.	18·16	18·97	Obscurity, 0·81
4A. and 4B. Yellow English Barley, 1882. Weight—{A., 2·20 grams. B., 2·14 ,, 30 Corns each. Steeped 72 hours. Germinated 6 days.	18·85	19·40	Obscurity, 0·55
5A. and 5B. Saale Barley, 1880. Weight—{A., 2·08 grams. B., 2·09 ,, 30 Corns each. Steeped 72 hours. Germinated 4 days.	17·62	17·24	Light, . 0·38
6A. and 6B. Saale Barley, 1880. Weight—{A., 2·10 grams. B., 2·14 ,, 30 Corns each. Steeped 72 hours. Germinated 8 days.	18·76	18·33	Light, . 0·43
7A and 7B. Yellow English Barley, 1882. Weight—{A., 2·20 grams. B., 2·17 ,, 30 Corns each. Steeped 70 hours. Germinated 5 days.	14·86	14·74	Light, . 0·12
8A. and 8B. Yellow English Barley, 1882. Weight—{A., 2·10 grams B., 2·17 ,, 30 Corns each. Steeped 70 hours. Germinated 11 days.	12·93	14·03	Obscurity, 1·10
Totals,	127·75	129·22	Obscurity, 1·47

In these experiments four results are recorded in favour of light and four in favour of obscurity; though the excess in favour of obscurity is rather more than twice as great as that recorded in favour of light.

This leaves a total excess of carbonic anhydride produced in favour of obscurity of 1·47 c.c., or 1·14 per cent. on the mean of the total quantity of carbonic anhydride produced in all the experiments.

The rate of increased activity in favour of obscurity, thus obtained, approaches in amount that found in the first series of experiments.

This result, if considered trustworthy, seems to bear out the explanation given above of the considerable discrepancy between the evidence afforded by the results of the first and second series of experiments as to the influence of light on the respiration of germinating barley.

A noteworthy point in this third series of experiments is the fact that although the contamination of the air by carbonic anhydride is much greater than it was in the first series, yet its effect in masking the stimulating action of light is not increased, as might reasonably be expected would be the case. The only part of the seed which would probably have the power of decomposing carbonic anhydride in presence of light is the young plumula, and the quantity of this gas which it would be able to decompose would certainly be very small, so it might happen that when the amount of carbonic anhydride present in the air is above a certain point it ceases to have an increased effect in diminishing the observed quantity of the gas which is produced by the seeds when germinated under the influence of light.

It seems fair to conclude from a consideration of all the results obtained that light has probably a small stimulating action on the respiration of germinating barley, resulting in an increase of between 3 and 4 per cent. in the quantity of carbonic anhydride excreted; and that this increased activity is lost sight of when the air surrounding the seeds is contaminated, even in a small degree, by carbonic anyhdride.

I made a few experiments to ascertain the influence of light on the respiration of germinating wheat, employing for the purpose the same apparatus that was used in the second and third series of experiments on barley.

In the six following experiments, the carbonic anhydride was absorbed by potassa solution as soon as formed, and the absorption of oxygen by the seeds was noted from time to time, as in the second series of experiments with barley :—

TABLE OF EXPERIMENTAL RESULTS.

EXPERIMENT.	Observations during Germination.					Total Carbonic Anhydride produced.		
	Temperature.	Interval.	Oxygen utilised.					
			A. Light.	B. Obscurity.	Excess in favour of	A. Light.	B. Obscurity.	Excess in favour of
	°C.	Hrs.	C.C.	C.C.	C.C.	C.C.	C.C.	C.C.
1A. and 1B.	19·6 to 22·3					28·50	27·17	Light, 1·33
White Wheat, 1882.		17½	5·91	6·15	Obscurity, 0·24			
Weight—{A., 2·04 grams.		23½	7·24	7·27	Do. 0·03			
{B., 2·01 ,,		24	7·28	6·64	Light, . 0·64			
30 Corns each.		22¾	7·49	6·03	Do. . 0·14			
Steeped 50 hours.								
Germinated 3 days.			27·92	26·09	Light, . 1·83			
2A. and 2B.	16·3 to 18·8	25	6·40	6·61	Obscurity, 0·21	25·69	25·70	Obscurity, 0·01
White Wheat, 1883.		28½	6·27	6·27	Equal			
Weight—{A., 1·47 grams.		18½	4·09	4·08	Obscurity, 0·01			
{B., 1·53 ,,		27½	5·99	5·75	Light, . 0·24			
20 Corns each.		13½	3·03	2·73	Do. . 0·30			
Steeped 50 hours.								
Germinated 2½ days.			25·78	25·44	Light, . 0·34			
3A. and 3B.	19·3 to 22·6					12·57	Lost	Light (?)
White Wheat, 1883.		16	3·72	3·68	Light, . 0·04			
Weight—{A., 1·41 grams.		24½	4·95	4·84	Do. . 0·11			
{B., 1·48 ,,		24	4·77	4·29	Do. . 0·48			
20 Corns each.								
Steeped 37 hours.			13·44	12·81	Light, . 0·63			
Germinated 3 days.								
4A. and 4B.	18·5 to 20·6					Lost	12·20	Light (?)
White Wheat, 1883.		17½	3·20	3·03	Light, . 0·17			
Weight—{A., 1·43 grams.		23½	3·54	3·01	Do. . 0·53			
{B., 1·34 ,,		23½	3·98	3·17	Do. . 0·81			
20 Corns each.		24	3·45	2·77	Do. . 0·68			
Steeped 24 hours.								
Germinated 3¼ days.			14·17	11·98	Light, . 2·19			
5A. and 5B.	14·3 to 18·1					13·67	14·60	Obscurity, 0·93
Red Wheat, 1884.		24½	4·37	4·41	Obscurity, 0·04			
Weight—{A., 1·54 grams.		18	2·38	2·71	Do. 0·33			
{B., 1·49 ,,		30½	4·12	4·08	Light, . 0·04			
20 Corns each.		16½	2·91	2·94	Obscurity, 0·03			
Steeped 36 hours.			13·78	14·14	Obscurity, 0·36			
Germinated 4 days.								
6A. and 6B.	10·5 to 14·0					12·71	13·11	Obscurity, 0·40
Red Wheat, 1884.		24½	3·61	3·50	Light, . 0·11			
Weight—{A., 1·47 grams.		24½	2·69	2·76	Obscurity, 0·07			
{B., 1·46 ,,		48	5·56	5·47	Light, . 0·09			
20 Corns each.								
Steeped 37 hours.			11·86	11·73	Light, . 0·13			
Germinated 4 days.								

The results obtained in this rather imperfect series of experiments are too few in number to justify taking an average. They show, broadly, for white wheat an increased activity in the respiration under the influence of light; but in the case of red wheat, in the two experiments recorded, there appears to be a small increase in the oxygen absorbed and carbonic anhydride excreted in favour of the samples grown in darkness.

These experiments, though they can hardly be considered decisive as to the action of light, bring to notice a peculiarity in the respiration of wheat which I have never met with in barley, that is, the volume of carbonic anhydride excreted generally exceeds in volume the amount of oxygen absorbed by the seeds. In the case of barley there is always more oxygen absorbed than carbonic anhydride excreted. This peculiarity of wheat certainly deserves further study.

It is more than probable that a portion at least of the oxygen absorbed by germinating wheat is retained, and does not appear again as carbonic anhydride, as is the case with germinating barley. If this is so, a considerable percentage of the carbonic anhydride excreted by germinating wheat cannot be accounted for as derived from the splitting up of a carbohydrate, and we must look to more complicated bodies, probably some of the nitrogenous compounds, for its source.

As with barley, I made a few experiments to determine the action of light on the respiration of germinating wheat, when the carbonic anhydride excreted was allowed to remain in contact with the seeds. Contrary to expectation, white wheat still showed an increased activity in respiration under the influence of light, and red wheat still showed a little in favour of obscurity:—

Experiment.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
	c.c.	c.c.	c.c.
1A. and 1B. White Wheat, 1883. Weight—{A., 1·40 grams. B., 1·44 ,, 20 Corns each. Steeped 24 hours. Germinated 4 days.	12·36	11·79	Light, . 0 57

Experiment.	Carbonic Anhydride produced.		Excess in favour of
	A. Light.	B. Obscurity.	
2A. and 2B. White Wheat, 1883. Weight— {A., 1·44 grams. B., 1·36 ,, 20 Corns each. Steeped 24 hours. Germinated $4\frac{1}{2}$ days.	C.C. 13·76	C.C. 12·59	C.C. Light, . 1·17
3A. and 3B. Red Wheat, 1884. Weight— {A., 1·47 grams. B., 1·45 ,, 20 Corns each. Steeped 47 hours. Germinated 5 days.	7·75	7·37	Light, . 0 38
4A. and 4B. Red Wheat, 1884. Weight— {A., 1·47 grams. B., 1·49 ,, 20 Corns each. Steeped 38 hours. Germinated 6 days.	7·67	8·27	Obscurity, 0 60

If these experiments on wheat were considerably multiplied, using rather larger quantities of the seed, no doubt a more decided result might be obtained.

On Acrosiphonia Traillii, a new British Alga. By Edward A. L. Batters, B.A., LL.B., F.L.S.

(With Plate II.)

Acrosiphonia Traillii, J. G. Ag. (Batt. in Herb.).—Filaments slender, one or two inches long, tufted and densely matted at base, becoming free and divergent above; colour at first dark green, but soon becoming brownish olive; tufts composed of numerous separate bundles; branches near the base rhizoidal, recurved, and interlaced; upper branches erect, opposite, or subsecund; main axis distinct, composed of one or two long branches beset with opposite or scattered ramuli; the ultimate branches of two kinds, the one having apices drawn out with a long slender point, the other of nearly equal diameter throughout, with very obtuse apices. The spiny branches greatly outnumber the blunt ones, but both kinds are sometimes found side by side. Hooked branches are present, but in very small numbers. Fertile cells $1–2\frac{1}{2}$ times as long as broad. Average width of filaments 110 μ.

Hab.—On rocks in shallow tide-pools, in the shade, at a little above half-tide level. March to July. Spores escape in June. Joppa, near Edinburgh. G. W. Traill.

This species belongs to the section *Speirogonieæ*, in which the fertile cells at first are scattered, solitary, or two or three together, of Kjellman's sub-genus *Melanarthrum*, which is characterised by the fertile cells containing very numerous motile bodies, about 2·5 μ. in diameter, so closely packed as to render the cells which contain them opaque.

Although very closely related to *A. albescens*, Kjellm., *A. Traillii* appears to be a fairly well marked species.

Named in honour of Mr. G. W. Traill, its discoverer, to whom alone is due the credit of having noted that it was different from *A. centralis*.

Explanation of Figures in Plate II.

Fig. 1. Plant natural size.
Fig. 2. Portion of tuft separated, slightly magnified.
Fig. 3. Apex of a branch, showing spiny and blunt ramuli, × 100.
Fig. 4. Branch with fertile cells, *f* × 100.
Fig. 5. Branch with hooked ramulus and fertile cells, × 100.
Fig. 6. Apex of obtuse ramulus, showing perforated chlorophyll body, × 100.
Fig. 7. Base of branch with rhizoidal filaments, × 100.

Notes on Gleichenias. By Percival C. Waite.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during March 1894. By Robert Lindsay, Curator.

During the month of March the thermometer was at or below the freezing point on nineteen mornings, indicating collectively for the month 63° of frost, as against 64° for the corresponding month last year. The lowest temperatures were registered on the mornings of the 12th, 27°; 16th, 25°; 17th, 24°; 26th, 26°; 27th, 25°. The day temperatures were high, the lowest being 46°, on the 5th, and the highest 65°, on the 30th. There was a fair amount of bright sunshine, and on the whole the month was a most favourable one. Vegetation generally has made good progress. The leaf-buds of deciduous trees and shrubs are well advanced. Early flowering varieties of *Rhododendron*, *Andromeda*, and *Ribes* are flowering freely.

Forsythia suspensa and *Magnoliæ conspicua* are unusually well flowered. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following eighteen came into flower during March, thus completing the list, viz.:—*Tussilago alba*, on 2nd March; *Narcissus pumilus*, 6th; *Scilla bifolia alba*, 6th; *S. taurica*, 6th; *Orobus vernus*, 6th; *Sisyrinchium grandiflorum album*, 12th; *Omphalodes verna*, 13th; *Draba aizoides*, 14th; *Erythronium Dens-canis*, 14th; *Aubrietia grandiflora*, 16th; *Sisyrinchium grandiflorum*, 18th; *Ribes sanguineum*, 19th; *Narcissus Pseudo-Narcissus*, 20th; *Corydalis solida*, 22nd; *Hyoscyamus Scopolia*, 22nd; *Symphytum caucasicum*, 22nd; *Adonis vernalis*, 24th; *Fritillaria imperialis*, 25th.

On the rock-garden 75 species and varieties came into flower during the month, as against 81 for March last year. Amongst the most interesting were — *Anemone ranunculoides*, *A. fulgens*, *Aubrietia Hendersonii*, *Cardamine trifoliata*, *Corydalis nobilis*, *Dentaria pentaphylla*, *D. enneaphylla*, *Doronicum caucasicum*, *Narcissus incomparabilis giganteus*, *Omphalodes verna alba*, *Pachysandra procumbens*, *Pachystima Canbyi*, *Rhododendron ciliatum*, *Saxifraga ciliata*, *S. juniperina*, *S. fimbriata*, *S. crassifolia*, *S. sancta*, *S. retusa*, *S. pyrenaica*, *Scopolia Hladnickiana*, *Soldanella montana*, etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during March 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	30°	40°	48°	17th	24°	50°	54°
2nd	32	43	49	18th	34	47	55
3rd	33	44	51	19th	43	48	57
4th	33	38	49	20th	44	47	51
5th	30	39	46	21st	37	54	61
6th	37	43	49	22nd	32	45	56
7th	27	33	52	23rd	29	43	58
8th	37	45	52	24th	32	44	57
9th	34	41	55	25th	27	42	56
10th	33	40	48	26th	26	43	48
11th	35	37	49	27th	25	38	56
12th	27	42	48	28th	34	44	53
13th	30	40	48	29th	28	40	62
14th	32	43	50	30th	30	39	65
15th	28	41	50	31st	31	40	57
16th	25	41	50				

REGISTER OF SPRING-FLOWERING PLANTS, SHOWING DATES OF FLOWERING, AT THE ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE YEARS 1893 AND 1894.

No.	Names of Plants.	First Flowers opened. 1893.	1894.
1	Adonis vernalis, ...	March 13	March 24
2	Arabis albida, ...	,, 3	February 20
3	Aubrictia grandiflora, . . .	,, 20	March 16
4	Bulbocodium vernum, . . .	February 10	January 12
5	Corydalis solida, . . .	March 24	March 22
6	Coryllus Avellana, . .	February 8	February 3
7	Crocus Susianus, ...	,, 8	,, 6
8	,, vernus, ...	,, 14	,, 12
9	Daphne Mezereum, . . .	,, 19	,, 19
10	Dondia Epipactis, ...	January 16	Dec. 28 (1893)
11	Draba aizoides, ...	March 13	March 14
12	Eranthis hyemalis, . . .	January 25	January 19
13	Erythronium Dens-canis, . .	March 13	March 14
14	Fritillaria imperialis, . . .	April 3	,, 25
15	Galanthus nivalis, . . .	January 30	January 16
16	,, plicatus, . . .	,, 28	,, 22
17	Hyoscyamus Scopolia, . . .	March 18	March 22
18	Iris reticulata, ...	,, 3	February 19
19	Leucojum vernum, . . .	February 6	January 18
20	Mandragora officinalis, . . .	March 26	February 26
21	Narcissus Pseudo-Narcissus, .	,, 23	March 20
22	,, pumilus, . . .	,, 10	,, 6
23	Nordmannia cordifolia, . . .	February 20	February 14
24	Omphalodes verna, . . .	March 15	March 13
25	Orobus vernus, ...	,, 2	,, 6
26	Rhododendron atrovirens, . .	February 4	January 24
27	,, Nobleanum, . .	,, 14	February 3
28	Ribes sanguineum, . .	March 17	March 19
29	Scilla bifolia, ...	,, 6	February 5
30	,, ,, alba, ...	,, 7	March 6
31	,, præcox, ...	February 10	January 22
32	,, siberica, ...	,, 14	,, 22
33	,, taurica, . . .	March 7	March 6
34	Sisyrinchium grandiflorum, . .	,, 2	,, 18
35	,, ,, album,	,, 5	,, 12
36	Symphytum caucasicum, . .	,, 24	,, 22
37	Symplocarpus fœtidus, . . .	February 14	February 13
38	Tussilago alba, . . .	,, 16	March 2
39	,, fragrans, ...	,, 6	Dec. 25 (1893)
40	,, nivea, ...	,, 18	February 19

E. Batters del F Huth, Lith^r Edin^r

ACROSIPHONIA TRAILLII, *Batt.*

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF MARCH 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount	Direction.	
		°	°	°	°					
1	29·198	46·7	36·6	43·0	41·9	S.W.	Nim.	10	S.W.	0·340
2	29·428	47·0	35·8	42·0	40·1	W.	Cum.	6	W.	0·010
3	29·845	47·7	35·9	42·7	39·6	W.	...	0	...	0·060
4	29·538	51·4	35·5	39·9	38·8	W.	Cir. St.	8	W.	0·030
5	29·947	46·0	32·7	39·2	37·9	W.	Cir. St.	10	W.	0·140
6	29·153	46·4	39·0	43·8	41·1	W.	...	0	...	0·000
7	29·691	48·9	30·3	33·3	32·9	N.W.	Fog.	5	...	0·060
8	29·218	47·9	33·1	44·1	41·4	W.	Cir. St.	6	W.	0·035
9	29·142	48·6	37·3	43·1	41·1	S.W.	Nim.	10	S.	0·235
10	29·234	50·9	35·7	38·2	37·6	W.	Cir.	2	W.	0·330
11	28·883	48·8	37·8	41·2	38·8	W.	Cir. St.	5	W.	0·190
12	29·084	44·8	34·2	40·0	37·6	W.	...	0	...	0·000
13	28·786	45·8	33·2	37·8	36·2	W.	Cir.	1	W.	0·010
14	29·249	47·7	34·0	40·1	37·8	W.	...	0	...	0·020
15	29·376	46·8	34·1	37·8	36·8	N.W.	...	0	...	0·000
16	29·782	46·9	28·5	37·4	35·3	W.	...	0	...	0·000
17	30·089	48·0	28·1	42·4	39·8	W.	...	0	...	0·000
18	30·109	52·7	35·6	45·0	43·1	W.	Cum. St.	10	W.	0·000
19	30·181	51·7	44·6	50·1	48·7	W.	Cum. St.	10	W.	0·000
20	30·190	54·6	45·1	47·9	45·4	W.	Cum. St.	10	W.	0·000
21	30·164	49·6	39·6	49·6	46·0	W.	...	0	...	0·000
22	30·282	59·1	34·2	44·1	43·0	W.	Fog.	5	...	0·000
23	30·419	53·6	31·0	44·8	42·1	E.	Fog.	5	...	0·000
24	30·392	61·0	32·1	39·7	39·2	E.	Fog.	5	...	0·000
25	30·169	55·5	33·0	37·9	37·9	E.	Fog.	7	...	0·000
26	30·002	51·0	31·0	38·6	38·4	E.	Fog.	5	...	0·000
27	30·096	54·9	30·0	45·0	43·1	E.	Fog.	2	...	0·000
28	30·214	47·5	37·4	38·0	37·1	E.	St.	10	E.	0·010
29	30·061	46·0	31·0	40·5	40·3	E.	Cir.	3	N.	0·000
30	29·814	64·6	33·1	45·0	43·0	S.W.	Fog.	2	...	0·000
31	29·670	65·6	36·8	42·3	41·1	W.	Cum. St.	10	S.	0·010

Barometer.—Highest Observed, on the 23rd, = 30·419 inches. Lowest Observed, on the 13th, = 28·786 inches. Difference, or Monthly Range, = 1·633 inch. Mean = 29·723 inches.

S. R. Thermometers.—Highest Observed, on the 31st, = 65°·6. Lowest Observed, on the 17th, = 28°·1. Difference, or Monthly Range, = 37°·5. Mean of all the Highest = 50°·9. Mean of all the Lowest = 34°·7. Difference, or Mean Daily Range, = 16°·2. Mean Temperature of Month = 42°·8.

Hygrometer.—Mean of Dry Bulb = 41°·8. Mean of Wet Bulb = 40°·1.

Rainfall.—Number of Days on which Rain fell = 14. Amount of Fall = 1·480 inch. Greatest Fall in 24 hours, on the 1st, = 0·340 inch.

A. D. RICHARDSON,
Observer.

III. On Plants in the Plant Houses. By R. L. Harrow.

The past month, which is perhaps one of the most interesting periods of the whole year to those engaged in the study of plant life in its various stages, has been very favourable to the good development of both flowers and foliage. The great majority of plants cultivated under glass, which have been inactive during the winter, and have been partially or wholly destitute of foliage, are now vigorously started into growth. A much greater display of flowers has been produced, the number of species recorded being about seventy-five. A few of these we are able to exhibit, viz.:—

Brownea grandiceps, Jacq. This is a leguminous shrub, which is a native of South America, where it is said to attain a height of 60 feet. The inflorescences, which are produced in large globular heads at the extremity of branches, and also upon the old wood, resemble, when fully expanded, the flowers of a Rhododendron. The light red flowers at the base of the inflorescence are the first to open, the remainder opening successively in tiers until the apex is reached, and a fully expanded flower head is seen. The foliage, which is at all times handsome, has, in a young state, a peculiar drooping appearance, gradually with age assuming a more erect appearance. The leaves possess from nine to twelve pairs of leaflets. The figure in the "Botanical Magazine" was prepared from a specimen received from the Glasnevin, Botanic Garden, Dublin.

Myriocarpa longipes, Liebmann. This is a member of the order Urticaceæ, the genus consisting of six species. It is a strong-growing, shrub-like plant, with large elliptic leaves, some of which are about eighteen inches in length, and half the distance in breadth. The singular inflorescences are produced in the axils of the leaves, and branch dichotomously, sometimes attaining a length of from 2 to 3 feet, and trailing upon the ground. The flowers are arranged in a spiral manner along its whole length, giving it a remarkable appearance. It is a native of Vera Cruz. The plant under notice was received from Kew during 1893.

Randia maculata, DC. This plant was sent some years ago to this country by Mr. T. Whitfield, a noted collector of plants, from Sierra Leone, and was for some time known under the name of *Gardenia Stanleyana*. It is a free-flowering, shrub-like plant, with spreading dichotomous branching, the foliage being thick and oblong upon very short petioles. The flowers are produced singly in the forks of the branches, and when fully grown are about 9 inches long, being of a dull green and purple upon the outer surface, and white with purple blotches in the interior. The anthers are affixed to the inside of the mouth of the corolla. They are very fragrant, and a considerable time elapses from their first appearing till the corolla bursts; but when fully expanded the plant is a remarkably handsome object.

Strophanthus longicaudatus, DC. This genus of Apocynaceæ is noted for its poisonous properties, and has of late years supplied a drug used in connection with diseases of the heart. The species under notice is a native of Tropical Africa, and is a low-growing plant with opposite dark green leaves. The flowers are terminal, generally produced in threes. The sepals are small and persistent; the corolla is of a greenish-yellow colour. The five segments are reflexed and tail-like. It is now flowering in the annexe of the Palm House.

Fothergilla Gardenii, Murr. This is a pretty North American dwarf deciduous shrub, belonging to the order Hamamelideæ, this being the only species of the genus. The inflorescences are terminal, and appear before the leaves, the flowers, which are white, being very sweet scented. The foliage is small, the leaves being covered with lightish hairs.

Calypso borealis, Salisb. A North American terrestrial orchid of miniature growth. The flowers are of a pinkish colour, and borne upon a slender sheathed stem springing from the base of the petiole of the leaves. The labellum is larger than the petals and sepals, differing slightly in colour. The leaves are solitary, ovate, and of a succulent nature.

Of other plants of interest which have flowered may be noted: *Illicium anisatum*, Gærtn.,—the Star Anise of China, bearing fragrant white flowers; *Hakea acicularis*, R. Br.,—a protead with acicular leaves and small white flowers, native of Australia; *Viburnum macrocephalum*, Fortune,—a beautiful spring-flowering shrub, with immense white inflorescences, from China; *Bowica volubilis*, Harv.,—a liliaceous twining plant with small pedicillate flowers, a native of South Africa; *Bignonia speciosa*, R. Grah.,—a lovely tropical climber, from Uruguay; *Talauma pumila*, Blum.,—a native of Amboyna and Java, with deliciously scented flowers, only fragrant at night; *Rhododendron racemosum*, Franch.,—a small Yunnan species.

MEETING OF THE SOCIETY,

Thursday, May 10, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

Mr. R. TURNBULL exhibited a stem of *Hippuris*, showing a spiral arrangement of the normal whorls of leaves.

From Mr. P. H. NORMAND, Whitehill, Aberdour, were exhibited cut blooms of two-year-old seedlings of *Cytissus scoparium*, var. *andreanus*,—the flowers varied in colour, none so dark as the parent variety, and some being as yellow as the type; also blooms of *Spiræa primifolia*, fl. pl.; also a plant of *Anemone Hepatica*, with white blotches on the leaves; also cut blooms of double white Banksian rose from a cool conservatory at Balmuto; also blooms of *Ornithogalum lacteum*, grown under glass, which had been cut more than a month previous.

From Dr. STUART, Chirnside, cut blooms were exhibited of a Trollius hybrid between *T. europæus* and *T. americanus*.

From Mr. CAMPBELL of Ledaig cut blooms, from the open garden, were exhibited of *Deutzia gracilis*, *Buddleia globosa*, double red hawthorn, etc.

Amongst herbaceous and alpine plants on the table from the Royal Botanic Garden were—*Androsace sarmentosa*, *A. villosa*, *Daphne rupestris*, *Gentiana verna*, *Myosotis pygmæa*, *M. lithospermifolia*, *Silene acaulis alba*, *Sobolowskya clavata*.

Issued November 1894.

The following papers were read:—

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during April 1894. By Robert Lindsay, Curator.

The past month of April has been one of the most favourable experienced for many years. Seldom has there been so little frost in April, and vegetation has gone on advancing without check. Such a fine early season rarely occurs. The foliage of many deciduous trees and shrubs is remarkably luxuriant and perfect. Apple, pear, cherry, and currants are quite smothered with blossom. Nearly all early ornamental trees and shrubs are flowering profusely—considerably above the average in this respect. The hawthorn came into flower on the 29th of the month, much earlier than I have ever observed it before, and fully three weeks before its ordinary time of flowering here. The thermometer was at or below the freezing point on six occasions, registering in all 5° of frost for the month, as against 12° for the corresponding month of last year. The lowest readings occurred on the 1st, 31°; 2nd, 29°; 14th, 32°; 20th, 32°; 21st, 31°. The lowest day temperature was 44° on the 3rd, and the highest 72° on the 27th of the month. The collective amount of frost registered this season up to the end of April is 325°, as against 517° for the same period last year. The following is the distribution for each month:—October, 18° of frost; November, 55°; December, 52°; January, 121°; February, 63°; March, 63°; April, 5°. The lowest point reached this season was 9° Fahr., or 23° of frost, which occurred on the 7th of January.

On the rock-garden 153 species and varieties came into flower during the month, as against 166 for April of last year. Among the more interesting were:—*Anemone alpina*, *A. Pulsatilla*, var. *bracteata*, *A. thalictroides*, *Androsace coronopifolia*, *Arnebia echioides*, *Aubrietia Leichtlini*, *Bryanthus erectus*, *Cassiope fastigiata*, *Crenularia eunomioides*, *Corydalis Scoulerii*, *Cytisus Arduinii*, *Erythronium giganteum*, *Heloniopsis umbellata*, *Muscari Szovitzianum*, *Narcissus*

Empress, N. triandrus pulchellus, Phlox nivalis, P. setacea vars., *Polemonium humile, Primula Dinyana, P. integrifolia, P. intermedia, Ranunculus montanus, R. speciosus, Rhodora canadensis, Rhododendron anthopogon, R. Chamæcistus, R. glaucum, R. Grievei, Sobolowskya clavata, Trillium erectum, T. grandiflorum, Uvularia grandiflora, Veronica linifolia,* etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during April 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum	9 A.M.	Maximum
1st	31°	45°	60°	16th	33°	46°	71°
2nd	29	41	59	17th	44	52	57
3rd	33	39	44	18th	41	43	53
4th	38	41	47	19th	35	49	58
5th	40	43	50	20th	32	52	61
6th	34	43	51	21st	31	50	61
7th	38	43	54	22nd	35	50	64
8th	38	42	50	23rd	38	48	52
9th	38	42	61	24th	38	46	60
10th	44	59	65	25th	36	50	65
11th	38	60	62	26th	40	50	68
12th	40	46	61	27th	32	50	72
13th	39	46	61	28th	36	51	71
14th	32	46	57	29th	42	57	65
15th	36	49	65	30th	44	50	57

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of April 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·924	54·8	34·4	47·0	45·2	W.	Cum. St.	10	W.	0·120
2	29·879	57·9	32·1	42·9	42·4	S.E.	Cir. Cum.	3	S.E.	0·000
3	29·840	56·7	37·1	40·7	40·4	E.	St.	10	E.	0·010
4	30·040	42·2	40·4	42·1	41·0	E.	St.	10	E.	0·000
5	30·217	44·8	42·0	44·4	43·0	E.	St.	10	E.	0·005
6	30·165	51·0	39·8	42·7	41·2	E.	Cir. St.	10	E.	0·000
7	30·044	49·2	42·1	46·9	43·0	S.E.	Cir. St.	10	E.	0·140
8	29·877	49·5	41·1	42·3	41·4	E.	Cum. St.	10	E.	0·020
9	29·743	45·8	40·6	42·1	42·1	E.	Fog	10	...	0·010
10	29·887	56·9	41·5	56·8	51·6	W.	Cir.	5	W.	0·000
11	29·886	63·0	41·3	59·2	53·9	N.W.	Cir.	3	S.	0·000
12	29·762	61·8	44·0	46·9	45·5	E.	Cir.	6	E.	0·000
13	29·823	57·6	41·1	45·0	41·1	E.	Cum.	9	E.	0·000
14	29·631	48·6	36·7	44·7	41·0	E.	Cir. Cum.	4 4	E.	0·000
15	29·588	51·9	39·4	49·1	46·0	S.	Cir.	2	S.	0·055
16	29·419	57·4	36·3	46·4	45·8	E.	Cir. St.	8	E.	0·300
17	29·289	54·5	43·8	45·9	45·7	S.	St.	10	S.	0·310
18	29·654	52·8	45·1	46·5	46·2	N.	Nim.	10	N.	0·350
19	30·072	49·6	37·5	48·9	45·9	E.	...	0	...	0·000
20	30·076	54·8	36·1	51·8	47·9	E.	...	0	...	0·000
21	29·959	58·5	35·1	47·4	45·0	E.	...	0	...	0·000
22	29·854	55·6	39·2	46·0	43·0	E.	...	0	...	0·030
23	29·593	56·9	41·9	45·8	43·9	E.	Cir.	8	E.	0·020
24	29·461	48·8	42·9	47·2	44·7	N.E.	Cir. Cum.	3 6	S. E.	0·095
25	29·439	55·6	40·2	51·2	45·6	S.E.	Cum.	8	S.	0·000
26	29·495	58·8	43·5	49·7	45·0	S.	Cum.	9	S.	0·075
27	29·511	61·0	35·0	48·2	46·0	S.	Cir.	6	S.	0·000
28	29·904	56·0	40·9	52·2	47·0	N.	...	0	...	0·030
29	29·897	57·8	47·6	53·0	50·8	W.	Cir. St.	10	W.	0·100
30	30·160	60·6	47·0	50·2	47·9	S.	Cir. St.	10	N.	0·000

Barometer.—Highest Observed, on the 5th, = 30·217 inches. Lowest Observed, on the 17th, = 29·289 inches. Difference, or Monthly Range, = 0·928 inch. Mean = 29·803 inches.

S. R. Thermometers.—Highest Observed, on the 11th, = 63°·0. Lowest Observed, on the 2nd, = 32°·1. Difference, or Monthly Range, = 30°·9 Mean of all the Highest = 54°·3. Mean of all the Lowest = 40°·2. Difference, or Mean Daily Range, = 14°·1. Mean Temperature of Month = 47°·2.

Hygrometer.—Mean of Dry Bulb = 47°·4. Mean of Wet Bulb = 45°·0.

Rainfall.—Number of Days on which Rain fell = 16. Amount of Fall = 1·670 inch. Greatest Fall in 24 hours, on the 18th, = 0·350 inch.

A. D. RICHARDSON *Observer.*

III. On Plants in the Plant Houses, with Exhibition of Specimens. By R. L. Harrow.

The number of plants which have flowered in the houses of Royal Botanic Garden during the month of April is 125. This is a large increase upon the month of March, consequently there has been a much more showy appearance amongst the inhabitants of the greenhouses; the colours of the azaleas, rhododendrons, and other early summer flowering plants being especially brilliant. Amongst those worthy of notice are:—

Eugenia polypetala, Wight. This is an evergreen shrubby bush, a native of India, where it is said to grow to from twenty to thirty feet. The leaves are generally produced in whorls of three or four, are six to eight inches in length, and of a linear lanceolate shape, being borne on very short petioles. The flowers are large and solitary, arising upon the old wood. The number of petals is from twelve to sixteen. At present the plant is very rare in our gardens.

Utricularia montana, Jacq. A native of the West Indian Islands, this is probably the most handsome species of this genus of Lentibularieæ. The roots are swollen into hollow green tubers, connected by small fibres. The leaves are about six inches long, elliptic lanceolate, gradually becoming narrower as they near the petiole. The flowers are produced upon an erect scape, which rises above the foliage, generally bearing from three to four flowers; these are spurred and two-lipped, the lower lip being twice as large as the upper, and with a yellow blotch about the centre. The plant grows upon the damp mossy trunks of trees in its native habitats. A fine figure may be seen in the "Botanical Magazine," t. 5923.

Ranunculus cortusæfolius, Willd. This is a very showy species, which was introduced from Teneriffe in 1826, and is a tall-growing kind, the flowers being large and of a lustrous yellow, somewhat resembling the common buttercup. The foliage is dark green in colour, the radical leaves being large, gradually becoming smaller as the stem increases in height, all being covered with short hairs.

Richardia Rehmannii, N. E. Br. This is a lovely little Aroid, a native of South Africa, with narrow tapering leaves about eighteen inches long, arising from an underground rhizome. The inflorescence is small, and grows to a less length than the foliage. The spathe is white, slightly tinged with red at the margin.

Acradenia Franklinæ, Kipp. This plant is a member of the Rutaceæ, said to have been first introduced in 1845 from Tasmania. It is of a compact, shrubby growth. The leaves are trifoliate, fragrant, and covered with small glands. The flowers are white in terminal and axillary clusters, the petals deflexed, and stamens alternate.

Adenandra umbellata, Willd. Belonging also to the Rutaceæ, this is a native of the Cape of Good Hope, growing to a height of two or three feet. It is very free flowering, the flowers—three to four in number—being produced in an umbel-like manner at the apex of each shoot. The petals are large white, with a purple streak running through the centre of each. The leaves are small and alternate.

Amongst others of interest may be mentioned :—*Eutaxia myrtifolia*, R. Br.,—a pretty leguminous shrub, with numerous yellow and brown flowers, introduced in 1803 from Australia; *Cantua buxifolia*, Lamk.,—an elegant, slender, drooping polemoniaceous plant, introduced in 1849 from the Peruvian Andes, and figured in the "Botanical Magazine," t. 4582; *Hibbertia Readdi*, Hort.,—a small-growing plant, with small yellow flowers, belonging to the order Dilleniaceæ; *Malpighia coccifera*, Linn.,—possesses small, solitary, pink flowers and spiny leaves, growing to a height of about three feet; *Armeria latifolia*, Willd.,—this pretty species was lately figured in the "Botanical Magazine," from a plant flowered at Kew, received from these gardens; *Marica Northiana*, Ker.,—a fragrant species from Brazil, with livid, showy flowers; *Oncidium altissimum*, Smith,—introduced nearly a century ago from the West Indies, bears scapes, sometimes 3 feet in length, carrying numerous yellow flowers; *Tetranema mexicana*, Benth.,—commonly called the Mexican Foxglove, a small-growing plant, with short peduncles, the flowers lasting over a long period; *Phalænopsis Luddemaniana*, Rchb. fil,—a native of the Phillipines, introduced by Messrs. Hugh Low & Co.

MEETING OF THE SOCIETY.

Thursday, June 14, 1894.

Professor BOWER, President, in the Chair.

Mr. WILLIAM SANDERSON exhibited a plant of *Oncidium macranthum* in flower.

From Mr. CAMPBELL of Ledaig was exhibited a shell-full of ripe strawberries from his open garden.

Amongst herbaceous plants from the Royal Botanic Garden on the table were a series of hybrids of *Dianthus*, raised by Mr. BURNETT, of Aberdeen.

Mr. TAGG exhibited specimens of *Tabernæmontana longiflora*, Benth., showing extra-axillary branching.

The following papers were read :—

NOTE ON THE OCCURRENCE OF A VARIEGATED FORM OF THE COMMON MISTLETOE (*Viscum album*). By J. GRIEVE.

There is at present growing on a healthy thorn, in the Dean Cemetery of this city, a form of the common mistletoe sufficiently striking to merit attention being called to it. As will be seen from the specimen exhibited, the leaves are beautifully variegated, such a departure from the normal type being very unusual. Indeed, I do not know of any other example of the mistletoe "sporting" in this manner, and I have ventured to place it before the Society in order to learn if any of the members have met with such "sports" in this parasitic plant. The specimen exhibited is some ten or twelve years old, but no record of it has hitherto been made.

Issued November 1894.

Mr. DUNN remarked that he had seen variegated specimens of mistletoe, but only on unhealthy hosts.

NOTE ON THE ORIGIN AND HISTORY OF SAXIFRAGA WALLACEI, HORT. By J. GRIEVE.

As I am aware that the Botanical Society of Edinburgh does not confine its attention to matters of purely scientific botany, but takes a great interest in everything relating to horticulture also, I need scarcely apologise for bringing under your notice the subject of the origin and history of a now well-known plant, namely, *Saxifraga Wallacei.* I am the more anxious to place this subject before you, seeing that doubts still exist in the minds of many—both as to the parentage of the plant and its raiser*; and being acquainted with its history from the beginning, I am able to speak with some degree of confidence on the subject.

In 1873, Messrs. Jas. Backhouse & Son, of York, sent out

* Under *S. Camposii*, Boiss. et Rent., in the "Botanical Magazine," t. 6640, which had been in cultivation for many years at Kew, Mr. Baker places as a synonym *S. Wallacei*, Hort., and says:—"According to Willkinson, its [*S. Camposii*] nearest affinity is with *S. trifurcata*, Schrad. ('Botanical Magazine,' t. 1651), and *S. cuneata*, Willd., but to me it appears to be scarcely distinguishable from *S. Maweana*, Baker ('Botanical Magazine,' t. 6384), except in the smaller leaves, which seem never to assume the reniform shape. It is true that, judging by the dried native specimens, *S. Camposii* is a stouter, more rigid species, with a more crowded rosette of leaves, and shorter peduncles and pedicels, but under cultivation these differences are so considerably modified that the two plants may not unreasonably be regarded as geographical forms, one inhabiting the southern mountains of Spain, the other the northernmost ones of Marocco. The *S. maderensis* represents the same type in its western limit of growth—the island of Madeira; the *S. cuneata* of the Pyrenees represents the northern limit within the Peninsular area; within that area occur the equally or, indeed, more closely connected forms of *S. obscura*, Gren. and Godr., and *S. canaliculata*, Boiss. et Reut.; and it would not be difficult to connect all with the forms that occur under other names elsewhere in Western Europe." This is interesting taken in connection with the following dogmatic assertion of a writer in the "Garden," xxxv. (1889), p. 420:—"*S. Wallacei*, however it may have found its way to the Dean Cemetery, is *S. Camposii*, Boiss., cultivated for many years in gardens, and having nothing to do with *S. Maweana*." As illustrating the confusion that exists regarding these dactyloid saxifragas, the following quotation from another writer in the "Garden," xxix. (1891), p. 545, may be noted:—"True *S. Camposii* of Boissier is very seldom met with in cultivation, and I question whether it is to be found growing in any garden except that of M. Boissier himself, or of some one to whom he may have given a specimen of the plant."

two new Saxifrages—*S. Maweana* * and *S. Wilkommiana.*† These were described by them as "two new species of the *S. palmata* section, with showy tufts of large pure white flowers, on stems six to ten inches high." They added that, though nearly allied to each other, they are quite distinct, and might be regarded as two of the finest of the group. The first of these, *S. Maweana*, has now practically gone out of cultivation; but the second, *S. Wilkommiana*, is still grown.

Some two years after they were sent out, the late George Wallace, of the Dean Cemetery, Edinburgh, succeeded in raising from them a saxifrage now usually known in plant catalogues as *S. Wallacei* of gardens. This plant has become very widely known, and it is, perhaps, one of the best of its kind, whether for bedding purposes or as a pot plant. It has some qualities which mark it as an improvement on both parents, since it lasts longer in bloom than *S. Maweana*, and is of much superior habit to *S. Wilkommiana*, while it possesses a sweet scent but faintly present in either parent. Messrs. Dicksons & Co. procured the original plant from the raiser, and at once proceeded to increase it, preparatory to sending it out.‡ As many as 10,000 pots of it have been in stock in Messrs. Dicksons' Nurseries at one time—for, although the plant very rarely seeds, it is easily grown from cuttings. It was distributed all over Britain and throughout the Continent of Europe, as well as in America.

As already stated, doubts have been thrown on its origin and history, and it is chiefly to set these doubts at rest, and to give honour to whom honour is due in the raising of it, that I have ventured to bring this subject to-night before

* *S. Maweana*, Baker, figured in the "Botanical Magazine," t. 6384, was discovered by Mr. P. B. Webb, of Paris, in 1827, "in its only known habitat, rocks of the Beni Hosmar range of mountains opposite Tetuan," in Marocco, "at about 2000 feet elevation." He regarded it as a form of *S. globulifera*. It was not recognised to be a new species until Mr. Maw gathered it in 1869, and it was introduced into cultivation by him. It is also figured in "Gardeners' Chronicle," 1871, fig. 300.

† Is the *S. canaliculata*, Boiss. et Reut., from the mountains of Spain?

‡ It was awarded a first-class certificate by the Royal Caledonian Horticultural Society in 1878. The name was given at the suggestion of Mr. James M'Nab.

the members of the Botanical Society. I trust the plant will long keep alive the memory of its raiser—one who, though but a humble horticulturist, was, throughout a long life, a keen and enthusiastic lover of plants.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Temperature and Vegetation during May 1894. By Robert Lindsay, Curator.

The past month of May will be remembered as one of the most disastrous to vegetation that has occurred for many years. Preceded by a very mild and genial month, vegetation was in a most forward and flourishing condition, rendering it peculiarly susceptible to injury from frost. Between the 19th and the 24th of the month a succession of frosty nights took place, which has done serious damage to fruit crops throughout the country. Many hardy trees, shrubs, and herbaceous plants have sustained severe injury. The following plants, in exposed situations, were more or less injured :—*Azalea pontica*, *A. mollis*, and Ghent varieties Laburnum and Horse Chesnut, had their flowers browned and destroyed; young shoots of Oak, Ash, Maple, Larch, *Abies Veitchii*, and *A. cephalonica*, Roses, *Dimorphanthus*, Rhododendrons of the Arboreum and Campanulatum breeds, *Pieris formosa*, Tulip tree, etc.; *Spiræa palmata*, *S. Aruncus*, *Rodgersia podophylla*, *Rheum officinale*, and *R. Emodi*, *Tamus communis*, *Polygonum Sieboldii*, *P. amplexicaule*, *P. molle*, *Trillium grandiflorum*, Male Fern, Oak Fern, Royal Fern, and even the Common Bracken had their young fronds completely blackened. The thermometer was below the freezing point on six occasions, registering in all 23° of frost. The lowest readings occurred on the 20th, 28°; 21st, 26°; 22nd, 28°; 23rd, 28°; 24th, 28°. The lowest day temperature was 48°, on the 16th, and the highest 70°, on the 4th of the month.

On the rock-garden 227 species and varieties came into blossom against 300 for May of last year. Among the most interesting were :—*Anemone narcissiflora*, *A. Polyanthus*, *Aciphylla Colensoi*, *Anthemis alpestris*, *Androsace sarmentosa*, *A. lactea*, *Anthyllis erinacea*, *Aquilegia Whitmanniana*, *Cheiranthus alpinus, C. Allionii, Cytisus decumbens, C. Scoparius Andreanus, C. purpureus, Campanula Allionii, Clintonia Andrewsiana, Daphne Cneorum, D. Fioniana, Dodecatheon integrifolium, Doronicum grandiflorum, Dianthus Michael Foster, Enkianthus himalaiensis, Gentiana verna, Linum flavum, Myosotis alpestris, Mertensia sibirica, Menziesia Drummondii, Onosma taurica, Ononis rotundifolia, Olearia Gunniana, Phlox verna, Primula integrifolia, P. magellanica, P. rosea, P. sikkimensis, Potentilla aurea, Papaver pyrenaicum, Rubus arcticus, Ranunculus Traunfelnerii, Ramondia pyrenaica alba, Saxifraga atropurpurea, S. Melvillei, S. Sturmiana, Saponaria ocymoides Loderi, Silene acaulis, Scilla peruviana, Veronica saxatilis alba, Wulfenia carinthiaca,* etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during May 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	37°	49°	59°	17th	39°	44°	53°
2nd	38	45	55	18th	41	48	55
3rd	42	50	52	19th	37	42	49
4th	33	43	70	20th	28	37	58
5th	31	54	58	21st	26	47	50
6th	39	54	63	22nd	27	44	57
7th	38	46	53	23rd	28	50	58
8th	39	46	63	24th	28	56	67
9th	39	50	61	25th	37	55	69
10th	39	54	65	26th	38	47	53
11th	41	55	63	27th	36	45	59
12th	37	61	64	28th	37	43	52
13th	35	50	60	29th	39	42	56
14th	41	44	53	30th	39	41	57
15th	43	45	50	31st	40	59	61
16th	42	43	48				

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of May 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	30·319	59·4	40·6	51·2	46·9	N.W.	Cir. St.	10	N.	0·215
2	29·957	58·5	40·7	47·1	46·9	W.	Nim.	10	W.	0·135
3	29·584	54·8	44·7	54·1	49·8	N.W.	Cir.	5	N.W.	0·005
4	29·640	56·9	35·6	43·3	38·3	N.W.	Cum.	6	N.W.	0·000
5	29·825	52·1	35 0	50·1	44·0	N.W.	...	0	...	0·050
6	29·449	55·9	42·2	52·1	47 9	W.	Cir. Cum.	2 4	W.	0·060
7	29·489	57·7	40·6	49·0	45·8	W.	Cum. St.	10	W.	0·135
8	29·653	56·5	41·8	48·2	48·0	S.	Nim.	10	S.	0·040
9	29·564	58·6	42·0	51·6	46·9	S.	Cum. St.	10	S.	0·010
10	29·370	55·0	42·7	51·4	47·0	S.	Cir. Cum. St.	4 5	S.	0·165
11	29·607	60·8	42·7	51·4	47·2	W.	Cum. St.	10	W.	0·000
12	29·902	60·7	39·6	56 7	50·8	N.W.	Cum.	1	N.W.	0·000
13	30·018	60·0	38·0	49·7	45·0	S.E.	Cum. St.	9	S.E.	0·405
14	29·854	54·6	44·0	45·7	45·4	E.	Nim	10	E.	0·480
15	29·977	49·8	45·7	47·1	47·0	E.	Nim.	10	E.	0·110
16	30·131	48·2	44·8	45·1	44·3	E.	Nim.	10	E.	0·045
17	30·340	46·6	42 6	44·4	42·3	E.	Cum. St.	10	E.	0·000
18	30·321	47·8	44·0	47·2	44·1	E.	Cir.	8	N.W.	0·015
19	30·321	51·4	40·5	43·0	37·7	N.E.	Cum. St.	10	N.E.	0·000
20	29·986	44·7	32·1	40·9	37·0	Var.	Cum. St.	10	N.E.	0·020
21	29·958	50·1	31·7	44·4	39·2	N.E	Cum.	2	N.	0·020
22	30·081	50·2	31·9	47·6	43·0	N.E.	Cum.	1	N.W.	0·020
23	30·335	51 8	32·2	48·2	42 7	N.E.	...	0	...	0·020
24	30·411	53 2	33·2	48·7	45·1	N.E.	...	0	...	0·020
25	30·098	59·7	43·1	54 8	48·1	W.	Cir. St.	9	N.W.	0·015
26	29·933	63·1	41·9	47·7	43·9	N.	Cum. St.	9	N.	0·030
27	29·810	50·4	39·8	46·9	40·7	N.	Cum.	5	N.	0·200
28	29·533	53·8	42·0	45·4	44·1	N.E.	Nim.	10	N.E.	0·240
29	29·565	48·3	43·0	48·2	44 9	E.	Cum. St.	8	E.	0·250
30	29·605	52·1	42·9	45 9	44·7	E.	Nim.	10	E.	0·090
31	29·611	51·3	43·0	46·9	45·1	N.	Cum. St.	10	N.	0·010

Barometer.—Highest Observed, on the 24th, = 30·411 inches. Lowest Observed, on the 10th, = 29·370 inches. Difference, or Monthly Range, = 1·041 inch. Mean = 29·879 inches.

S. R. Thermometers.—Highest Observed, on the 26th, = 63°·1. Lowest Observed, on the 21st, = 31°·7. Difference, or Monthly Range, = 31°·4. Mean of all the Highest = 54°·0. Mean of all the Lowest = 40°·1. Difference, or Mean Daily Range, = 13°·9. Mean Temperature of Month = 47°·0.

Hygrometer.—Mean of Dry Bulb = 48°·2. Mean of Wet Bulb = 44°·6.

Rainfall.—Number of Days on which Rain fell = 26. Amount of Fall = 2·805 inches. Greatest Fall in 24 hours, on the 14th, = 0·480 inch.

A. D. RICHARDSON,
Observer.

III. On Plants in the Plant Houses. By R. L. Harrow.

During the month of May many interesting and rare plants have flowered in the houses of the Royal Botanic Garden. The luxuriant well-ripened growth of last summer has already shown very satisfactory results, in copious floriferousness. Several plants have, since the last meeting of the Society, produced their flowers in profusion, due, no doubt, to the greater amount of light and better conditions under which they are now grown, this being particularly noticeable in the Palm House. The number of species flowered during the past month numbers rather more than one hundred and twenty-five. Among the most noteworthy are the following:—

Odontodenia speciosa, Benth. This is a climbing plant, a native of Trinidad, said to have been first flowered in Europe by Messrs. Veitch in 1854. The strong-growing stems of this plant are glabrous and terete, the large opposite leaves being of leathery substance, borne upon short stout petioles. Its inflorescences of terminal and axillary racemes are very handsome, the individual flowers measure about three inches across the corolla, and are reddish-yellow in colour. A figure of this plant may be seen in the "Botanical Magazine," t. 4825, under the name of *Dipladenia Harrisii*.

Sandersonia aurantiaca, Hook. A rare plant in cultivation; discovered at Durban, South Africa, in 1854, by Mr. J. Sanderson, Secretary of the Hort. Society of Natal, after whom this monotypic genus was named. The herbaceous stems resemble in manner of growth those of *Gloriosa*, and grow to about three feet in height. The lower leaves are larger and more distant than those nearer the apex, from the axils of which the solitary flowers spring. These are drooping; the orange-coloured perianth being inflated, the throat contracted, and the limb six-toothed; at the base of the perianth are six spurs containing nectar.

Prostranthera lasianthos. Labill. This native of New South Wales has long been an inmate of our gardens, having been introduced in 1806, yet it is but seldom seen in cultivation. It has a shrub-like habit, with lanceolate serrated leaves of a dark green colour. The flowers are axillary and terminal, with bilabiate corolla, which is very hairy, the throat covered with lavender coloured spots.

Reevesia thyrsoidea, Lindl. This tree-like shrub, a member of the order Sterculiaceæ, is a native of China. It was flowered at Kew in 1845, having previously been introduced by J. Reeves, Esq., of Canton. The foliage is of a dark green colour, the individual leaves are broadly lanceolate acuminate. The inflorescences are in large terminal corymbs, and very fragrant. The petals are pure white, the filaments of the anthers united into a tube, the stigma protruding above at the apex.

Eurycles sylvestris, Salisb. The pretty white flowers of this now rare species of Amaryllid are now to be seen in the Palm House. They are large and pure white, borne upon a stout peduncle in a umbel-like manner. The leaves are broad and fleshy, the venation being very prominent, are about a foot high, and are produced after the appearance of the inflorescence. Its native habitats are the Malay Peninsula and Phillipines.

Aotus gracillima, Meissn. Amongst Australian Leguminoseæ this takes a high rank as a decorative plant. The slender branches grow to a length of about three feet; the linear leaves are scattered and numerous. The flowers are borne in profusion for about a foot at the ends of the branches, and are of a yellow and brown colour.

Cyrtanthus Huttonii, Baker. This rare species is one of the most lovely of the cultivated plants of this genus, and has lately produced a strong inflorescence. The leaves are about a foot long, the stout peduncle springing from amongst them, and the flowers produced in an umbel-like manner. The perianth is of a reddish-yellow colour, about an inch in length. A native of Cape Colony.

Others of interest are:—*Platytheca galioides*, Steetz.,—a monotypic genus of Tremandreæ. This species has an erect habit, small linear leaves, and numerous pretty blue flowers; a native of South-west Australia. *Elæocarpus cyaneus*, Sims,—an Australian plant with racemes of white flowers, the fruits being blue; *Passiflora alata*, Aiton,—a large flowered species with crimson and purple flowers, a native of Peru, introduced in 1772; *Darwinia Hookeriana*, Benth.,—possessing pretty drooping flowers, belonging to the order Myrtaceæ, a native of Australia; *Phajus Marshalliæ*,—a fast-growing, white-flowered orchid from Moulmein; *Burchellia capensis*, R. Br.,—an evergreen shrub with scarlet heads of flowers, belonging to the order Rubiaceæ; *Goethea Wiotii*, Hort.,—a tropical member of Malvaceæ, with peculiar flowers possessing an epicalyx; *Gesnera elongata*, Humb. et Bonpl.

MEETING OF THE SOCIETY,

Thursday, July 12, 1894.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

Miss KATHERINE MILLAR and Mr. ALEXANDER PORTEOUS were elected Resident Fellows of the Society.

Dr. T. B. SPRAGUE exhibited specimens of peloria in *Digitalis purpurea* and in *Campanula*.

Miss MADDEN exhibited a specimen of peloria in *Digitalis purpurea*.

Mr. R. TURNBULL exhibited a leaf of cabbage showing hypertrophic development of the midrib.

Mr. DUNN exhibited *Morus alba*, with set fruit, from the open garden at Dalkeith.

Mr. J. GRIEVE exhibited a plant with flowers, in pot, of *Rubus phœnicolasius*, the Japanese wine-berry, one of the so-called American blackberries.

Amongst herbaceous plants on the table from the Royal Botanic Garden were: *Primula involucrata*, *Allium M'Nabianum*, *Pratia angulata*, etc.

The following papers were read :—

REPORT ON THE FLORA OF ROUND ISLAND, MAURITIUS. By Surgeon-Major H. H. JOHNSTON, Army Medical Staff, D.Sc., F.L.S.

The islands forming the Mauritius group are situated in the Southern Indian Ocean, in 20° south latitude and between 57° and 58° east longitude. They lie 470 miles east of Madagascar, and 100 miles east-by-north of

Issued November 1894.

Bourbon. The principal island of the group, to which the name Mauritius is applied, is a mountainous oceanic island of volcanic origin, but no active volcano has been known within the memory of man. The geological formation consists of vesicular basalt, which, on decomposing, forms a very porous red earth.

The island has an area of 713 square miles, its greatest length from north to south being 38 miles, and its breadth from east to west 28 miles.

The northern part of the island is a low plain, and the centre consists of an elevated plateau surrounded by three ranges of rugged mountains, reaching a height of 2711 feet above sea-level in the Black River Mountain.

There are numerous streams of water, the largest of which is twelve miles long. The lakes are few in number and small in size.

When Mauritius was discovered by the Portuguese in 1505, the island was clothed to the water's edge with virgin forest, in which existed a large number of endemic species of plants. On account of the terrific hurricanes which occasionally visit the island, the trees were nowhere high, but they formed a dense mass of nearly uniform height, and they were thus better fitted to withstand the violence of the wind. Beneath this dense canopy of ever-green foliage, large numbers of shade and moisture-loving plants, such as orchids, ferns, club-mosses, and other Cryptogams, found a genial home. During the present century the greater part of the virgin forest has been cleared away to make room for sugar-cane plantations, in consequence of which many of the native plants have been exterminated. Foreign plants have found their way into the island, where they flourish, and have killed out many of the native species. Thus, in Baker's "Flora of Mauritius and the Seychelles," published in 1877, the number of native flowering plants is only 705 species, whereas the naturalised species number 269.

Mauritius, being situated within three degrees of the Tropic of Capricorn, has a tropical climate; but owing to its isolated position in the Indian Ocean and the cool south-east trade wind which blows during the greater part of the year, the climate is more temperate than that of other places in the same latitude. In general terms the climate may be described as hot, damp, and rainy, with a fair amount of bright sunshine, moderate winds, and occasional hurricanes of terrific violence. The higher parts of the island are much cooler, but very much damper and more rainy than at the coast. From observations made at the Royal Alfred Observatory, situated at Pamplemousses, and 179 feet above sea-level, I am enabled to give the following particulars of the climate of Mauritius near the coast. Mean atmospheric pressure, reduced to sea-level, 30·082 inches; lowest, 27·95 inches in the great hurricane of 29th April 1892, when the wind reached a velocity of 121 miles per hour. The mean velocity of the wind is only 11·4 miles per hour, and storms and gales very seldom occur. During the thirteen years 1876–88 the wind exceeded 40 miles per hour on three occasions only. The mean temperature in the shade is 74°·8 F., highest 96°·2 F., and lowest 48° F. The mean annual rainfall is 47·02 inches, but the quantity varies considerably in different years, and it has ranged from 29·74 inches to 71·86 inches. The average number of days of rainfall is 200. The relative humidity of the atmosphere is 73·7 per cent. of saturation, the highest recorded on any one day was 97 per cent., and the lowest 38·4 per cent. In 1888 the total duration of bright sunshine was 62 per cent. of the possible bright sunshine, or, in other words, the sun was not obscured by clouds during 62 per cent. of the time it was above the horizon.

Mauritius is almost encircled by a coral reef, which in some places extends two or three miles out from the shore. From one to one and a half mile beyond the outer margin of this reef the 100-fathom line of soundings is reached, except at the north end of the island, where a shallow sea extends 15 miles to the north. The sea over the greater part of this northern bank is under 30 fathoms deep, and on the bank there are numerous shoals and reefs, besides a few small islands of volcanic formation. The most distant of these islands are Round Island and Serpent Island. The former is situated 13 miles north-east of the north end of Mauritius, and the latter lies 1¾ mile north of Round Island. Beyond the 100-fathom line the sea becomes rapidly deeper, and at a distance of only 8 miles from the coast of Mauritius the depth is 1350 fathoms, and at 20 miles 1870 fathoms, or 11,220 feet. It will, therefore, be observed that the islands of the Mauritius group form the summit of a huge volcanic mountain, the greater part of which is submerged beneath the waters of the Indian Ocean. Round Island, though only 13 miles distant from Mauritius, and separated from it by a shallow sea nowhere exceeding 43 fathoms, contains several species of endemic plants and animals, which are not found on Mauritius itself. If these two islands were ever connected together by dry land, it must have been at a very remote period, before such differences could have occurred in their floras and faunas. How much more remote then must have been the time when such islands as Mauritius, Bourbon, and Rodriguez were supposed to have formed part of an ancient continent, when these islands are now separated by an ocean over 11,000 feet deep. The floras and faunas of the Mascaren Islands are of the same type, and the different islands, besides containing their own peculiar endemic species, also contain species common to the other islands of the group, as well as several species widely distributed over other parts of the world.

Round Island is not surrounded by a coral reef; and in consequence of its exposed position to the surf, caused by the prevailing south-east trade wind, it is only possible to land on the island after a spell of calm weather. Even then a landing is only possible at two points, one on the west and the other on the south-west side of the island.

Lieutenant-Colonel J. A. Lloyd, Surveyor-General of Mauritius, visited Round Island on 16th December 1844, and was storm-stayed for seven days. His attention was chiefly directed to the geology of the island; and an account of his visit is published in the "Transactions of the Natural History Society of Mauritius" for the years 1842–45, pp. 154–161. He also visited Serpent Island, the most remote of the Mauritius group. Colonel Lloyd only refers to the flora and fauna in a general way, and the paper published by him deals chiefly with the geology of the island.

Colonel N. Pike, author of "Sub-Tropical Rambles," paid a visit to Round Island on 7th December 1868, and investigated its fauna. He again visited the island, on 10th November 1869, in company with the Governor, Sir H. Barkly, and Mr. John Horne, Director of Woods and Forests. Colonel Pike devoted his attention to the fauna, and Sir H. Barkly and Mr. Horne investigated the flora. Accounts of the scientific results of these two visits are given by Colonel Pike in his "Sub-Tropical Rambles," published in 1873, and in the "Transactions of the Royal Society of Arts and Sciences of Mauritius" for 1869.

On 26th November 1889, after a long spell of calm dry weather, Mr. William Scott, Assistant Director of Woods and Forests, and I landed on Round Island and resided on it for two days, with no other protection from the weather than that afforded by the fan-shaped leaves of a palm tree. As Round Island is uninhabited, and contains no drinking water in dry weather, one has to bring everything in the way of food and drink from Mauritius, and it is especially necessary to bring a large supply of provisions in case of being storm-stayed, as happened to Colonels Lloyd and Pike.

Having made arrangements beforehand to have a boat ready for us at Mapou, at the north end of Mauritius, Mr. Scott and I started from the Royal Botanic Garden at Pamplemousses, at three o'clock in the morning of 26th November 1889. Mr. Scott and I drove together, and we were followed by two carioles conveying our two Indian servants, provisions, water-barrel, camp-bed, botanical apparatus, etc. After a drive of eleven miles we reached Mapou at five o'clock, at which hour we had ordered the boat to be ready; but, with the usual unpunctuality of natives in out of the way places, it was seven o'clock before we set sail for Round Island. After a short sail over the smooth shallow sea intervening between the land and the outer margin of the coral reef, we steered through a narrow channel in the reef, locally called a "passe," and soon found ourselves being tossed about by the long swell of the Indian Ocean. The morning was fine, bright, and dry, but, unfortunately, we had a light wind which was considerably ahead of us, and during the six hours occupied in crossing we suffered considerably from the effects of sea-sickness.

As we neared our destination and came into smoother water in the lee of the west side of the island, we were enabled to have occasional glimpses over the gunwale of the boat, and note the general appearance of the island. As the name implies, the general outline of Round Island is that of a rounded dome rising abruptly out of the ocean and reaching an elevation of 1055 feet above sea-level. The island is 1 mile long from north to south, and ¾ mile broad from east to west. From a distance the island has a very barren aspect, its steep, brown, rocky sides having only small clusters and scattered plants of palms and screw-pines to enliven the desert appearance of the island. In this respect it forms a marked contrast to the luxuriant evergreen forests of Mauritius. The tree-flora appeared to be entirely composed of palms and screw-pines, and, in this respect also, it differed entirely from the native forests of Mauritius and other tropical countries I have visited, where the great bulk of the trees belong to the Dicotyledons, and palms stand out only here and there, giving the landscape its well-known tropical appearance.

At about one o'clock in the afternoon our boat approached the landing-place on the west side of the island. There was very little swell on at the time, but we had to exercise caution in landing on account of the exposed position of the coast, which is unprotected by any natural barrier. There is no beach, and the shelving cliffs rise out of water about two fathoms deep. As we neared the landing-place, which is formed of a flattish portion of rock 5 feet above the surface of the sea, one of the boatmen dropped a heavy stone attached to a rope over the stern of the boat, and allowed the stone to reach the bottom of the sea. Then by means of the rope he allowed the boat to drift towards the landing-place, until the bow of the boat was sufficiently near the rock to allow another boatman to jump on shore, and pass another rope, attached to the bow of the boat, through an iron ring fastened in the rock. By these means the bow of the boat was steadied within about a foot of the landing-rock, and watching our opportunity, as the boat rose and fell with the swell, we jumped on shore at the proper moment; and immediately afterwards we had all our stores landed and carried to the top of the rocky shelving cliffs, where they were deposited under the shade of some palm trees. The boat returned to Mapou the same afternoon, and we were left to our own resources on the island for the next two days.

Feeling the effects of sea-sickness, I confined myself to botanising in the immediate vicinity of our camp on the afternoon of our arrival on the island. On the following day I botanised during the greater part of the day, and ascended to the top of the hill, from which I obtained a good view of Serpent Island, which rises out of the sea like a haycock to the height of 530 feet. It lies $1\frac{3}{4}$ mile to the north of Round Island, and it is about $\frac{1}{3}$ mile broad. The steep sides of Serpent Island are almost destitute of vegetation, and they have a white chalky appearance from the guano which has been washed down over them by the rain. Colonel Lloyd landed on Serpent Island in 1844, and he states that the three species of sea-birds he observed on it were different from the three species of sea-birds found on Round Island. On the forenoon of our last day on Round Island, I collected specimens of the three species of palms which are native on the island. The boat returned for us on 28th November, and at about three o'clock in the afternoon we set sail with a fair wind for Mapou, which we reached in about three hours' time, and drove the same evening to Pamplemousses.

Mr. Scott devoted his time to making collections of specimens of the rocks and animals; and he also shot a couple of rabbits, which have been introduced into the island. With reference to the geological formation, Round Island appears to have once formed part of a volcanic crater, as described by Darwin in the case of the Galapogos Islands. The eastern side of the island has a crescentic shape, and it is much steeper than the western side. The rocks also on the eastern side appeared to me to have been exposed to much greater heat than those of other parts of the island. From these circumstances the island appears to have been originally a volcanic crater, in which, subsequently, the continued action of the surf, caused by the prevailing south-east trade wind, has gradually worn away the soft friable volcanic tuff of the eastern half of the crater. The greater part of Round Island is formed of this volcanic tuff, which abounds in olivine, and occurs in well marked strata. On the western side of the island I observed that the strata dipped towards the west at an angle of about 35 degrees. In many places there were narrow fissures running east and west, and other fissures at right angles to these. The greater part of the surface of the island is composed of bare rocks of volcanic tuff, from which almost all the soil has been washed away by the heavy rains into the sea. Scattered over the surface of the island from the seashore to the summit of the hill, I observed large blocks of vesicular doleritic lava, rich in olivine. The summit of the hill is crowned with three remarkable blocks of this rock, about 200 yards distant from one another. I also observed blocks of limestone scattered over the surface of the ground from the seashore to the summit of the hill. This stone contains Diatomaceæ and other organisms. When struck with another stone, it gives out a metallic ring.

Our knowledge of the flora of Round Island is at present very unsatisfactory, because many of the plants found on the island have been either imperfectly identified or not identified at all, from the absence of flowers and fruit. Owing to the great difficulty of landing on the island, except after a spell of calm weather, it has happened that the flora has been investigated at the same season of the year by the different naturalists who have visited the island. Colonel Lloyd visited Round Island in December 1844, Colonel Pike in November 1868 and 1869, Sir H. Barkly and Mr. Horne in November 1869, and I in November 1889.

The following table shows the number of species in each of the three divisions of the vegetable kingdom; but it is probable that in some instances, owing to imperfect specimens, the same plant may have been referred to different species by the different botanists who have investigated the flora of Round Island. I have tried to obviate this source of error as far as possible. Further investigation and the examination of perfect specimens in flower and fruit, where these can be obtained, will clear up doubtful points, and it is probable that additional species will be found if the island is visited at another season of the year.

Class.	Native.	Naturalised.	Total.
Dicotyledones . . .	24	1	25
Monocotyledones . . .	12	1	13
Cryptogameæ . . .	14	—	14
Total . . .	50	2	52

Of the 50 native species of plants, the Dicotyledons include 24 species, or almost half of the total number. There are 12 species of Monocotyledons, so that these are exactly in the proportion of one to two of the Dicotyledons, which is also the proportion of these two classes to each other in the flora of Mauritius. There are 14 species of Cryptogams, only 3 of which were observed by the other botanists prior to my visit in 1889. The 52 species belong to 28 natural orders, or less than 2 species to an order on an average. The number of species in the larger orders are Lichenes 6, Gramineæ 5, and Ebenaceæ, Euphorbiaceæ, and Palmæ 3 each.

Bojer, in his "Hortus Mauritianus," published in 1837, records 2 species of plants from Round Island, but Bojer never visited the island himself; Lloyd records 12 species by their vernacular names; Pike 11 species; Barkly and Horne 29 species; and myself 39 species. Of the 39 species observed and collected by me, 20, or fully half, were not observed by the other botanists. On the other hand, of the total 52 species recorded from Round Island, 13 were not observed by me; but, as I have already stated, some of these latter are probably identical with plants collected by me and recorded under different specific names.

The type of the flora is essentially Mauritian, but many of the plants found in Round Island depart considerably from the type of the same species in Mauritius. So far as the plants have been identified, most of the Round Island species are also native in Mauritius, but it is probable that several of the species which have not been identified may turn out to be new, and not occur in

Mauritius. The palm, *Latania Loddigesii*, Mart., is endemic in Round Island, Flat Island, and Coin de Mire, but not in Mauritius. The screw-pine, *Pandanus Vandermeerschii*, Balf. fil., is endemic in Round Island, Flat Island, Coin de Mire, Amber Island, and probably in Ile Vakois, but not in Mauritius. *Trichosandra borbonica*, Dcne., belonging to the Asclepiadaceæ, is found in Round Island, but not in any of the other islands of the Mauritius group. It is native, however, in Bourbon, 100 miles distant. Of the species that have been identified, two only are endemic in Round Island and found in no other part of the world, viz., the Bottle Palm, *Hyophorbe amaricaulis*, Mart., and *Selaginella Barklyi*, Baker; and even this small number, I think, must be reduced to one, for in a note on specimens of *S. obtusa*, Spring, forwarded by me from Round Island to Kew, Mr. Baker writes: "I am afraid *S. Barklyi* is only an extreme form of *obtusa*." I did not find *S. Barklyi* in Round Island; but all the plants of *S. obtusa* I observed in Round Island were much smaller and had smaller leaves than the plants of the same species observed by me in Mauritius. Baker, in his "Flora of Mauritius and the Seychelles," writes with reference to two species of Diospyros from Round Island, that both "may likely prove, when fully known, distinct from the Mauritian species." The leguminous plant and *Phyllanthus* found by me in Round Island, but not identified, do not agree with the description of any species described in Baker's "Flora of Mauritius and the Seychelles."

In a few places groups of palms and Pandani have retained the soil by means of their numerous adventitious roots; but in most places these trees and the other plants grow on the bare rocks, their roots descending through the vertical cracks and then spreading out to great distances between the stratified layers of volcanic tuff. In some of the plants I dug up, the roots exceeded the stems several times in length. In dry weather the plants suffer from drought, on account of the greater part of the rain-water flowing down the steep, rocky slopes into the sea immediately after falling on the island. On the lower slopes on the west side of the island I observed many shrubs of *Fernelia buxifolia*, Lam., dead from the effects of the drought. The plants are very much exposed to the terrific hurricanes which occasionally devastate the Mauritius group of islands. It is not, therefore, to be wondered at that I nowhere saw any trees exceeding 20 feet in height, although Sir H. Barkly writes that he saw plants of *Latania Loddigesii*, Mart., 40–50 feet high in one of the sheltered ravines not visited by me. This palm and the *Pandanus Vandermeerschii*, Balf. fil., are the two most widely distributed trees on the island, extending from the seashore upwards to near the summit of the hill. The other two species of palms, the *Hyophorbe amaricaulis*, Mart., and *Dictyosperma album*, Wendl., were not so abundant on the lower slopes of the hill near the sea as the two former trees. The dicotyledonous trees and shrubs formed a small wood on the south side of the hill 450–550 feet above sea-level, and it was in this wood only where I found the *Trichosandra borbonica*, Dcne. Although fourteen species of Cryptogams are recorded, they were by no means abundant in number, and most of them would have been passed over by me unobserved if I had not kept a careful look-out for them.

The remainder of my paper contains a complete list of all the plants recorded from Round Island by myself and others. I have followed the nomenclature of Baker's "Flora of Mauritius and the Seychelles," so far as Round Island species are described in it. The lower Cryptogams were identified by Mr. C. H. Wright of Kew Herbarium, and doubtful plants were referred to Mr. J. G. Baker and Mr. N. E. Brown, of the same institution.

Under each species I have entered notes of my own, taken from living specimens; and I have also, as far as possible, entered in chronological order the different names under which the other botanists have recorded the plants observed by them.

ABBREVIATIONS.

Bojer, Hort. Maur.—Hortus Mauritianus. By W. Bojer. 1837.

Trans. Nat. Hist. Soc. Maur.—Transactions of the Natural History Society of Mauritius. 1842-1845.

Trans. Roy. Soc. Maur.—Transactions of the Royal Society of Arts and Sciences of Mauritius. New Series. Volume IV. 1869.

Sub-Trop. Rambles—Sub-Tropical Rambles. By Nicholas Pike. 1873.

Baker, Flor. Maur. Seych.—Flora of Mauritius and the Seychelles. By J. G. Baker. 1877.

Linaceæ.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records having seen in 1844 the "Bois de Ronde," *Erthryoxylon laurifolium*, Lam.—Baker, Flor. Maur. Seych., p. 35, in the belts of forest wood on the upper part of the island. This shrub, which is native in the Mauritius, has not been seen in Round Island by the other botanists who have since visited the island.

Leguminosæ.

Among the trees on the south-east side of the hill, at 460 feet above sea-level, I found a leguminous plant, which I have not identified, as it was neither in flower nor fruit. Root woody, about a foot long, little branched. Stem about a foot long, woody, unbranched. Leaves 1–2 inches long, equally bipinnate, without tendrils; pinnæ, 3–5-jugate; leaflets, 5–15-jugate, $\frac{1}{5}$ inch long, oblong, subacute, glabrous, green above, pale purplish-green beneath.

This plant was not observed by the other botanists who previously visited the island.

Samydaceæ?

On the south side of the hill, 480–520 feet above sea-level, I found several small trees, which, perhaps, belong to the Samydaceæ; but I have not identified them, as they were not in flower, and only two unripe fruits were obtained by me.

Tree 10–12 feet high, much branched, with terete, glabrous, brown branches. Leaves alternate, $1\frac{1}{2}$–3 inches long, round-ovate, obtuse, rounded at the base, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole $\frac{1}{4}$–$\frac{1}{2}$ inch long. Unripe fruit springing from the axil of a branch, $\frac{1}{3}$ inch broad, globose, beaked, glabrous, pale green.

This tree appears to be the same as the one seen in 1869 by Barkly and Horne, and recorded by them in Trans. Roy. Soc. Maur., 1869, pp. 120 and 137:—"No. 22. Sp.: A small tree about 12 feet high, somewhat resembles *Blackwellia*, but I cannot trace it to any of them."

* Passifloraceæ.

*Passiflora suberosa, Linn.—Baker, Flor. Maur. Seych., p. 105. This tropical American species is naturalised in Round Island, where I found it common all over the island, with its stems trailing on the ground, or climbing up other plants. It is also naturalised in Mauritius, where it is common in the forests.

This plant was not observed by the other botanists who previously visited Round Island.

Combretaceæ.

Terminalia Benzoin, Linn. fil.,—Baker, Flor. Maur. Seych., p. 111 (*fide* J. G. Baker). This tree is rare on the south side of the hill, 520 feet above sea-level. It was neither in flower nor fruit. The leaves do not agree with the description in Baker, Flor. Maur. Seych., p. 111. Tree 10 feet high, much branched, with contorted, terete, brown branches. Leaves 4–6 inches long, oval, sub-acute, narrowed at the base, obscurely crenate, glabrous, dark-shining green above, pale yellowish green beneath, sub-coriaceous; petiole ¼ inch long. *T. Benzoin*, Linn. fil., is native in Mauritius.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records having seen, in 1844, the "Benjoin," or Bois Benzoin, which is the vernacular name of the tree in Mauritius.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having only seen, in 1869, three trees without flower or fruit of "No. 15. *Terminalia* species," which, they considered, differed from all the Terminaliæ hitherto known in Mauritius, Bourbon, and Rodriguez.

Myrtaceæ ?

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having seen, in 1869, "No. 16. *Jossinia* species, a small shrubby tree about 5–10 feet in height."

This tree was not observed by the other botanists who have visited Round Island.

Portulaceæ.

Portulaca oleracea, Linn.,—Baker, Flor. Maur. Seych., p. 125. I only found one small plant on the rocky hill-side, 200 feet above sea-level, near the landing-place, on the west side of the island. This plant is also native in Mauritius.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records having seen in Round Island, in 1844, the "Pourpier," which is the vernacular name of *P. oleracea*, L., in Mauritius.

Rubiaceæ.

Fernelia buxifolia, Lam.—Baker, Flor. Maur. Seych., p. 142. This shrub is common, and grows from 4–6 feet in height. On the west side of the island many of the plants were dead from the effects of the severe drought. I found no plants in flower or fruit at the time of my visit in November 1889. This species is also native in Mauritius.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137, record having seen, in 1869, "*Fernelia buxifolia*" (p. 119), which is the same as their "No. 17. *Fernelia* species" (p. 137).

In Baker, Flor. Maur. Seych., p. 142, under *Fernelia buxifolia*, Lam., one of the stations mentioned is "Round Island, Sir H. Barkly!"

On the south side of the hill, 500 feet above sea-level, I saw considerable numbers of a tree which was neither in flower nor fruit, and in which most of the leaves were in shreds, apparently from the attacks of insects. Mr. J. G. Baker, to whom specimens were sent, wrote to me the following note:—"Looks like a Plectronia, but cannot be certain without flowers." Tree 9–20 feet high, much branched, with spreading branches. Trunk 4½ inches to 3 feet in circumference, 2 feet from the ground, with brown longitudinally-wrinkled bark. Leaves opposite, 1½–2½ inches long, broadly oval, obtuse, slightly cordate at the base, entire, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole ⅙ inch long. This tree appears to be the same as—"No. 18. *Pyrostria* species near *P.*

polymorpha"—seen by Barkly and Horne in 1869, and recorded by them in Trans. Roy. Soc. Maur., 1869, pp. 119 and 137.

Compositæ.

Ageratum conyzoides, Linn.—Baker, Flor. Maur. Seych., p. 163. This annual, which is also native in Mauritius, is common in Round Island, but at the time of my visit in 1889 all the plants were dead from the effects of the severe drought.

Barkly and Horne saw this plant in Round Island in 1869, and they record "No. 26. *Ageratum* sp." in Trans. Roy. Soc. Maur., 1869, pp. 119 and 138.

In Baker, Flor. Maur. Seych., p. 163, under *Ageratum conyzoides*, Linn., one of the stations mentioned is "Round Island, Sir H. Barkly!"

Sonchus oleraceus, Linn. ex parte.—Baker, Flor. Maur. Seych., p. 180. Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 138, record "No. 27. *Sonchus* sp.: Rare," which they saw in Round Island in 1869. Barkly states that this *Sonchus* is the same as the one which grows in Flat Island, viz. *S. oleraceus*, Linn. ex parte. It is also native in Mauritius and in several of the small coral islands of the Mauritius group.

This plant was not observed by the other botanists who have visited Round Island.

Myrsinaceæ ?

Barkly and Horne, in 1869, saw two plants at about 800 feet above sea-level, which, in Trans. Roy. Soc. Maur., 1869, pp. 119 and 136, they record under "No. 14. *Badula* species (?). A small tree 12 feet in height, with the habit of growth of some of the larger growing Ardisias. Comes very near *Badula ovalifolia*, V. Don V. II., p. 13."

This tree was not observed by the other botanists who have visited Round Island.

Ebenaceæ.

Diospyros species.—On the south side of the hill, 450–530 feet above sea-level, I found a species of *Dios-*

pyros which I have not identified, as it was neither in flower nor fruit. It is probably one of the three species collected by Barkly and Horne in 1869. Tree 6–10 feet high, much-branched with spreading branches. Trunk $1\frac{1}{2}$ to 2 feet in circumference 2 feet from the ground, with glabrous smooth brown bark. Leaves alternate, $2\frac{1}{2}$–5 inches long, broadly ovate, obtuse, cordate at the base, entire, glabrous, dark-shining green above, pale green beneath, coriaceous; petiole $\frac{1}{6}$ inch long.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records having seen the "Ebony" in Round Island in 1844.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 137, record, under Nos. 19, 20, and 21, three species of *Diospyros* resembling *D. pterocalyx*, *melanida*, and *chrysophyllos* respectively. Specimens of these were forwarded to Kew, and they are referred to in Baker, Flor. Maur. Seych., pp. 198 and 199. One is identified as *D. leucomelas*, Poir., which is also native in Mauritius, and the other two are doubtfully placed under *D. mauritiana*, A. DC., and *D. melanida*, Poir.

D. LEUCOMELAS, Poir.—Baker, Flor. Maur. Seych., p. 198. "Round Island, Sir H. Barkly!"

D. MAURITIANA, A. DC.—Baker, Flor. Maur. Seych., p. 198. "We have barren specimens of an allied plant gathered by Sir H. Barkly on Round Island, with slender zig-zag branches, very short petioles, and very glossy strongly veined leaves three to four times as broad as long, rounded at both ends. Both this and the other Round Island forms may likely prove, when fully known, distinct from the Mauritian species."

D. MELANIDA, Poir.—Baker, Flor. Maur. Seych., p. 199. "We have a plant from Round Island, gathered by Sir H. Barkly, with a fruit-calyx just like that described above ('Fruit-calyx nearly flat, above an inch broad, the lobes produced at the border into a broad reflexed crisped wing'), but with larger leaves more rounded at the base, and veining more like that of *D. tessellaria*."

Boragineæ.

Tournefortia argentea, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, states that in 1844 "the shore to windward is studded with Veloutiers."

"Veloutier" is the vernacular name of *T. argentea*, Linn. fil., in Mauritius, where the plant is also native.

Pike, in Trans. Roy. Soc. Maur., 1869, p. 15, records having seen in Round Island in 1868 "Veloutiers (*Tournefortia argentea*, Linn.)."

This plant was not seen in Round Island by Barkly, Horne, and me, but it is likely to occur there.

Convolvulaceæ.

Ipomœa pes-capræ, Roth.—Baker, Flor. Maur. Seych., p. 211. This plant, which is also native in Mauritius, was seen by Pike in 1868, and recorded by him as "*Ipomœa maritima*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145. He saw it growing at 800 feet above sea-level.

Barkly and Horne also saw this plant in 1869, and they record it under "No. 13. *Ipomœa maritima*" in Trans. Roy. Soc. Maur., 1869, pp. 118 and 136.

It was not observed by me in 1889.

Dichondra repens, Forst.—Baker, Flor. Maur. Seych., p. 213. This plant was growing on the ground between the aërial roots of *Pandanus Vandermeerschii*, Balf. fil., on the east side of the hill, 720 feet above sea-level. It was first found by Mr. W. Scott, who showed me the place where it was growing. It is also native in Mauritius. The plants were in fruit. Leaves $\frac{1}{7}$–$\frac{1}{3}$ inch broad, green above, pale green beneath. Capsule brown; pedicel drooping. This plant was not observed by the other botanists who previously visited Round Island.

Solanaceæ.

Solanum nigrum, Linn.—Baker, Flor. Maur. Seych., p. 214. I found only one plant, 2 inches high, on the rocky ground 180 feet above sea-level, near the landing-place on the west side of the island. This plant, which is also native in Mauritius, was not observed by the other botanists who previously visited Round Island.

ASCLEPIADACEÆ.

TRICHOSANDRA BORBONICA, Dcne.—De Candolle, Prodromus viii. 626 (*fide* N. E. Brown). This plant is not recorded from Mauritius in Baker, Flor. Maur. Seych., but it is recorded from Bourbon by Petit—Thouars and Lépervenche—Mezières, in De Candolle, Prodromus viii. 626, published in 1844. In Round Island the plant is common in the forest belt on the south side of the hill, 530–540 feet above sea-level. The following description was made from living specimens, by me, on 27th November 1889:—A woody climber with a stem 3 inches thick 2 feet from the ground, and long, slender, terete, glabrous, greyish-brown branches, twining right to left round other plants to a height of 10 feet; juice milky. Leaves opposite, petioled, 1–3 inches long, $\frac{1}{2}$–2 inches broad, oblong or obovate-oblong, obtuse or sub-acute, mucronate, rounded or slightly cordate at the base, entire, glabrous, dark green above, pale green beneath, coriaceous, penninerved. Calyx purplish green. Corolla-limb 5-lobed, pale whitish purple. Pollinia waxy. Stigma peltate, pale yellow, with a shallow, pale purplish-yellow pit on the top at the centre. Follicles one or two developed, divaricate, 2–3 inches long, fusiform, glabrous, dark green, becoming brown after dehiscence. Seeds $\frac{1}{5}$ inch long, obspathulate, flexuous, wrinkled, glabrous, brown, with the truncate apex crowned with a copious tuft of simple, spreading, white hairs 1 inch long.

Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 136, record this plant from Round Island, in 1869, under "No. 2. *Streptocaulon* species."

TYLOPHORA LÆVIGATA, Dcne.—Baker, Flor. Maur. Seych., p. 228. I found this plant, in flower and fruit, common all over the island, from the seashore to the top of the hill 1055 feet above sea-level. It is also native in Mauritius.

Barkly and Horne saw this plant in Round Island in

1869, and they record it under "No. 1. *Tylophora* species" in Trans. Roy. Soc. Maur., pp. 118 and 135.

In Baker, Flor. Maur. Seych., p. 228, one of the stations mentioned under *T. lævigata*, Dcne, is "Round Island, Sir H. Barkly!"

NYCTAGINACEÆ.

BOERHAAVIA DIFFUSA, Linn.—Baker, Flor. Maur. Seych., p. 264. I found this plant in flower and fruit sparingly on the rocky hillside, 200–240 feet above sea-level, near the landing-place on the west side of the island. It is also native in Mauritius. Stems $\frac{1}{6}$–1 foot long. Leaves dark green above, pale whitish-green beneath. Corolla $\frac{1}{8}$ inch across when expanded, purple. Filaments dark purple; anthers pale yellow. In all the Round Island plants the corolla is purple and the filaments dark purple, whereas in all the plants I observed on the coral islands lying off the south coast of Mauritius, the corolla was green with white lobes, and the filaments were white. This plant was not observed by the other botanists who previously visited Round Island.

EUPHORBIACEÆ.

EUPHORBIA THYMIFOLIA, Burm. — Baker, Flor. Maur. Seych., p. 303. I found this plant, sparingly in flower and fruit, on the rocky hillside, 200 feet above sea-level, near the landing-place on the west side of the island. It is also native in Mauritius. Stems $\frac{1}{2}$–$2\frac{1}{2}$ inches long. This plant was not observed by the other botanists who previously visited Round Island.

PHYLLANTHUS NIRURI, Linn.—Baker, Flor. Maur. Seych., p. 309. I found only three plants, without flowers or fruit, on the rocky hillside, 200 feet above sea-level, near the landing-place on the west side of the island. This plant is also native in Mauritius. It was not observed by the other botanists who previously visited Round Island.

PHYLLANTHUS sp.—On the rocky hillside, 680 feet above sea-level, at the east side of the island, I found only two plants of a *Phyllanthus*, which I have not identified, as it was neither in flower nor fruit. Stems $1\frac{1}{2}$–3 inches long, erect. Leaves $\frac{1}{3}$ inch long, oblanceolate-linear, obtuse; stipules deltoid-acuminate. This plant was not observed by the other botanists who previously visited Round Island.

LILIACEÆ.

LOMATOPHYLLUM BORBONICUM, Willd.—Baker, Flor. Maur. Seych., p. 374. I found this plant, without flowers or fruit, common on the rocky ground, 1020 feet above sea-level, near the top of the hill, at the north end of the island. It is also native in Mauritius.

Barkly and Horne saw this plant in 1869, and they record it, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 137, under "No. 23. *Aloe* sp."

Pike, in Sub-Trop. Rambles, p. 145, states that he saw "a species of aloe" in Round Island in 1869.

ASPARAGUS UMBELLULATUS, Sieber.—Baker, Flor. Maur. Seych., p. 377. I found only one plant in fruit, climbing on *Pandanus Vandermeerschii*, Balf. fil., on the rocky hill-side, 160 feet above sea-level, near the landing-place on the west side of the island. This plant, which is also native in Mauritius, was not observed by the other botanists who previously visited Round Island.

PALMÆ.

LATANIA LODDIGESII, Mart.,—Baker, Flor. Maur. Seych., p. 381. I saw this palm common all over the island. The male plants were in flower, and the female in fruit. Palm 10–20 feet high. Leaves coriaceous, glaucous on both surfaces, with a dark purple margin; petioles tomentose and pale yellow at the base, glabrous and green in the upper part, split at the base and perforated by the spadices in the outer leaves. Male flowers odoriferous. Perianth-segments, filaments, and anthers yellow. Pollen ellipsoid, glabrous, yellow. Drupe dull green.

Bojer, who never visited Round Island, erroneously recorded this palm from Round Island under *Latania rubra*, Jacquin, in Bojer, Hortus Mauritianus, p. 307, which was published in 1837.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, states that in 1844 he saw in Round Island the "Ravinal with its fan-like leaves," by which he evidently meant the *L. Loddigesii*, Mart., which is the only plant with fan-like leaves on the island. The Ravenal, *Ravenala madagascariensis*, Sonnerat, belongs to the natural order Musaceæ, and it is a native of Madagascar. It is naturalised in Mauritius, where it grows in wet ground near water, conditions which do not exist in the dry rocky hillsides of Round Island.

Pike saw this palm in Round Island in 1868, and he records it as "*Latania glaucophylla*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145.

Barkly and Horne also saw it in 1869, and they record it as "*Latania glaucophylla*" in Trans. Roy. Soc. Maur., 1869, pp. 116, 117, and 138. Barkly states that he saw plants of this palm 40–50 feet high in the sheltered ravines in Round Island.

In Baker, Flor. Maur. Seych., p. 381, under *L. Loddigesii*, Mart., the following stations are mentioned:—"Mauritius, on Round Island, Flat Island, and Coin de Mire. Indigenous only on these islets, but introduced on the mainland, Horne! Endemic."

HYOPHORBE AMARICAULIS, Mart.—Baker, Flor. Maur. Seych., p. 283. This palm is common, and I found it in flower, but not in fruit. Palm 10–20 feet high, with the stem bottle-shaped at the base or, rarely, at the middle. Leaf-sheath thick, glabrous, pale green; midrib of leaf green; pinnæ sub-coriaceous, shining green on both surfaces, with pale yellow veins and margin. Male perianth-segments pale yellow. Filaments whitish; anthers pale yellow; pollen ellipsoid, glabrous, yellow. Rudimentary ovary yellow, with a pale-green apex.

Bojer erroneously recorded this palm from Round Island under *Chamærops excelsior*, Boj., in Bojer, Hort. Maur., p. 307, which was published in 1837.

Lloyd saw this palm in Round Island in 1844, and records it as the "Cocoa-nut tree" in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

Pike also saw it in 1868, and he erroneously records it as the "*Jubæa spectabilis*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 144.

Barkly and Horne saw it in 1869, and they record it under "No. 24. Bottle Palm" in Trans. Roy. Soc. Maur., 1869, pp. 114–116 and 138.

In Baker, Flor. Maur. Seych., p. 383, under *H. amaricaulis,* Mart., the only station mentioned is "common in Round Island, Barkly! Horne! Endemic."

The vernacular name of this palm in Mauritius is Palmiste Gargoulette or Bottle Palm.

Dictyosperma album, Wendl.—Baker, Flor. Maur. Seych., p. 384. I saw this palm common in Round Island in fruit only. It is also native in Mauritius.

Palm 10–20 feet high. Leaf-sheath thin, tomentose, pale whitish-yellow; midrib of leaf green; pinnæ coriaceous, shining green above, glaucous beneath, with green veins and margin. Spadix 1 foot long, with persistent membranous bracts at the bases of the branches. Fruit ½ inch long, ovoid, glabrous, shining green, with a brown apex. Persistent perianth-segments pale green, with a brown margin and apex.

Lloyd saw this palm in Round Island in 1844, and he records it by its vernacular name "Palmiste" in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

Pike also saw it in 1868, and he records it as "*Areca alba*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 144.

Barkly and Horne saw it in 1869, and they record it under "No. 25 Areca sp.: Near *A. alba,*" in Trans. Roy. Soc. Maur., 1869, pp. 116 and 138.

In Baker, Flor. Maur. Seych., p. 384, under *D. album,* Wendl., the following note occurs:—"In a plant from Round Island, Mr. Horne says one or two of the lower branches of the spadix are subtended by membranous bracts."

Pandaneæ.

Pandanus Vandermeerschii, Balf. fil.—Baker, Flor. Maur. Seych., p. 398. I saw this plant common all over the island in fruit only.

Tree 10–20 feet high. Leaves channelled above, keeled beneath, glabrous, shining green above, glaucous beneath, rigidly coriaceous, with the midrib and margin pale green, and armed with reddish brown spines. Drupes pale yellow at the base, brownish-red at the middle, and pale reddish yellow at the apex.

Lloyd saw the "Vacoa," which is the vernacular name of *Pandanus* in Mauritius, in Round Island in 1844, and he records it by this name in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

Pike saw it in 1868, and he records the "*Pandanus Vandermeerschii*" in Trans. Roy. Soc. Maur., 1869, p. 15, and in Sub-Trop. Rambles, p. 145.

Barkly and Horne also saw it in 1869, and they record "*Pandanus Vandermeerschii*" in Trans. Roy. Soc. Maur., 1869, pp. 113 and 114.

In Baker, Flor. Maur. Seych., p. 398, under *P. Vandermeerschii*, Balf. fil., the following stations are mentioned:—"Round Island, Amber Island, Flat Island, and Coin de Mire, not on the mainland, Barkly! Horne! Balfour! Endemic." On 5th September 1889 I found one plant, without flowers or fruit, of a Pandanus, in Ile Vakois, which is probably *P. Vandermeerschii*, Balf. fil.

In Baker, Flor. Maur. Seych., *P. Vandermeerschii* is misspelt *P. Vandermeeschii*.

* Pandanus utilis, Bory.—Baker, Flor. Maur. Seych., p. 398.—Barkly and Horne found several plants of this species in 1869, but they only occurred in one spot, scarcely more than 100 feet above the landing-place, and they came to the conclusion that the seeds had probably been planted there by some early visitor.

Bojer, in Hort. Maur., p. 301, published in 1837, records *P. utilis* as native in Mauritius; but Balfour in Baker, Flor. Maur. Seych., records it as "a native of Madagascar, is commonly planted in Mauritius for the sake of its leaves."

This plant was not observed by the other botanists who have visited Round Island.

Cyperaceæ.

Fimbristylis glomerata, Nees.—Baker, Flor. Maur Seych., p. 418. I found this plant rare on the rocky hill side, 110 feet above sea-level, on the west side of the island. It was neither in flower nor fruit. It is also native in Mauritius. This is probably the same plant seen by Barkly and Horne in 1869, and recorded by them under "No. 6. *Cyperus* species: Perhaps *Cyperus maritimus*," in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

GRAMINEÆ.

ANDROPOGON SCHŒNANTHUS, Linn.—Baker, Flor. Maur. Seych., p. 446.

Lloyd saw this grass in 1844, and recorded it by its vernacular name, "Citronnelle," in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

Pike saw it in 1868, and recorded it as the "Citronelle" in Trans. Roy. Soc. Maur. 1869, p. 15.

Barkly and Horne found this grass the most common one in the island, growing in tufts among the trees at the summit of the hill; and they recorded it by its proper name, "*Andropogon Schœnanthus*," in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

CHLORIS MONOSTACHYA, Poir.—Baker, Flor. Maur. Seych., p. 453 (*fide* J. G. Baker). I found this grass in a withered condition in fruit, 180–520 feet above sea-level. It is also native in Mauritius.

It is not recorded by the other botanists who previously visited Round Island; but it is probable that it is one of the grasses observed by them.

On the west side of the island, 200–460 feet above sea-level, I found a few specimens of a young grass, without flowers or fruit, which I have not identified. Stems 1–3 inches long, erect, pilose; leaves $\frac{1}{2}$–$1\frac{3}{4}$ inches long, lanceolate-linear, acute, green above, glaucous beneath.

This grass was probably observed by the other botanists who previously visited Round Island.

I found a common grass growing in withered tufts, without flowers, but with stems from which the grain had dropped off, on the rocky hillside, 180–520 feet above sea-level. I have not identified it, but it most probably was one of the grasses observed by the other botanists who previously visited the island. Stems densely tufted, $\frac{1}{2}$–$1\frac{1}{4}$ foot long, erect. Leaves $\frac{1}{2}$–1 foot long, linear, acuminate, glabrous, firm.

In addition to *Andropogon Schœnanthus*, Linn., recorded by Lloyd, Pike, Barkly, and Horne, these naturalists found at least four other species of Gramineæ, which, however, have not been identified, with the exception probably of *Chloris monostachya*, Poir., found by me in 1889.

Lloyd saw the "Chiendent" in 1844, and he records this name in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158.

This is probably the same grass referred to by Pike as the "creeping *Cynadon*," which he saw in 1868, and recorded in Trans. Roy. Soc. Maur., 1869, p. 15; and also the same as Barkly and Horne's "No. 7. *Cynodon* species: Not common," seen by them in 1869, and recorded in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

Lloyd, in Trans. Nat. Hist. Soc. Maur., 1842–45, p. 158, records the "Gazon," *Zoysia pungens*, Willd., which is native in Mauritius, and which he states he saw in Round Island in 1844.

Pike, in Trans. Roy. Soc. Maur., 1869, p. 15, records the "common Turfing grass," which he saw in Round Island in 1868; but which grass he refers to by this name I do not know.

Barkly and Horne saw the following three grasses in 1869, and recorded them as follows, in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136:—

"No. 5. *Graminæ* species."

"No. 8. *Graminæ* species: Rare. Only one small plant, and it had been eaten by the goats."

"No. 9. *Graminæ* species: Not common. Perhaps *Panicum brevifolium* or *Panicum repens*, both are Mauritius species."

Filices.

Adiantum caudatum, Linn.,—Baker, Flor. Maur. Seych., p. 474. I found this fern sparingly in fructification, in the crevices of rocks, 200–460 feet above sea-level, on the west side of the island. It is also native in Mauritius.

Fronds 1–3 inches long, $\frac{1}{3}$–$\frac{1}{2}$ inch broad, shortly stalked.

Pike saw this fern in 1868, and he records "*Adiantum caudatum*" in Trans. Roy. Soc. Maur., 1869, p 15, and in Sub-Trop. Rambles, p. 145, with a drawing of the fern on p. 151.

Barkly and Horne saw it in 1869, and they record "*Adiantum caudatum*" in Trans. Roy. Soc. Maur., 1869, pp. 113 and 136.

In Baker, Flor. Maur. Seych., p. 474, under *A. caudatum*, Linn., one of the stations mentioned is "Round Island, Sir H. Barkly."

SELAGINELLACEÆ.

SELAGINELLA BARKLYI, Baker.—Baker, Flor. Maur. Seych., p. 522. Barkly and Horne found this plant in 1869, and they record it under "No. 11. *Selaginella* species: not common," in Trans. Roy. Soc. Maur., 1869, pp. 112 and 136.

In Baker, Flor. Maur. Seych., p. 522, under *S. Barklyi*, Baker, the following note occurs:—"Round Island, Sir H. Barkly! and what is probably a more robust form of the same species with larger leaves from Coin de Mire, Horne! Endemic." This plant has not been found by the other botanists who have visited Round Island, but Baker, in a note on specimens of *S. obtusa*, Spring, collected by me in Round Island in 1889, writes—"I am afraid *S. Barklyi* is only an extreme form of *obtusa*."

S. OBTUSA, Spring.—Baker, Flor. Maur. Seych., p. 523 (*fide* J. G. Baker). I found this plant, in fructification, growing in the clefts of rocks, 580 feet above sea-level, on the south side of the hill. It is also native in Mauritius, but the Round Island plants have smaller leaves than those I found in Mauritius. Stems 1–3$\frac{1}{2}$ inches long. Larger leaves $\frac{1}{16}$ inch long, minutely ciliated at the upper margin and apex. In Mauritius the plants I examined had the larger leaves $\frac{1}{12}$ inch long. In the Round Island plants the leaves were considerably browned, apparently from the effects of the prolonged drought.

With the exception of one moss, none of the following

Cryptogams were observed by the other botanists who previously visited Round Island :—

Musci.

Barbula sp. (*fide* C. H. Wright). Friable rocks, 220 feet above sea-level, on the west side of the island. Plant yellowish brown.

Barkly and Horne saw one moss in 1869, and they record, in Trans. Roy. Soc. Maur., 1869, pp. 112 and 136, "No. 12. Moss from trees: common on the higher parts of the island;" and Sir H. Barkly writes, "I presume it to be a *sphagnum*."

Pike, in Sub-Trop. Rambles, in a footnote to p. 166, writes, "I believe it is *Hypnus acicularis*, Linn."

I did not observe this moss in 1889.

Hepaticæ.

Lejeunia sp. (*fide* C. H. Wright).—Growing on the stem of the "Bottle Palm," *Hyophorbe amaricaulis*, Mart., 630 feet above sea-level, on the south side of the hill. Plant pale green.

Lichenes.

Ramalina calicaris, Fr. (*fide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 240 feet above sea-level, on the west side of the island. Common. Thallus and fructification pale yellow.

Parmelia conspersa, Ach. (*fide* C. H. Wright).—Rocks on hillside, 450 feet above sea-level. Common. Thallus pale yellow.

Physcia picta, Nyl. (*fide* C. H. Wright).—Growing on the adventitious roots of *Latania Loddigesii*, Mart., 200 feet above sea-level, on the west side of the island. Thallus white.

Lecanora subfusca, Ach. (*fide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 200 feet above sea-level, on the west side of the island. Plant white.

LECANORA near PHLOGINA, Nyl. (*fide* C. H. Wright).—Growing on the dead branches of *Fernelia buxifolia*, Lam., 200 feet above sea-level, on the west side of the island. Plant brownish yellow.

PSOROMA (?) (*fide* C. H. Wright).—Rocks on hillside, 720 feet above sea-level. Thallus greenish grey.

FUNGI.

CAPNODIUM, sp. (*fide* C. H. Wright).—Growing on the stem of *Hyophorbe amaricaulis*, Mart., 630 feet above sea-level, on the south side of the hill. Plant black.

POLYPORUS SANGUINEUS, Fries. (*fide* J. G. Baker).—Growing on the dead branch of a tree, 460 feet above sea-level, on the south side of the hill. Plant red on both surfaces.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON TEMPERATURE AND VEGETATION DURING JUNE 1894. By ROBERT LINDSAY, Curator.

The past month has been rather cold and wet for June. There was an absence of any really warm weather, still no frost occurred, and as regards vegetation the month was a moderately good one. The lowest night reading of the thermometer was 34°, which was registered on the 1st of the month, and the highest 52°, on the 27th. The lowest day temperature was 55°, on the 4th, and the highest 83°, on the 26th. The foliage of forest and ornamental deciduous trees is now complete. Variegated varieties of *Biota*, *Cupressus*, and *Taxus* have developed bright, well-coloured foliage. Late rhododendrons and hawthorn were full of flower during June. Hardy herbaceous plants generally have grown well, and flowered abundantly.

On the rock-garden 288 species and varieties came into flower during the month. Amongst the most interesting were the following:—*Anthyllis montana rubra*, *Achillea mongolica*, *A. leucophylla*, *Anthemis macedonica*, *Androsace* *foliosa, Campanula abietina, C. Hendersoni, C. "G. F. Wilson," Cacalia alpina, Choisya ternata, Cistus formosus, Crambe cordifolia, Craspedia Richei, Cyananthus lobatus, Cypripedium Calceolus, Dianthus alpinus, D. cæsius, D. glacialis, D. neglectus, D. superbus, D. hybridus, Hedysarum obscurum, Helonias asphodeloides, Myosotis lithospermifolia, Modiola geranioides, Nardostachys Jatamansi, Linum alpinum, Lathyrus Drummondii, Linaria origanifolia, Papaver alpinum, P. pyrenaicum, Potentilla lanaginosa, Ramondia pyrenaica, Rodgersia podophylla, Rosa alpina, Saponaria Boissieri, Saxifraga valdensis, Tropæolum polyphyllum, Silene quadridentata, Veronica cataractæ, V. carnosula, V. cupressoides, V. monticola, V. lycopodioides,* etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during June 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	34°	55°	65°	16th	40°	63°	74°
2nd	39	52	59	17th	50	57	64
3rd	44	54	62	18th	38	55	65
4th	45	50	55	19th	41	57	70
5th	41	43	57	20th	48	60	71
6th	34	51	63	21st	41	63	72
7th	36	54	70	22nd	42	65	72
8th	41	57	65	23rd	49	63	69
9th	47	54	61	24th	44	56	62
10th	46	54	61	25th	46	50	71
11th	45	50	63	26th	50	68	83
12th	45	60	69	27th	52	67	74
13th	44	65	69	28th	48	52	69
14th	44	54	70	29th	50	58	73
15th	50	62	69	30th	49	60	74

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of June 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·757	54·3	39·0	53·8	48·7	N.	Cum.	1	W.	0·000
2	29·660	59·7	44·7	51·4	49·6	N.	Cir.	7	S.	0·000
3	29·913	54·2	48·2	50·8	48·7	E.	Cum. St.	10	E.	0·010
4	29·872	54·8	48·1	50·9	49·7	E.	Cum. St.	10	E.	0·755
5	29·719	51·8	45·2	45·7	44·8	E.	Nim.	10	E.	0·375
6	29·829	52·1	38·2	51·5	50·0	N.	...	0	...	0·000
7	29·769	57·6	41·8	53·2	52·8	N.E.	Cum.	9	N.	0·005
8	29·818	63·0	45·2	56·8	53·9	N.E.	...	0	...	0·045
9	29·774	59·6	50·0	52·6	52·0	N.E.	Cum. St.	10	N.E.	0·010
10	29·659	54·6	50·1	54·6	53·0	E.	Nim.	10	E.	0·820
11	29·556	56·4	47·2	56·1	51·0	N.W.	Cir.	4	N.W.	0·170
12	29·795	59·0	48·8	58·0	52·9	N.	Cum.	5	N.	0·015
13	29·930	64·1	47·5	59·7	52·8	S.E.	...	0	...	0·000
14	30·010	62·7	47·1	53·8	49·8	W.	Cum. St.	10	W.	0·000
15	29·800	64·4	53·6	62·1	58·2	S.W.	Cum.	9	S.W.	0·025
16	30·014	64·3	44·2	57·2	50·4	W.	Cum.	5	W.	0·000
17	29·606	65·7	54·0	57·7	54·2	S.W.	Cum. St.	10	S.W.	0·030
18	29·624	58·4	43·2	52·1	49·8	W.	Cum.	7	W.	0·055
19	29·884	58·8	44·6	53·9	49·7	S.W.	Cum.	10	S.W.	0·060
20	29·797	61·0	52·6	61·2	54·9	W.	Cum. St.	10	S.W.	0·000
21	30·034	63·6	45·2	58·3	50·0	W.	Cir. Cum.	3	W.	0·000
22	29·869	66·0	47·2	62·2	56·8	S.W.	Cir. St.	5	S.W.	0·000
23	29·758	65·1	52·2	58·9	54·5	S.W.	Cir. St.	10	S.W.	0·160
24	29·705	60·8	47·9	54·9	49·1	W.	Cum.	3	W.	0·010
25	29·984	60·8	49·7	51·4	50·4	E.	Cum. St.	10	E.	0·010
26	30·195	65·5	51·0	65·5	61·1	N.	Cum.	3	N.E.	0·000
27	30·317	72·7	55·2	63·9	58·6	E.	Cum. St.	9	E.	0·000
28	30·314	65·2	50·9	54·2	53·1	E.	Cum. St.	10	E.	0·000
29	30·360	62·2	54·4	57·7	56·4	E.	Nim.	10	E.	0·000
30	30·385	67·1	51·0	55·6	54·2	N.	...	0	...	0·000

Barometer.—Highest Observed, on the 30th, = 30·385 inches. Lowest Observed, on the 11th, = 29·556 inches. Difference, or Monthly Range, = 0·829 inch. Mean = 29·890 inches.

S. R. Thermometers.—Highest Observed, on the 27th, = 72°·7. Lowest Observed, on the 6th, = 38°·2. Difference, or Monthly Range, = 34°·5. Mean of all the Highest = 60°·8. Mean of all the Lowest = 47°·9. Difference, or Mean Daily Range, = 12°·9. Mean Temperature of Month = 54°·3.

Hygrometer.—Mean of Dry Bulb = 55°·8. Mean of Wet Bulb = 52°·4.

Rainfall.—Number of Days on which Rain fell = 16. Amount of Fall = 2·555 inches. Greatest Fall in 24 hours, on the 10th, = 0·820 inch.

A. D. RICHARDSON,
Observer.

III. On Plants in the Plant Houses, with Exhibition of Specimens. By R. L. Harrow.

The past month of June has been prolific in the number of species of flowering plants in the houses of the Royal Botanic Garden, about one hundred and fifty having flowered during that period. Tropical and temperate ferns have rapidly, and with remarkable vigour, perfected their numerous fronds, giving the houses devoted to them a healthy pleasing appearance. Many of the cacti and other succulent plants are now commencing another year's growth, the apex of the stems of such genera as *Cereus*, *Mammillaria*, and others of like habit, presenting a much brighter colour.

Palms and foliage plants in the tropical houses are now growing luxuriantly, while in those buildings devoted to the cultivation of the natives of more temperate regions a promise of equal growth is exhibited in the large number of expanding buds and leaves. Amongst the flowering plants most worthy of notice are the following:—

Solanum Wendlandii, Hook. f. This is one of the finest of the species in cultivation of this genus, and is a native of Costa Rica. It was introduced by Dr. Wendland, Director of Herrenhausen Royal Gardens, Hanover, after whom it was named by Sir J. Hooker. The plant is of a climbing habit, the stem branches and petioles of the leaves bearing small prickles. The foliage is variable both in size and form, the lower being generally pinnate or pinnatifid, while those at the apex are simple. The inflorescence is a large cyme which terminates the branches, the flowers being of a lilac blue and often more than two inches across; these open successively, and thus each inflorescence continues in flower over a very lengthened period.

Gerbera Jamesonii, Bolus. "This plant is said to have first been discovered by the collector Rehman in 1878, and subsequently by Mr. Jameson in the goldfield district of Barbetown." See "Botanical Magazine," t. 7087, where a figure of this fine composite may be seen. The foliage is large and pinnatifid; the flower stalk rises to a height of more than a foot; the inflorescence, although bright, is said to lose much colour under cultivation. The ray florets, under natural conditions at the Cape, being described as of a much more intense colour.

Combretum purpureum, Vall. A native of Madagascar. This lovely stove climber, although often seen in cultivation, is seldom seen in good condition. The flowers are small, of a rich dark scarlet colour, the stamens standing out from the petals in a very prominent manner; the inflorescence is a branched panicle bearing numerous flowers. The leaves are opposite and oblong lanceolate in shape, being of a reddish-brown colour while in a young state, gradually assuming a dark green with age. This plant is now placed by the "Index Kewensis" under its original name of *C. coccineum*, Lamk.

Musa coccinea, Roxb. This old inhabitant of our gardens is a small growing species, coming from China and Cochin China, growing to a height of about four feet. The inflorescence is a very attractive one, the spathes being of a very bright scarlet tipped with a yellow band. The leaves are about a yard in length, and six to nine inches in breadth.

Myrtus Luma, Molina. This very free flowering species is a native of Chili, and in some parts of the country is said to be hardy. A fine plant is now flowering in the temperate house. The leaves are small ovate; the inflorescences are borne at the extremities of the branches in profusion; the flowers are white, the petals being slightly concave, and the large number of stamens give them a light appearance. The flowers are slightly fragrant. The synonyms of *Eugenia apiculata*, and *E. Luma* have been given this plant, and, under the latter name, a fine figure may be seen in the "Botanical Magazine," t. 5040.

Cypripedium Stonei, Hook. Introduced by Messrs. Low, from Borneo; this is a very fine species. The leaves are stout and leathery, about an inch in width and a foot in length. The scape, which rises from amongst these, generally carries about three flowers. The sepals are white, broad, and striped with purple lines. The petals are about five inches long, curved downwards, these also being covered with purple spots.

Others worthy of note are:—*Mitraria coccinea*, Cav.,—a plant of scandent habit with lovely scarlet flowers, a native of Chili; *Rhynchostylis retusa guttata*, Rchb., fil. (*Saccolabium guttatum*, Linn.),—coming from the East Indies, bearing fine racemes of flowers; *Spathyphyllum hybridum*, Hort.,—a pretty Aroid with a large pure white spathe, being a cross between *S. cannæfolium* and *S. Patini*; *Arctotis Leichtliniana*, Lynch,—a native of South Africa, belonging to the order Compositæ, with large highly-coloured ray florets; *Aristea capitata*, Ker.-Gawl.,—an iridaceous plant with pretty blue flowers, native of Cape of Good Hope; *Desfontainea spinosa*, Ruiz. and Pav.,—a shrub resembling the holly, native of Peru, bearing solitary terminal scarlet and yellow flowers—a member of the order Loganiaceæ; *Actinotus Helianthii*, Labill.,—a curious umbelliferous plant, resembling somewhat a composite in the form of its inflorescence, a native of Australia; *Crossandra undulæfolia*, Salisb.,—sometimes called *C. infundibuliformis*, introduced from East Indies in 1881, a pretty stove plant belonging to the order Acanthaceæ.

C

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

VOLUME XX.

PART II.

EDINBURGH:
PRINTED FOR THE BOTANICAL SOCIETY BY
MORRISON AND GIBB.
MDCCCXCV.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LIX.

MEETING OF THE SOCIETY,

Thursday, November 8, 1894.

Professor F. O. Bower, President, in the Chair.

The following Officers of the Society were elected for the Session 1894–95:—

PRESIDENT.

Professor F. O. Bower, D.Sc., F.R.SS. L. & E., F.L.S.

VICE-PRESIDENTS.

Rev. David Paul, M.A., LL.D.
Malcolm Dunn.
Patrick Neill Fraser.
Symington Grieve.

COUNCILLORS.

Colonel Fred. Bailey, R.E.
Sir Alexander Christison, Bart., M.D.
William Craig, M.D., F.R.S.E., F.R.C.S.E.
Henry Halcro Johnston, M.B., C.M.
J. Rutherford Hill.
Commander F. M. Norman, R.N.
Robert A. Robertson, M.A., B.Sc. Edin.
Andrew Semple, M.B., F.R.C.S.E.
T. Bond Sprague, M.A., F.R.S.E.
Robert Turnbull, B.Sc.

Honorary Secretary—Professor Sir Douglas Maclagan, M.D., LL.D., P.R.S.E.
Honorary Curator—The Professor of Botany.
Foreign Secretary—Andrew P. Aitken, M.A., D.Sc., F.R.S.E.
Treasurer—Richard Brown, C.A.
Assistant Secretary—James Adam Terras, B.Sc.
Artist—Francis M. Caird, M.B., C.M.
Auditor—Robert C. Millar, C.A.

Issued November 1895.

LOCAL SECRETARIES.

Aberdeen—Professor J. W. H. TRAIL, M.A., M.D., F.L.S.
Bathgate—ROBERT KIRK, M.B., C.M.
Beckenham, Kent—A. D. WEBSTER.
Berwick-on-Tweed—FRANCIS M. NORMAN, R.N.
Birmingham—GEORGE A. PANTON, F.R.S.E., 73 Westfield Road.
,, W. H. WILKINSON, F.L.S., F.R.M.S., Manor Hill, Sutton Coldfield.
Bridge of Allan—ALEXANDER PATERSON, M.D.
Bromley, Kent—D. T. PLAYFAIR, M.B., C.M.
Calcutta—GEORGE KING, M.D., F.R.S., Botanic Garden.
,, DAVID PRAIN, M.D., F.R.S.E., F.L.S., Botanic Garden.
Cambridge—CHARLES C. BABINGTON, M.A., F.R.S., Professor of Botany.
,, ARTHUR EVANS, M.A.
Chirnside—CHARLES STUART, M.D.
Croydon—A. BENNETT, F.L.S.
Dundee—Professor P. GEDDES.
,, W. G. SMITH, B.Sc.
Glasgow—Professor F. O. BOWER, D.Sc., F.R.S., F.L.S.
,, Professor J. CLELAND, M.D., F.R.S.
Kelso—Rev. DAVID PAUL, M.A., LL.D., Roxburgh Manse.
,, Rev. GEORGE GUNN, M.A., Stitchel Manse.
Kilbarchan—Rev. G. ALISON.
Lincoln—GEORGE MAY LOWE, M.D., C.M.
London—WILLIAM CARRUTHERS, F.R.S., F.L.S., British Museum.
,, E. M. HOLMES, F.L.S. F.R.H.S.
,, JOHN ARCHIBALD, M.D., F.R.S.E.
Melbourne, Australia—Baron FERDINAND VON MUELLER, M.D., K.C.M.G., F.R.S.
Melrose—W. B. BOYD, of Faldonside.
Nova Scotia—Professor GEORGE LAWSON, LL.D., Dalhousie.
Otago, New Zealand—Professor JAMES GOW BLACK, D.Sc., University.
Ottawa, Ontario—W. R. RIDDELL, B.Sc., B.A., Prov. Normal School.
Perth—F. BUCHANAN WHITE, M.D., F.L.S.
Saharunpore, India—J. F. DUTHIE, B.A., F.L.S.
Silloth—JOHN LEITCH, M.B., C.M.
St. Andrews—Professor M'INTOSH, M.D., LL.D., F.R.SS. L. & E.
,, ROBERT A. ROBERTSON, M.A., B.Sc.
Wellington, New Zealand—Sir JAMES HECTOR, M.D., K.C.M.G., F.R.SS. L. & E.
Wolverhampton—JOHN FRASER, M.A., M.D.

The PRESIDENT made intimation of the death of Dr. NATHAN PRINGSHEIM, and of Professor PIERRE DUCHARTRE, Honorary Foreign Fellows of the Society.

Mr. TAGG exhibited, from the Museum of the Royal Botanic Garden, fasciated inflorescence of *Uraria crinita;* fasciated stem of *Tamus communis;* and a series of models by Brendel, of Berlin, illustrating the construction of ovules and the taxis of members upon an axis.

The PRESIDENT (Professor F. O. Bower) delivered the following address:—

In selecting a subject on which to address the Society, I have thought that I could not do better than direct your attention to certain matters connected with the minute structure of the cell and nucleus, in which great advances have recently been made in our knowledge; and these at the present time especially demand our attention, since the questions do not now merely relate to minutiæ of structure, but are acquiring a wide theoretical bearing upon some of the largest of our morphological ideas—even upon alternation of generations itself, which is one of the broadest morphological conceptions we possess.

Perhaps no generalisation focussed attention more definitely on the nucleus than that of Strasburger, that *free nuclear formation does not take place.* In the earlier periods of nuclear investigation, it was given out that new nuclei might be formed by a process of aggregation of nuclear matter derived from the cytoplasm round certain points. Such formation of fresh nuclei was styled *free nuclear formation.* As long as such a view was entertained, the nucleus would possess, as regards its origin, no greater interest than oil-globules or starch-grains. But closer observation showed that fresh nuclei are always derived from pre-existent nuclei. Naturally this suggested the intimate connection between nuclei and heredity. The conception of the origin of nuclei by lineal descent from a remote ancestry, naturally connected itself with that of the similar origin of the living organisms in which they are found; and the idea thus arose that the nucleus may be the bearer of the hereditary qualities transmitted to offspring.

Now we know that coalescence of nuclei is an essential feature in fertilisation; and it has been shown by Van Beneden that the number of chromosomes in the two coalescing nuclei is the same: the resulting nucleus of the zygote will therefore acquire twice that number of chromosomes—an equivalent quantum from each. Are we then to imagine that each succeeding generation will have twice as many chromosomes in its nuclei as the preceding?

Such a thing is clearly impossible, and investigation has disclosed a process of reduction of the number to one-half, at a period prior to spore-formation. It is on this process of reduction, and on various matters connected with it, that I desire more especially to concentrate your attention this evening.

The first general and authoritative discussion of this matter has been due to Strasburger, before the British Association at Oxford; and his paper, published in the current number of the "Annals of Botany," will undoubtedly give a strong impulse to the study of this question. From various sources evidence has lately been accumulated that, as regards the nuclear condition, there is a difference between those two generations which alternate with one another so conspicuously in the life-history of archegoniate plants. Every elementary student knows that the life-cycle of a fern includes two phases, differing greatly in external form,—the fern plant, or neutral generation, or *sporophyte*; and the prothallus, or sexual generation, or *gametophyte*. A more advanced student will tell you that, on grounds of comparison, we may hold that the sexual generation was, in the progress of descent, the original one, and that the neutral generation or sporophyte arose as a derivative of the former,—a phase intercalated in the course of descent; that it was apparently not produced by a mere transformation of the sexual plant, but arose as a new growth by elaboration of the product of sexuality,—the zygote. Theorists, amongst whom I must class myself in this matter, have attempted to connect the origin of this wonderful development with the action of external causes. I believe myself that the expansion, though perhaps not the origin, of this most striking phenomenon of antithetic alternation is to be closely correlated with the migration of living organisms from an aquatic habitat to exposed land-surfaces. But whatever views we may hold as to the influences which brought it about, and whatever our morphological opinions based on comparison, we who are specially interested in alternation must feel that a crisis has now arrived in the progress of our study; for facts are being rapidly disclosed which show that the distinction of the alternating generations is to be based not merely on external form, but even on the minute structure of the nuclei of the component cells.

This new aspect of the question of alternation was first opened up by Overton. It had already been ascertained, on ground of the observations of Guignard and of Strasburger, that in Angiosperms the reproductive cells contain only half as many chromosomes as the vegetative cells. Overton suggested a widening of the thesis: "that the reduced number of chromosomes in the nucleus is a feature which is peculiar, not to reproductive cells, but to the whole sexual generation." This has now been shown to be the case for various Gymnosperms, by Overton, and by Strasburger and Dixon; while Guignard, Strasburger, and Overton have shown it also for Angiosperms. But practical difficulties have presented themselves in the solution of the question in the Archegoniatæ, though Overton concludes that such results as were obtainable by him are favourable to the hypothesis that the reduction takes place in the spore-mother-cells, and persists throughout the gametophyte. Observations of Humphrey and of Strasburger on *Osmunda* have since supported this conclusion for the Pteridophyta, while Farmer's observations on *Pallavicinia* lead to the same result for one of the Bryophyta. As regards the Thallophytes, it still remains as a question for future observation to decide, how, and at what time there follows the reduction in number of chromosomes after they have been doubled by sexual coalescence, a reduction which must undoubtedly occur. Strasburger thinks it probable that in these low forms the reduction takes place during germination, though, possibly, in such plants as *Coleochæte* and *Œdogonium*, not until the development of the spores; a suggestion which seems from analogy a very probable one.

The whole tendency of observations is thus towards the conclusion that the nuclei of the two alternating generations differ in number of chromosomes. The cells of the sexual generation showing on their division only half as many chromosomes as those of the neutral generation, while the critical points in the life-cycle as regards this difference are—the *zygote*, where coalescence of the two sexual nuclei results in a doubling of the chromosomes, and the *spore-*

mother-cell, where the reduction of these to one-half has been found to occur.

I may be allowed to offer a few remarks on this broad conclusion—first, as regards the position of the second critical point in the spore-mother-cell; secondly, as regards the possible bearings of apogamous and aposporous developments upon this question; and, thirdly, upon the theory of the process of reduction.

The critical point of reduction having been now localised in the spore-mother-cells, these appear in a more important light than hitherto. In recent years, when tracing the development of spore-producing members, the attention has been more definitely fixed on the archesporium and the spore; attempts were made to strictly localise and define the former, while the latter was recognised as bearing the importance of a separate detachable body, which served as the apparent starting-point of the new generation. Now, however, the physiological interest will certainly centre itself upon the spore-mother-cells, as being those in which the essential physiological change, as evidenced by the microscopic details, is actually effected; they, as Strasburger states, initiate the new sexual generation. He goes on, however, to assert that: "Consequently the presence or absence of a well defined archesporium is not a matter to which importance should be attached. For the archesporium is merely the merismatic tissue from which the spore-mother-cells are derived, a tissue which is frequently, but by no means necessarily, differentiated from the surrounding tissues at an early stage; so that its differentiation cannot be of fundamental importance."

From the physiological point of view, I am prepared to subscribe to this statement; but from the morphological side, it cannot be allowed that the details of origin of the tissues which give rise to the spore-mother-cells are unimportant. That tissue may be found, and, as I have shown at length elsewhere, is found to be various in its origin. It is not uniformly referable in all archegoniate plants to any one layer of cells; its lateral limits are also very variable, even in species of the same genus (*Lycopodium*). But notwithstanding this, we, who maintain that spore-production was the first function of the sporophyte, and believe that the sporogenous tissue of to-day is a residue which still performs the function to which the whole primitive sporophyte was devoted, should appraise at a fitting value all the developmental facts which lead up to the culminating point of spore-formation. I can conceive that in the future some of the most weighty comparative evidence may be found in the early steps of differentiation of the sporogenous tissue.

I would, in the second place, draw your attention to the greatly increased interest which will now attach to the abnormal phenomena of apogamy and apospory.

In entering upon the consideration of these abnormalities, Strasburger first discusses the question of the maintenance of individuality of the chromosomes even in the resting nucleus. He concludes, that though they "may lose their morphological individuality, they do not lose their physiological individuality"; and it is the maintenance of this individuality which determines on division the breaking up of the chromatin into a definite number of chromosomes. The reduction is due to the fusion into one of two chromosomatic individuals. The doubling of the number in fertilisation is due to the coalescence of two equal sets of chromosomes from the two conjugating nuclei.

You will clearly apprehend that if the difference in nuclei in the alternating generations be such as has been described, there must be an abnormal change in their condition accompanying the phenomena of apogamy and apospory. It is true that variations in number of chromosomes take place in somatic cells which have passed from the embryonic condition; but this will not suffice as a general explanation of the changes in apogamy and apospory, since these growths commonly arise from cells in the embryonic state. It may be reasonably understood that the nuclei of the apogamous bud may by some means have acquired a double number of chromosomes, without any ostensible sexual coalescence. In the aposporous growths the nuclei will have undergone a reduction, and since many of those growths appear quite independently of the sporangia, we must conclude that other cells than the spore-mother-cells are capable of undergoing a reduction of chromosomes. It is even to be noted that in many of those cases where the aposporous developments originate from the sporangia, the archesporial cells—which would give rise normally to the spore-mother-cells—do not take part in the development, but become abortive (Linn. Trans., vol. ii. plate 57). Accurate observations have not as yet been made on either of these peculiar developments with a view to ascertaining their nuclear condition,—it is therefore somewhat premature to discuss them; but, putting aside apogamy for the moment, I wish to offer a few remarks on the phenomenon of apospory. In writing on the subject some years ago (1887) I concluded that "the phenomenon of apospory is a sport, and not a reversion bearing pregnant interpretations with it" (Linn. Trans., vol. ii. p. 323). This conclusion was thus stated in order to meet and oppose the suggestion of Pringsheim, that the phenomena of apogamy and apospory showed that the two generations were not fundamentally distinct by descent. Now their difference by history of descent is beginning to be more clearly recognised, and the main points have been stated by Professor Strasburger in very similar terms to those in my own paper in the "Annals of Botany," August 1890. It is still true that apospory is not a reversion, in the sense that the sporophyte thereby does not revert to the primitive gametophyte. But in another sense it may probably be regarded as a phenomenon of reversion: in the primitive sporophyte, before vegetative development of the tissues, all the cells were probably spore-mother-cells, and capable of reduction of chromosomes. That faculty was lost by certain cells as the vegetative tissues (sterile or somatic cells) made their appearance, and thus the reduction was deferred. It need, however, be no matter for great wonder that, if this were the history, the cells which normally do not exercise that faculty should on occasions resume it:—that the unreduced somatic nuclei should on occasions resume the faculty of reduction of chromosomes. One point in the observed facts of aposporous development is interesting and significant, viz. that when the direct transition takes place from sporophyte to gametophyte, the new development commonly springs, not from one point only, but from many points, and, not from a single cell, but from a number of cells. In such cases it would appear that reduction had taken place in a considerable number of cells. This would seem to indicate that the change of condition is a somewhat general one for the parts involved, depending probably upon some peculiarity of general physiological condition of the plant or part in question. What that physiological condition is, and how produced, it is difficult to suggest. In the case of the mosses in which apospory was induced by Pringsheim and by Stahl, moist culture was successfully adopted. This certainly assists the developments in ferns when once initiated, but I have found that attempts to induce apospory in ferns by moist culture of small portions of the fronds was entirely without success, though a large number of species were tried (Annals of Botany, vol. iv. p. 168). The conclusion was thus arrived at, that the phenomenon of apospory is by no means a promiscuous one, occurring readily and often, but a process which seems to appear spontaneously under conditions not yet understood, and is not readily induced. It may now be added that there is probably an internal initiative leading to the reduction, while conditions of moist culture are favourable to, though probably not the prime cause of, the subsequent prothalloid growths.

While the phenomenon of apospory may thus be looked upon as in a sense a phenomenon of reversion,—cells normally somatic having resumed their pristine faculty of reduction of chromosomes, it is more difficult to suggest any explanation of the apogamous condition; and, in either case, we must wait for observation of the nuclear details to lead with any degree of certainty to the true interpretation of these interesting abnormalities.

Turning now to the third point, viz. the theory of the process of reduction: As above noted, Strasburger concludes that the individuality of the chromosomes is maintained, even though their identity cannot be microscopically observed in the resting nucleus. No extrusion of chromosomes, or absorption of them, has been seen in cells of plants which could account for the reduction; it is believed that the reduction is due in each case to the fusion of two chromosomes into one. Further, each chromosome is recognised as being composed of alternating discs of chromatin and linin. Accepting the term "Id" proposed by Weismann, Strasburger applies it to these discoid elements composed of chromatin and linin, and concludes that reduction consists in "the fusion in pairs of the ids, and therefore also of the chromosomes." If this be so, we see in the process of reduction the last, and perhaps the most important step in the process of sexual coalescence. It may strike us with surprise that a considerable interval should elapse between the first and last steps of the process. Take the case of *Corypha umbraculifera*, which may grow for sixty or eighty years without flowering. During all this period the initial, but, on the above view, not the final steps of sexual coalescence would have been taken. The neutral sporophyte would, throughout its vast body, developed through long years, retain the individuality of the ids of the two parents; the final fusion only taking place in the spore-mother-cells of the inflorescence. But while contemplating with astonishment such extreme cases as those of the late-flowering Angiosperms, where a very long interval may thus elapse between the first and last steps of sexual coalescence, it is to be borne in mind that comparison teaches by how gradual steps that extreme condition was attained. In view of the facts derived from the Algæ and lower Archegoniatæ, the acceptance of the above conclusion becomes less difficult.

The idea of such an interval is, moreover, not an entirely new one, for Pringsheim, in 1878, had written to the effect that two phases are to be distinguished in sexual coalescence of vegetable cells — conjugation and connubium. His definition of these is as follows: "Copulation appears as a fertilising relation of the mother-cells of the sexual elements; connubium as a similar relation of the ultimate sexual elements." (Pringsh. Jahrb., Bd. xi. p. 18.) His application of this definition is, it is true, widely different from that which might now be based upon it; but the fundamental idea is the same, viz. the elapse of an interval of time between the more apparent, and the ultimate and more intimate steps of the process of sexual coalescence. According to our present view that interval will amount to the whole vegetative period of the sporophyte, from the point of coalescence of the male and female cells to the development of the first spore-mother-cells of the resulting sporophyte. And in most of the vascular plants, where successive crops of fertile spores may be formed, the period may vary for different and successive parts of the same individual plant.

Considerations such as those we have now discussed may be expected to modify our view of the meaning and origin of antithetic alternation. The neutral generation is now very generally regarded as a result of elaboration of the zygote, and thus it is a phase intercalated during descent into the life-cycle. I have suggested, elsewhere, as the chief cause of its origin the migration of aquatic forms to the land, in which case sexuality by motile spermatozoids would be checked, and only take place at intervals, while the increase in number of individuals having to be attained by some other method, spore-formation in increasing numbers would come into effect. In view of the facts and conclusions brought forward by Strasburger, I see reason to modify, but not to abandon, that opinion. The migration to a land habit has probably been a dominant influence in leading to an increased output of spores, as illustrated by the ascending series of the Archegoniatæ; but it may be a question whether it was the prime cause of the sub-division of the zygote. The fact that such subdivision is found in Algæ of the Confervoid series, and the further facts connected with the germination of zygotes of the Conjugatæ, etc., appear to suggest that the initial impulse to sub-division of the zygote is to be sought in connection with the steps of sexual coalescence, and subsequent reduction of the doubled number of chromosomes. But until the facts are better known in such plants as *Œdogonium*, *Sphæroplea*, and *Coleochæte*, it is impossible to progress beyond the area of surmise.

The above remarks are such as the stimulating paper of Professor Strasburger has impelled me to put before you. There can be no doubt that the detailed work of the last few years, culminating in the address at Oxford, will give a new impulse to the study of plants showing antithetic alternation. It remains for the investigators of to-day to carry on the work of Hofmeister. We may reasonably hope that their efforts may end in raising the whole question of alternation of generations from the plane of mere morphological and comparative description towards the higher level of physiological explanation.

List of the chief Memoirs referred to in the address:—

BOWER.—On Apospory. Linn. Trans., vol. ii., part 14.
—— On Antithetic Alternation. Annals of Botany, vol. iv., p. 347.
—— Attempts to induce Apospory. Annals of Botany, vol. iv., p. 168.
—— Studies on Spore-producing Members. Phil. Trans. (1894).
DE BARY.—Ueber Apogame Farne. Bot. Zeit. (1878). p. 449.
DIXON.—Fertilisation of *Pinus silvestris*. Annals of Botany, vol. viii., p. 21.
FARMER.—Studies in Hepaticæ. Annals of Botany, vol. viii., p. 35.
FARLOW.—On Apogamous Ferns. Q.J.M.S. (1874).
GUIGNARD.—Nouvelles Études sur la Fecondation. Ann. Sci. Nat. Sér 7, tom. xiv.
HERTWIG.—Die Zelle und die Gewebe (1892).
HUMPHREY.—Nucleolen und Centrosomen. Ber. d. d. Bot. Ges. (1894), Heft. 5.
OVERTON.—On the Reduction of Chromosomes. Annals of Botany, vii., p. 139.
PRINGSHEIM.—Ueber Sprossung der Mossfrüchte. Pringsh. Jahrb., Bd. xi., p. 18.
STAHL.—Ueber künstlich hervorgerufene Protonema - bildung. Bot. Zeit. (1876).
STRASBURGER.—Neue Beobachtungen. Bot. Zeit. (1879), p. 265.
—— "The Periodic Reduction of the Number of the Chromosomes." Annals of Botany, vol. viii., p. 281. Where references to the above and many other works on the subject will be found.

On the motion of the Rev. Dr. PAUL the thanks of the Society were given to the President for his address.

The PRESIDENT made the following announcement regarding the Roll of the Society:—

During the past year the Society lost by death:—1 Honorary British Fellow — Richard Spruce. 2 Honorary Foreign Fellows — Pierre Duchartre, Paris; Nathan Pringsheim, Berlin. 3 Resident Fellows—Sir Thomas Buchan-Hepburn, Bart.; Alexander Gellatly; Robert Hutchison. 2 Non-Resident Fellows—Rev. George Gordon; A. Stephen Wilson. 1 Associate—Joseph Whittaker.—Total, 9.

During the same period the Society received the following accessions:—9 Resident Fellows—Sir A. Buchan-Hepburn, Bart.; Mrs. A. Dowall; R. C. Munro Ferguson, M.P.; Lady Henry Grosvenor; Reginald MacLeod; Miss Katherine Millar; Alexander Porteous; A. Thomson; Percival C. Waite. 2 Non-Resident Fellows—James Grieve, M.D.; J. J. Mooney, M.D. 2 Lady Members—Miss E. Madden; Miss C. C. Pearson.—Total, 13.

The Roll of the Society stands at present thus:—

Honorary Fellows—		
Royal	3	
British	5	
Foreign	19	
		27
Resident Fellows		133
Non-Resident Fellows		147
Corresponding Members		49
Associates		24
Lady Associate		1
Lady Members		5
Total of Roll		386

The following Papers were read:—

Cystopteris montaña, Bernhardi, in Stirlingshire. By A. Somerville, B.Sc., F.L.S.

Cystopteris montana of Bernhardi, the Mountain Bladder Fern, is one of our rare Pteridophytes. With what may be termed decidedly arctic sympathies, *C. montana* usually selects for its habitat a moist situation in cloud-land, at between 2300 and 3600 feet, with a northern (or, in one case, a north-western) exposure, where it will receive but little of the direct rays of the sun.

When on Ben Lomond in August last (1894) in the company of Mr. R. Kidston, F.G.S., Colonel J. S. Stirling, of Gargunnock, and Dr. R. Braithwaite, F.L.S., author of the "British Moss Flora," I had the pleasure to meet with this interesting plant, previously unrecorded for Stirlingshire, recognising its deltoid very compound fronds and long stipes from having seen them on hills north of Glen Lochay, Mid-Perthshire, in 1888, when in company with Mr. Symington Grieve. Mr. Arthur Bennett, F.L.S., to whom the plant has been submitted, remarks in connection with it,—"I think the *Cystopteris* must be *C. montana*, though certainly the glandular setæ are much less numerous than usual." Fronds only were brought away by me, and it is to be hoped that this local species may spread at its newly found station, viz. the wet grassy ledges of the precipitous cliffs of the northern face of the hill, at about 3000 feet, and in company with its congener *C. fragilis*, Bernhardi.

It is somewhat remarkable that though Ben Lomond is but twenty-seven miles distant in a direct line from Glasgow, and is visited annually by many botanists, it should only at this late date be telling us that *Cystopteris montana* belongs to its flora, and to the flora of Stirlingshire. Through the kindness of Mr. Bennett I am in a position to give particulars in full of the other five counties in Britain in which *C. montana* occurs; they are (69) Westmoreland, on Helvellyn; (88) Perth, mid, on the Breadalbanes; (90) Forfar, in Caenlochan Glen; (92) Aberdeen, south, in Glen Callater; and lastly in Argyle, main, on Ben Laoigh, on its north-western side, as I have been kindly informed by Mr. G. Claridge Druce, F.L.S., who was the discoverer of it there. *C. montana* was first found in Britain by Mr. W. Wilson, on Ben Lawers, in 1836. Its foreign distribution, according to Sir J. D. Hooker, is in "arctic and alpine regions in Europe, Asia, and America."

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

*I. REPORT ON TEMPERATURE AND VEGETATION DURING July 1894. By ROBERT LINDSAY, Curator.

The month of July was for the greater part changeable and inclement, there was a marked absence of real summer warmth. Thunder storms were frequent during the month. The lowest night temperature was 37°, which occurred on the 25th of the month, and the highest 54°, on the 1st. The lowest day temperature was 61° on the 25th, and the highest 85° on the 6th.

*In a note, printed in the Transactions of the Society, vol. xix. (1890), p. 5. I indicated reasons why temperature records furnished monthly by the Curator of the Garden for many years, and published in the Society's Transactions, could not be considered trustworthy as a basis of scientific deduction; and during the four years that have elapsed since then, a table of readings of the exposed thermometers has been furnished monthly, along with the accurate meteorological register now kept in the Garden for the purpose, as stated in my previous note, of comparison. As no useful purpose seems likely to be served by these records, and their citation must be entirely misleading for scientific purposes, they have been discontinued since the end of July, and the Register of Meteorological Phenomena from certified instruments, in the manner adopted by meteorologists generally, is now the only record kept in the Garden.—ISAAC BAYLEY BALFOUR, Keeper of the Royal Botanic Garden, Edinburgh.

On the rock-garden 193 species and varieties came into flower during July, as against 112 for the corresponding month last year. Amongst the most interesting were:—*Aquilegia pyrenaica, Adlumia cirrhosa, Aster Thomsoni, Anemonopsis macrophylla, Coronilla iberica, Calochortus luteus, Calliprora flava, Campanula pulla, C. Haylodgensis, C. Tymonsii, Cerinthe alpina, Dianthus pulchellus, D. mæsiacus, D. monspessulansis, Epilobium obcordatum, Erica Mackiana, Erythræa diffusa, Galax aphylla, Gentiana punctata, G. septemfida, Geranium Lambertii, G. Traversii album, Helenium pumilum, Hypericum olympicum, Linaria alpina, Linum roseum, Ligularia Hodgsonii, Lilium pardalinum, Malva Munroana, Milla longipes, Mimulus cardinalis, Micromeria piperella, Polygonum vaccinifolium, Rhodotypus kerrioides, Rosa macrantha, R. lucida fl. pl., R. viridiflora, Spiræa Bumaldæ, S. bullata, Stobæa purpurea, Symphiandra Hoffmani, Veronica cupressoides, V. glauco-cærulea, V. Hectorii, V. parviflora, V. lycopodioides, Wahlenbergia gracilis,* etc.

Readings of exposed Thermometers at the Rock-Garden of the Royal Botanic Garden, Edinburgh, during July 1894.

Date.	Minimum.	9 A.M.	Maximum.	Date.	Minimum.	9 A.M.	Maximum.
1st	54°	62°	73°	17th	50°	56°	68°
2nd	50	62	69	18th	49	61	73
3rd	49	60	73	19th	45	62	73
4th	42	61	71	20th	46	65	71
5th	53	60	76	21st	42	66	68
6th	47	63	85	22nd	45	64	72
7th	51	64	77	23rd	42	59	74
8th	41	58	67	24th	46	59	69
9th	52	57	74	25th	37	52	61
10th	50	54	63	26th	51	60	63
11th	48	59	71	27th	54	56	68
12th	47	62	72	28th	53	55	69
13th	50	61	70	29th	52	57	70
14th	48	59	75	30th	47	59	73
15th	53	60	76	31st	54	62	75
16th	46	53	72				

II. ON VEGETATION DURING THE MONTHS OF AUGUST, SEPTEMBER, AND OCTOBER 1894. By ROBERT LINDSAY, Curator.

AUGUST.

During the month of August the wet weather continued till about the middle of the month. Drenching rains and the absence of bright sunshine throughout the month told rather severely on herbaceous plants in flower. Trees and shrubs, however, made good growths and flowered well, *Olearia Haastii* being exceptionally fine.

On the rock-garden 94 species of alpine and dwarf herbaceous plants came into flower during August, as against 72 for the corresponding month last year. Amongst the most interesting were:—*Aster Bigelowii, Astilbe Thunbergii, Cistus algarvensis, Cyananthus pedunculatus, Comarum Salesowii, Ballota spinosa, Gaultheria procumbens, Gentiana asclepiadea, G. a. alba, G. arvernensis, G. tibetica, Hypericum Elodeoides, H. patulum, Hyacinthus candicans, Monarda didyma rosea, Lilium auratum macranthum, Potentilla verna fl. pl., Papaver nudicaule miniatum fl. pl., Sedum cyaneum, Senecio compacta, Statice minima, Veronica pimeleoides nana, V. longifolia subsessilis, Yucca gloriosa, Y. filamentosa*, etc.

SEPTEMBER.

September was most favourable throughout; remarkably fine dry weather characterised this month, indeed such good harvest weather is rarely experienced. Most kinds of herbaceous plants flowered freely and were at their best during the month; the earlier flowering kinds ripened an abundant crop of good seed. Roses were also very fine in flower during September. Autumn tints were late in showing on trees and shrubs, and were not nearly so effective as usual.

On the rock-garden 30 species and varieties came into flower during September, as against 28 for the corresponding month last year. Amongst the best were:—*Achillea macrophylla, Aster sikkimensis, Centaurea alpina, Castanopsis chrysophylla, Chrysanthemum speciosum, Colchicum speciosum maximum, Crocus speciosus, Cyclamen hederæfolium album, Diplopappus linearifolius, Gladiolus Saundersii, Potentilla formosa, Sedum cordifolium, Stokesia cyanea*, etc.

OCTOBER.

During the month of October good weather continued till the 19th. Leaves of deciduous trees and shrubs fell off very slowly, the usual gales of wind being absent until the latter part of the month. All tender plants, out of doors, were injured by frost on the 19th of the month. Veronicas of the speciosa type had their foliage blackened slightly; *Polygonum vaccinifolium* had its flowers destroyed, as were also the flower-buds of *Lilium speciosum*. Autumnal tints, though less interesting than usual generally, are exceptionally fine on *Cotoneaster horizontalis*, *Galax aphylla*, and various species of *Saxifraga*. The brown tint is also very marked on the tips of the branches of *Biota elegantissima* and others. Fruit is fairly abundant on holly and *Pernettyia*.

On the rock-garden 18 plants came into flower during October, as against 3 during the corresponding month last year. These included—*Apios tuberosa*, *Cimicifuga japonica*, *Colchicum autumnale album fl. pl.*, *Crocus medius*, *C. asturicus*, *C. Salzmanni*, *Erica Watsoni*, *Kniphofia Pfitzerii*, *K. Saundersii*.

[Table

III. (1) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of July 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level. 76·5 feet. Hour of Observation. 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	30·278	66·7	52·6	54·9	54·0	N.E.	St.	10	N.E.	0·005
2	30·029	64·8	53·4	55·0	55·0	E.	St.	10	E.	0·570
3	29·943	63·2	52·2	62·1	57·0	W.	Cum.	5	W.	0·000
4	29·971	66·1	46·4	61·2	56·6	W.	Cum. St.	10	W.	0·000
5	29·967	65·2	57·9	61·1	57·2	S.W.	Cum. St.	10	S.W.	0·000
6	29·909	68·4	51·8	62·2	59·0	E.	Cir.	6	S.W.	0·350
7	29·771	76·9	55·3	62·1	56·1	W.	Cum.	3	W.	0·000
8	29·783	66·1	46·0	57·0	53·0	W.	Cum. St.	10	W.	0·015
9	29·668	61·1	53 6	57·8	54·6	S.	Cum.	5	S.	0·150
10	29·449	63·7	54·3	56·2	55·1	E.	St.	10	E.	0·210
11	29·233	58·0	51·7	57·8	55·9	Var.	Cum. St.	10	N.W.	0·000
12	29·129	64·1	51·1	60·0	56·7	S.	Cir.	8	W.	0·060
13	29·270	67·0	53·7	57·5	54·0	S.W.	Cum.	6	S.W.	0·000
14	29·496	64·8	52·9	59·0	56·0	W.	Cum. St.	10	W.	0·005
15	29·681	64·0	55·7	58·1	55·9	S.W.	Cir. St.	10	W.	0·085
16	29·606	67·7	48·4	53·9	52·9	E.	Nim.	10	E.	0·090
17	29·403	66·1	53·6	57·0	55·0	W.	Cir. Cum.	2 6	W.	0·000
18	29·403	63·9	52·0	59·9	56·1	W.	Cir. St.	9	W.	0·020
19	29·581	66·6	49·8	52·8	51·1	N.W.	Cum.	8	N.W.	0·000
20	29·697	66·7	49 9	61·1	54·9	W.	Cum.	8	W	0·270
21	29·702	64·7	45·8	60·0	55·8	E.	Cir. Cum.	2 1	S.W. S.	0·380
22	29·749	63·1	50·0	61·4	56·2	N.W.	Cum.	2	W.	0·010
23	29·910	65·2	46·7	56·8	53·7	E.	Cum.	8	E.	0·000
24	30·127	64·8	52·0	57·8	55 8	E.	Cum. St.	10	E.	0·010
25	30·033	62·2	55·0	56·0	55·1	N.E.	Nim.	10	N.E.	0·160
26	29·851	58·8	55·3	58·0	57·8	N.E.	St.	10	N.E.	0·000
27	29·923	59·5	55·4	56·0	56·0	N.E.	St.	10	N.E.	0·000
28	30·056	61·2	55·1	55·7	55·7	E.	St.	10	E.	0·010
29	30·076	61·8	54·9	59 2	58·0	E.	St.	10	E.	0·002
30	30·031	62·0	50·1	54·8	54·5	E.	Cir. St.	4 2	N. E.	0·000
31	29·885	65·6	54·2	60·3	57·6	N.E.	Cir. St.	8	S.	0·140

Barometer.—Highest Observed, on the 1st, = 30·278 inches. Lowest Observed, on the 12th, = 29·129 inches. Difference, or Monthly Range, = 1·149 inch. Mean = 29·762 inches.

S. R. Thermometers.—Highest Observed. on the 7th, = 76°·9. Lowest Observed, on the 21st, = 45°·8. Difference, or Monthly Range, = 31°·1. Mean of all the Highest = 64°·5. Mean of all the lowest = 52°·1. Difference, or Mean Daily Range, = 12°·4. Mean Temperature of Month = 58°·3.

Hygrometer.—Mean of Dry Bulb = 58°·1. Mean of Wet Bulb = 55°·5.

Rainfall.—Number of Days on which Rain fell = 19. Amount of Fall = 2·542 inches. Greatest Fall in 24 hours, on the 2nd, = 0·570 inch.

A. D. RICHARDSON, *Observer*.

(2) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of August 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·627	64·6	56·0	61·2	60·1	S.E.	Nim.	10	S.	0·040
2	29·473	68·1	55·0	60·2	56·9	S.W.	Cir. St.	10	S.W.	1·135
3	29·303	64·0	53·0	53·9	53·8	N.W.	Nim.	10	N.W.	0·005
4	29·497	66·3	54·0	58·9	55·2	S.W.	Cir. St.	6	S.W.	0·000
5	29·596	64·3	50·2	53·9	52·7	S.W.	Cir. / Cum.	1 / 1	S.W.	0·020
6	29·531	63·0	51·0	60·6	53·9	S.W.	Cum.	6	S.W.	0·000
7	29·628	64·7	50·1	59·8	55·0	S.W.	Cum.	6	W.	0·040
8	29·451	63·9	55·0	60·1	56·3	S.W.	Cum.	10	S.W.	0·100
9	29·510	69·0	54·0	60·1	57·9	N.	Nim.	10	N.	0·190
10	29·861	67·3	54·0	58·8	55·0	Calm	Cir. St.	10	N.	0·025
11	29·939	66·8	48·0	55·3	52·1	N.W.	Cir. St.	10	N.W.	0·000
12	29·730	61·8	55·1	57·1	56·0	S.W.	Nim.	10	S.W.	0·000
13	29·724	63·0	51·0	61·0	53·2	N.W.	Cum.	1	N.W.	0·765
14	29·396	65·2	50·7	59·2	57·7	W.	Nim.	10	W.	0·045
15	29·083	63·1	51·1	51·0	50·2	W.	Nim.	10	W.	0·180
16	29·634	61·7	49·8	56·0	49·9	N.W.	Cum.	2	N.W.	0·050
17	29·859	63·0	44·0	53·2	52·0	W.	Nim.	10	W.	0·190
18	29·921	65·3	48·8	58·1	53·2	W.	Cir. Cum.	8	N.W.	0·105
19	29·757	64·3	52·0	54·7	53·7	S.W.	Nim.	10	S.W.	0·045
20	29·657	63·2	48·4	56·4	50·9	N.W.	Cir. Cum.	2	N.W.	0·000
21	29·684	63·0	44·8	54·0	50·0	S.W.	Cir. St.	5	S.W.	0·045
22	29·693	59·8	45·0	59·8	53·0	W.	Cum.	1	W.	0·000
23	29·889	63·2	42·3	58·0	54·0	E.	...	0	...	0·000
24	30·100	61·7	44·0	54·9	51·0	N.E.	Cum.	2	N.E.	0·000
25	30·190	61·6	47·8	56·0	51·3	N.	...	0	...	0·000
26	30·010	59·0	48·1	52·2	48·5	E.	Cir. St.	10	E.	0·380
27	30·036	55·0	50·4	54·2	50·8	E	Cum.	2	E.	0·000
28	30·113	59·8	48·3	53·9	51·1	W.	Cum. St.	10	W.	0·000
29	30·110	62·6	49·8	57·1	53·2	W.	...	0	...	0·000
30	30·095	63·2	54·1	58·4	55·0	N.W.	Cir. Cum.	5	N.W.	0·000
31	29·987	64·6	52·0	58·6	55·1	W.	Cir. Cum.	5	W.	0·020

Barometer.—Highest Observed, on the 25th, = 30·190 inches. Lowest Observed, on the 15th, = 29·083 inches. Difference, or Monthly Range, = 1·107 inch. Mean = 29·745 inches.

S. R. Thermometers.—Highest Observed, on the 9th, = 69°·0. Lowest Observed, on the 23rd, = 42°·3. Difference, or Monthly Range, = 26°·7. Mean of all the Highest = 63°·4. Mean of all the Lowest = 50°·2. Difference, or Mean Daily Range, = 13°·2. Mean Temperature of Month = 56°·8.

Hygrometer.—Mean of Dry Bulb = 57°·0. Mean of Wet Bulb = 53°·5.

Rainfall.—Number of Days on which Rain fell = 18. Amount of Fall = 3·380 inches. Greatest Fall in 24 hours, on the 2nd, = 1·135 inch.

A. D. RICHARDSON, *Observer.*

(3) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of September 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected. 4 feet above grass. S. R. Thermometers for preceding 24 hours.		Hygrometer.		Direction of Wind.	Clouds.			Rainfall. (Inches.)
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	30·039	65·7	51·2	52·9	51·0	E.	St.	10	E.	0·050
2	30·116	57·7	46·1	53·0	48·0	N.	Cir.	4	N.W.	0·010
3	30·011	60·2	39·7	53·2	48·8	W.	...	0	...	0·010
4	30·031	59·0	45·1	53·1	47·8	N.	Cir.	4	N.	0·015
5	30·085	59·0	49·7	54·6	48·8	N.	Cum.	9	N.	0·075
6	30·143	57·0	47·0	52·2	47·9	W.	Cir. Cum.	8	N.	0·000
7	29·943	58·8	43·6	51·8	48·7	W.	Cir. St.	10	W.	0·000
8	29·903	56·0	41·0	53·9	48·3	N.	...	0	...	0·000
9	30·281	57·3	38·7	55·4	50·4	S.E.	...	0	...	0·000
10	30·329	61·0	39·2	50·9	49·1	S.W.	Cum.	2	S.W.	0·000
11	30·109	61·6	51·5	58·0	56·0	S.W.	St.	10	W.	0·000
12	30·358	65·1	45·7	54·5	50·1	W.	Cir.	3	...	0·000
13	30·357	59·9	43·3	51·2	50·1	W.	St.	10	W.	0·000
14	30·317	65·2	49·0	57·1	53·9	S.W.	Cir. Cum.	4	N.W.	0·000
15	30·357	64·8	53·5	58·1	55·9	W.	St.	9	W.	0·000
16	30·345	63·0	47·2	54·1	51·9	S.W.	...	0	...	0·000
17	30·332	63·5	44·1	49·6	49·6	W.	Fog	8	...	0·000
18	30·281	57·5	49·4	54·1	50·8	S.E.	St.	10	E.	0·000
19	30·157	56·0	51·5	53·8	51·6	S.E.	St.	10	S.E.	0·000
20	30·129	55·9	51·8	54·0	52·0	S.E.	St.	10	S.E.	0·000
21	30·018	56·2	45·6	53·2	51·4	N.E.	St.	10	N.E.	0·010
22	30·007	56·6	51·0	53·7	51·1	E.	Cum.	8	S.E.	0·010
23	29·816	55·8	49·1	52·1	50·0	S.E.	St.	10	S.E.	0·225
24	29·881	53·9	48·9	51·9	50·1	E.	Cir. Cum.	9	S.W.	0·010
25	29·824	55·1	42·8	50·9	49·8	E.	Cum. St.	9	E.	0·025
26	29·856	56·8	44·9	50·0	46·6	E.	Cir. Cum.	9	N.W.	0·000
27	30·143	57·2	37·2	48·9	44·4	S.W.	...	0	...	0·000
28	30·330	57·6	36·6	50·0	45·3	N.	...	0	...	0·015
29	30·391	54·8	48·2	51·1	48·0	N.E.	St.	10	N.E.	0·000
30	30·478	53·1	48·8	50·1	47·2	N.E.	St.	10	N.E.	0·000

Barometer.—Highest Observed, on the 30th, = 30·478 inches. Lowest Observed, on the 23rd, = 29·816 inches. Difference, or Monthly Range, = 0·662 inch. Mean = 30·145 inches.

S. R. Thermometers.—Highest Observed, on the 1st, = 65°·7. Lowest Observed, on the 28th, = 36°·6. Difference, or Monthly Range, = 29°·1. Mean of all the Highest = 58°·7. Mean of all the Lowest = 46°·0. Difference, or Mean Daily Range, = 12°·7. Mean Temperature of Month = 52°·3.

Hygrometer.—Mean of Dry Bulb = 52°·9. Mean of Wet Bulb = 49°·8.

Rainfall.—Number of Days on which Rain fell = 11. Amount of Fall = 0·455 inch. Greatest Fall in 24 hours, on the 23rd, = 0·225 inch.

A. D. RICHARDSON, } *Observers.*
W. DAVIDSON, }

(4) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of October 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	30·426	52·3	47·2	52·2	46·7	S.W.	Cir. St.	3	S.W.	0·000
2	30·381	56·9	39·3	52·0	49·3	S.W.	Cum.	9	S.W.	0·000
3	30·279	59·8	34·9	43·5	42·9	W.	...	0	...	0·000
4	30·258	59·0	36·0	45·1	44·8	W.	St.	10	W.	0·045
5	30·146	52·2	44·7	50·7	50·0	N.E.	Nim.	10	N.E.	0·060
6	30·060	53·0	49·0	50·7	50·0	E.	St.	10	E.	0·030
7	29·990	55·8	48·6	49·7	49·1	E.	Nim.	10	E.	0·000
8	30·008	54·1	43·0	50·1	49·7	E.	Cir. Cum.	9	W.	0·000
9	29·993	55·8	47·1	51·9	50·1	E.	Cir. Cum.	3	W.	0·045
10	29·926	59·6	51·6	56·9	54·6	S.W.	Cir.	1	N.W.	0·000
11	30·167	63·7	39·2	48·1	46·6	W.	...	0	...	0·000
12	30·147	56·8	41·1	50·9	50·6	W.	St.	10	W.	0·000
13	30·034	64·3	50·7	58·3	56·1	S.W.	Cir. St.	8	N.W.	0·440
14	30·153	63·9	42·2	46·0	41·2	N.	Cir.	1	N.	0·000
15	30·238	51·0	42·1	46·1	41·8	N.	...	0	...	0·000
16	30·220	48·9	38·2	42·1	39·8	N.W.	Cir.	8	N.	0·000
17	30·015	52·3	42·0	45·0	42·2	W.	Cir. St.	10	N.	0·050
18	29·810	49·8	41·2	43·7	40·0	N.	St.	10	N.	0·000
19	29·738	45·3	27·1	33·9	31·9	S.W.	...	0	...	0·530
20	29·662	44·8	34·1	43·0	41·7	E.	Nim.	10	E.	0·235
21	29·629	45·9	42·9	45·9	40·1	E.	Cum.	1	E.	0·000
22	29·777	46·9	29·4	36·1	34·7	W.	...	0	...	0·000
23	29·950	48·9	25·4	28·2	28·0	S.E.	Cir. Fog.	4 5	W. ...	0·595
24	29·189	48·0	28·0	47·9	47·4	E.	Nim.	10	E.	0·170
25	28·608	55·3	47·8	49·8	48·0	W.	St.	10	W.	0·030
26	29·392	55·4	33·2	40·3	37·8	W.	Cir.	4	W.	0·115
27	29·232	46·3	40·8	45·1	42·0	E.	Cir.	3	N.W.	0·010
28	29·518	48·3	34·8	40·1	37·7	S.E.	Cir. St.	10	W.	0·050
29	29·238	46·8	39·8	46·0	43·4	S.W.	Cir.	1	W.	0·085
30	29·532	51·3	37·1	41·7	41·3	S.W.	Cir. St.	5	N.	0·055
31	29·795	51·2	35·0	45·0	43·7	S.E.	Nim.	10	S.E.	0·240

Barometer,—Highest Observed, on the 1st, = 30·426 inches. Lowest Observed, on the 24th, = 29·189 inches. Difference, or Monthly Range, = 1·237 inch. Mean = 29·855 inches.

S. R. Thermometers.—Highest Observed, on the 13th, = 64°·3 Lowest Observed, on the 23rd, = 25°·4. Difference, or Monthly Range, = 38°·9 Mean of all the Highest = 53°0·. Mean of all the Lowest = 39°8·. Difference, or Mean Daily Range, = 13°·2. Mean Temperature of Month = 46°·4.

Hygrometer.—Mean of Dry Bulb = 46°·0. Mean of Wet Bulb = 44°·0.

Rainfall.—Number of Days on which Rain fell = 17. Amount of Fall = 2·785 inches. Greatest Fall in 24 hours, on the 23rd, = 0·595 inch.

A. D. RICHARDSON, *Observer.*

IV. On Plants in the Plant Houses. By R. L. Harrow.

During the three months that have elapsed since the last meeting of this Society in July, a large number of species of plants have flowered in the houses of the Royal Botanic Garden. In August 120 species were noted, including many of special interest. The large-flowering *Aristolochia gigas* v. *Sturtevantii* still retained a considerable share of popularity with the visitors to the garden. In September the number increased to 145, while during October it fell to 125 species. Amongst the plants which have flowered two of particular interest may be mentioned, as they afford an illustration of the vitality possessed by some seeds. In the spring of this year Mr. W. Loudon, one of the Fellows of the Society, presented to the garden packets of seeds of fifty-five species of plants, originally received from the Botanic Garden, Saharanpur, on the 7th November 1849. The seeds were sown; those of two species only have germinated after their forty-five years rest, namely *Cassia mimosoides*, Linn., v. *Wallichiana*, and *Ipomœa phœnicia*, Roxb., now placed as a synonym of *I. coccinea*, Linn. Both of the species have flowered, and the former has produced seeds. The flowering climbers trained upon the roof of the palm house annexe being now established, have flowered very freely, and, as the selection includes species flowering at different seasons, the interest in this feature of the house is likely to be kept up during the winter months. Amongst the plants most worthy of note which have flowered, some of which we are able to exhibit, are the following:—

Uraria crinita, Desv. This leguminous plant is widely distributed over British India, and other Asiatic tropical countries. It is of an erect habit, with a woody stem bearing large imparipinnate leaves, with, commonly, four pairs of large, bright green leaflets. But its chief feature is its terminal or axillary racemes, nearly two feet long, bearing many pairs of pinkish, caducous flowers. Our plant was received from Kew during the spring of the year, a very strong fasciated inflorescence, which has been preserved and will be exhibited later. A figure will be found in the "Botanical Magazine," t. 7377.

Senecio Galpinii, Hook. Plants of this dwarf composite, which has foliage covered on both sides with waxy bloom, produced their orange-coloured inflorescences. In the "Botanical Magazine," t. 7239, it is stated to have been raised from seed sent by Mr. E. E. Galpin, of Barbertown, in the Transvaal Republic, in May 1890, collected at the top of the Saddleback Mountains, and flowered at Kew in 1891.

Mimosa latispinosa, Lam. Is a native of Madagascar, introduced in 1823. It has a climbing habit, the stem bearing broad flattened spines and reaching a height of six feet or more. The light green alternate foliage is the most remarkable feature of the plant, owing to the broad white spines that occur between each of the thirty, or more, pairs of leaflets, each of which usually bears twelve pairs of pinnæ. The few flowers in capitate terminal clusters are interesting on account of their white stamens, and they possess a hawthorn odour.

Nepenthes bicalcarata, Hook. This Bornean species, which has a remarkable pair of fangs projecting downwards to the mouth of the pitcher from the base of the lid, is now flowering for the first time with us in Edinburgh, and Mr. H. J. Veitch, of the Royal Exotic Nursery, Chelsea, informs us that it has only flowered once before, to his knowledge, in this country. Our plant is a male, the panicled inflorescence being a yard in length with numerous staminate flowers. It was first introduced to this country by Mr. F. W. Burbidge in 1879, being sent to Messrs. Veitch & Sons, of Chelsea.

Pitcairnia Roezlii, E. Morren. Amongst bromeliads this is one of the brightest coloured and most effective. The many-flowered racemes, which are about a foot in length, standing conspicuously above the foliage. The sepals and petals are of a bright red colour, the stamens and pistil just protruding beyond the petals, the stigma is slightly violet coloured. It is a native of the Andes of Peru, and was introduced to cultivation about 1882.

Sesbania exasperata, Humb. Under the name of *S. Pavlensis* seeds of this leguminous plant were received from the Botanic Garden, Rio de Janeiro, in January last. It is a slender growing plant, about nine feet in height, with pinnate leaves. The racemes are axillary, and bear a few golden yellow papilionaceous flowers, the back of the standard being spotted with dark reddish coloured spots. A figure of this species in the November number of this year's "Botanical Magazine," t. 7384, was taken from a plant flowered at Kew during the spring, raised from seed received from Senor A. Sampaio, of San Paulo, S. Brazil.

Others worthy of note which have flowered are:—*Crossandra undulæfolia*, Salisb.,—an East Indian acanthaceous plant, with reddish-orange flowers; *Lycoris aurea*, Herb.,—a native of China, with bright golden yellow flowers, belonging to the order Amaryllideæ, and rarely seen in cultivation; *Billbergia Porteana*, Brong.,—introduced in 1849 from Brazil, a showy bromeliad with a drooping spike, the petals curled towards the base, and possessing violet filaments; *Jacquemontia violacea*, Choisy.,—a pretty tropical American climber belonging to the order Convolvulaceæ, figured in the "Botanical Magazine," t. 2151, under the name of *Convolvulus pentanthus*, Jacq.; *Begonia Froebeli*, A. DC.,—first flowered by Otto Froebel, of Zurich, in 1872, a fine scarlet-flowered species from Ecuador; *Saintpaulia ionantha*, H. Wend.,—a newly introduced plant from the Usambura Mountains of Central Africa, first exhibited at the Ghent exhibition of 1893.

MEETING OF THE SOCIETY,

Thursday, December 13, 1894.

Surgeon-Major H. H. Johnston, in the Chair.

Intimation of the death of F. Buchanan White, M.D., Non-Resident Fellow of the Society, was conveyed by the Chairman to the meeting.

The Treasurer submitted the following Statement of Accounts for the Session 1893–94:—

Receipts.

Annual Subscriptions, 1893–94, 77 at 15s., . . .	£57	15	0
Do. do. 1893–94, 1 at 10s., . . .	0	10	0
Compositions for Life Membership, ...	18	18	0
Transactions, etc., sold, ...	4	16	0
Diploma, Fees, ...	0	7	0
Interest received, ...	1	17	1
Subscriptions to Illustration Fund, ...	5	12	0
Receipts, . . .	£89	15	1
Balance of Payments, .	0	17	9
	£90	12	10

Payments.

Printing Transactions, £55, 3s. 6d.; Billets, etc., £18, 17s. 8d., ...	£74	1	2
Lithographing, ...	5	2	6
Rooms for Meetings, and Tea, ...	6	2	0
Commission paid to Collector of Subscriptions. . .	0	15	0
Stationery, Postages, Carriages, etc., ...	4	7	2
Fire Insurance on Books, ...	0	5	0
	£90	12	10

Issued November 1895.

STATE OF FUNDS.

Amount of Funds at close of Session 1892–93, . .		£65 11 0
Deduct—Decrease during Session 1893–94, as above, .		0 17 9
Amount of Funds at close of Session 1893–94, . .		£64 13 3
Being:—Sum on Current Account with Union Bank, ...	£5 17 3	
Sum in Deposit Receipt do.	60 0 0	
	£65 17 3	
Less due to Treasurer, . .	1 4 0	
		£64 13 3

EDINBURGH, *7th December* 1894. — Certified as a correct Abstract of the Treasurer's Accounts, which have been audited by me, compared with the Vouchers, and found correct.

ROBT. C. MILLAR, C.A., *Auditor.*

On the motion of Professor BAYLEY BALFOUR, seconded by Mr. JAMES GRIEVE, the report was adopted and the Treasurer thanked for his services.

The following donations to the Illustration Fund were announced:—

Miss Pearson, ...	£0 10 0
Mrs. Dowell, ...	1 0 0

Professor BAYLEY BALFOUR exhibited portions of the inflorescence of *Nepenthes bicalcarata* lately flowered in the Royal Botanic Garden, and a further communication regarding its special features was promised to the Society. A series of variegated foliage plants from the stoves in the Royal Botanic Garden were also exhibited.

Dr. and Mrs. SPRAGUE exhibited some "Jumping Beans," and the former said:—

Having seen a paragraph in the "Times," stating that some "Jumping Beans" had been exhibited at a recent meeting of the Royal Botanical Society, London, and that a quantity of these beans had been imported by Messrs. Melchers, Runge, & Co., of Fenchurch Avenue, we wrote to them to ask if they would sell us a few of the beans, and received the following reply :—

"We have your note of 14th inst., and in reply we beg to say that our broker has bought the last lot of about 500 from us at 10d. each, and we are informed that he has sold them at considerably higher prices. We could let you have up to 500 at this price, but not in smaller lots than 50, and if you will take the whole lot of about 3000 we would take a lower price into consideration."

We wrote for 50, and having mentioned them to our son, Dr. Charles Sprague, who resides at Höchst-am-Main, he told us he had recently seen an account of them in the German scientific paper entitled "Promotheus." He subsequently forwarded to us a copy of No. 262 of the paper, and the following is a brief abstract of the information contained in it :—

The shape of the so-called beans shows a botanist that each is the third part of the fruit of a plant belonging to the Euphorbiaceæ. Each bean contains the larva of a small moth, *Carpocapsa saltitans*, which is closely allied to the moth whose larva infests apples and pears (*Carpocapsa Pomonella*). Westwood described it in 1858 in the "Proceedings of the Entomological Society." It was very soon after described by Lucas, in France, who gave it the name *Carpocapsa Dehaisiana ;* and it is still known by that name in France, but everywhere else, in accordance with the rule of priority, it is known by the name which Westwood gave it.

Although the insect has been known nearly forty years, the plants which produce the so-called beans have only been known to science quite recently.

They grow in the neighbourhood of the Mexican town Alamos, in the province of Sonora, and belong to the genus *Sebastiania*, three or four species of which harbour the insect. The juice of the plant is very poisonous, and the wood of *Sebastiania Pavoniana* is so deadly that a dish of food or a cup of liquid will be rendered poisonous if it be simply stirred with a piece of the wood.

If the bean is opened when the larva is full grown, the interior is found to be entirely covered with a kind of yellow silk spun by the insect. The insect itself is of a bright yellow colour with a reddish head. The motions of the insect which cause the bean to jump have been described by Buchenau, in the "Transactions of the Botanical Society of Bremen," 1873. He found that, if the bean is laid on one of its flat sides, the insect can very easily turn it over so as to lie on the other flat side. It is more difficult to turn the bean so as to lie upon its rounded surface and then back again; and before the insect can do this it must be considerably warmed, to 80° or 90° F. The motions are most energetic when the bean lies upon a roughish surface—for instance on the earth in a flower pot. In order to watch the motions, Lucas cut a hole in the bean, so as to make a sort of window through which he could look, but the insect immediately spun a curtain over this window; but by making a second window on the opposite side Lucas was able to see the motions of the insect pretty distinctly. He states that the larva takes hold of its web by its hinder feet, then gives a violent jerk with its head and the forward part of its body; and the head striking the opposite side causes the bean to move, the nature of the motion depending upon the portion of the bean to which the insect has attached itself. If an actively moving bean is held between the finger and thumb the blows of the insect on the interior can often be distinctly felt—eighteen or twenty in succession. They are generally fifteen or sixteen in a minute, but may be as many as two in a second. It is stated that after the larva is full grown it remains active for about nine months before it becomes a chrysalis, and during this time it seems to have no food whatever. The larva cuts a small round piece out of the curved surface of the bean, and this hangs loosely suspended as a sort of door. When the time comes for the perfect insect to emerge from the chrysalis, it pushes its way through the hole; and the moth then flies away, leaving the skin of the chrysalis in the hole. It appears that there are several other kinds of plants, whose fruits are similarly occupied by insects and move in a similar way; for instance, some species of *Colliguaja* growing in Brazil and Chili.

The Belgian botanist, Mathias de Lobel, about the year 1576, mentions that the fruit of the Tamarisk moved actively for three days; the motion in this case being caused by the larva of a small beetle, *Namodes Tamaricis,* which so closely resembles the plant on which it feeds that it is difficult to find upon the plant. Similar motions are observed in some galls, particulars of which are given in the above-mentioned paper.

As regards the objects of the motions, it is conjectured that the bean may by means of them arrive at a sheltered spot, where the insect will not be dried up and killed by the direct rays of the sun, or injured by excessive rain.

Mr. Rutherford Hill exhibited a plant of *Aspidistra elatior* in flower; also a photograph of *Aristolochia gigas Sturtevantii* as it flowered in the Royal Botanic Garden during the year; also specimens of emetin and cephalin, the alkaloids of *Psychotria Ipecacuanha;* and a specimen of the bark of a *Rhopala* said to be fire-proof.

Mr. Lindsay exhibited photographs of *Chamærops excelsa* growing and fruiting in open air in the garden of Dr. Ramsay, Torquay.

The following communications were read:—

On Lathyrus Sativus, the Vetchling, with a Comparative Review of the Poisonous Properties of some allied Leguminous Plants. By R. Stewart M'Dougall, M.A., B.Sc.

The natural order Leguminosæ includes a very large number of plants having among them very diverse properties, some being nutritious, others purgative and astringent, and still others poisonous. The order is divided into three sub-orders—

a. Papilionaceæ,
b. Cæsalpineæ,
c. Mimoseæ.

The Papilionaceæ is the sub-order that concerns us, and contains such well-known plants as lupines, whin, broom, the clovers, medicagos, vetches, lathyrus, haricot bean, scarlet runner, peas, grain, lentil.

In view of what I shall have to say later on it is worthy of note that among ancient nations some of the pulses were reckoned unclean, the bean, for example, which Pythagoras condemned to his disciples because the constant use thereof dulled men's wits and caused many dreams; while others declared that therein dwelt dead men's souls and that, therefore, at least "the bishop should not eat beans."

One of the tribes of the Papilionaceæ is the tribe Vicieæ, including such genera as *Ervum*, *Pisum*, *Cicer*, *Vicia*, *Lathyrus*.

The genus *Vicia* and the genus *Lathyrus* have many points of resemblance, and it is not easy to give absolute characters to emphasise their difference, but generally it may be said that, while both are climbing in their habit, the plants of the genus *Vicia* have more numerous leaflets, the leaflets of the genus *Lathyrus* being few—one or two pairs and sometimes none. A more scientific distinction is that the style of a vetch is threadlike and ascending, with no conspicuous dilatation towards the apex, whereas the the style of a lathyrus is often bent and is dilated towards the apex.

The genus *Lathyrus* is made up of a large number of species of which ten or twelve are indigenous to Britain, among them *L. sylvestris* (the narrow-leaved everlasting pea), *L. latifolius* (the broad-leaved everlasting pea), *L. tuberosus* (the tuberous vetchling), *L. pratensis* (the meadow vetchling), *L. hirsutus* (the hairy vetchling), *L. Aphaca* (the yellow vetchling), and so on.

Incidentally I might call attention to one of the suggested derivations of *Lathyrus*, viz., "la," augmentative, and "thouros," anything exciting (in reference to the qualities of the seeds).

Lathyrus sativus, an annual, is not native in Britain, although a correspondent in the "Gardener's Chronicle" reminds us that not so long ago it was to be found in our gardens under the name of *L. cœruleus*, and appeared in seed catalogues under the title of *L. azureus* or Lord Anson's pea. It has been long cultivated in the south of Europe as a fodder plant, and, according to De Candolle, was indigenous before cultivation in the region extending from the south of the Caucasus or of the Caspian Sea to the north of India, "spreading thence towards Europe in the track of ancient civilisation."

There are several varieties of *L. sativus* showing slight differences in colour of flower, size and colour of seeds, in colour of foliage (darker or lighter), and strength of growth. I wish to refer specially to two varieties, viz.:—

1st, the *L. sativus* with small dark-coloured seeds, known in India as Khesári Pulse, or Latri, or Matar. The terms Matar, Muther, Mutter are all names used in India for peas generally, and the *L. sativus* seeds imported from India are well known in Britain under the name "Mutters."

2nd, *L. sativus*, the white variety, with larger pale-coloured seeds, which are spoken of as the seeds of the "dog-tooth vetch or the dog-tooth pea." Many inquiries are being made up and down the country as to what genus or species these seeds are to be referred to. Through the kindness of Professor Balfour we have been able to rear plants from these large wedge-shaped seeds, with the result that the seeds are seen to belong to *L. sativus*, weisse, the white-flowered variety of the Continent, a result confirmed by one of the greatest living authorities on seeds—Professor Nobbe.

As to a general description of the plant. *L. sativus*, although an annual, may be treated as a biennial by planting late, say, in early autumn, when by due care and in favourable conditions as regards soil the plant will flower in spring. The leaflets are in single pairs, oblong or lanceolate in shape, and with a three-parted tendril between them. The flowers, which are solitary, may be bluish or they may be white. The plant may grow to a height of three feet or so, obtaining support by its tendrils. The fruit is a small, smooth-winged, several-seeded pod. The seeds vary in colour and size, but all have the characteristic wedged, angled, or hatchet-shaped appearance.

Here is a table showing colour, size, and weight of certain samples examined by Harz:—

Locality.	Colour.	Largest diameter.	Weight of 100 seeds, in grammes.
Carinthia .	Greenish yellow . .	10·1	20·871
Do. .	Reddish yellow . .	10·3	25·830
Austria . .	Yellowish green . .	9·5	23·756
Sicily . .	Pea coloured, spotted .	12·0	41·423
Bohemia . .	Reddish pea coloured .	8·3	16·637
Verona . .	Pea coloured . . .	15·0	56·545
Greece . .	Partly faint pea coloured, partly brown	7·6	18·438
Sicily . .	Pale pea coloured . .	14·7	48·991
East India .	Dark marbled on a brownish ground	7·1	13·619
Do. .	Deep reddish brown, black spotted	7·5	16·527

A note of different analyses may be found useful. Church, in his "Food Grains of India," gives for the seeds of the Indian variety:—In 100 parts, water, 10·1; albuminoids, 31·9; starch and fibre, 53·9; oil, 0·9; ash, 3·2. The nutrient ratio is 1 : 1·75, the characteristic being the richness in nitrogenous constituents.

Harz found the lathyrus to contain 84 per cent. of dry substance, 25 per cent. of proteid stuff, 1·9 per cent. of fat, 54·5 per cent. of non-nitrogenous extract, 4·1 per cent. of fibre, 2·9 per cent. of ash.

The seeds of *L. sativus*, weisse (so-called dog-tooth vetch), grown on chalky, loamy soil, contained in 100 parts of air dry weight:—Water, 12·31; ash, 2·19; cellulose, 4·44; starch, 31·10; other non-nitrogenous substance, 26·42; proteid, 23·63. 100 parts of the ash yielded:—Potass, 45·13; chloride of sodium, 2·28; lime, 10·86; magnesia, 3·72; iron oxide, 0·44; phosphoric acid, 21·86; carbonic acid, 9·78; sulphuric acid, 4·96; silicic acid, 0·98.

CULTIVATION.—In India it is sown about the close of the rains (October) in heavy clay soils, and on land hardened through submersion, and occasionally in rice fields before the rice is cut. It may be reaped in March. Many thousands of acres may be under the crop. Full details as to methods of cultivation, and the number of acres under the crop, are given in Watt's valuable article. Apart from cultivation, it is very common as a weed, springing up after a preceding crop has been reaped.

Parts of the Plant used as Food.—(*a*) The green parts may be cooked and eaten by the poorer people.

(*b*) Grown as fodder for cattle in India (in an herbal, dated 1829, *L. sativus* is mentioned as frequently sown in Switzerland for soiling cattle).

(*c*) In India the young pod is eaten sometimes as a green vegetable.

(*d*) The seeds are eaten cooked, or ground into flour and made into bread.

Other Uses.—(*a*) Used to adulterate the pigeon pea, *Cajanus indicus*, known in India as dal. This latter pulse is much cultivated in India, and is held in much favour, being eaten to a very large extent roasted, or in cakes or curries, etc.

(*b*) The seeds are given to poultry. I have gone into several grain dealers' shops in Edinburgh and asked to see their "poultry feed," and have had no difficulty in recognising and picking out of the general feed seeds of *L. sativus*, weisse (the so-called dog-tooth vetch). Some of the grain dealers did not trouble about the presence of the *L. sativus* seeds, while others, more careful, informed me that if such adulteration showed itself in a sample of ordered peas, they refused to have it. I found that the reason for refusal did not arise from any decided knowledge that the seeds of *L. sativus* had been known to be harmful, but the general impression was that they were "an inferior quality of pea."

(*c*) Dr. Voelcher has recorded several cases where mixed feeding cakes have been adulterated with the seeds of *L. sativus*, and with bad effects.

The Effects of continued Eating on Man.—I will give some evidence from representative accounts, but, generally, I may state that in the case of human beings using the pulse as a daily article of food, paralysis is the result,—paralysis of the lower extremities,—the attack being sudden, and with no warning symptoms leading up to it. Curiously enough no pain is suffered, and the paralysed part, instead of becoming misshapen, continues to grow. As an old herbalist laconically puts it, "The disease is regarded as incurable, but being neither very painful nor fatal, those who are seized with it generally submit to it with patience."

As we will see illustrated later in the case of the horse, the attack is worst in cold weather, and in wet, damp conditions. And now for some evidence from observers. Colonel Sleeman, quoted in Duthie and Fuller, tells how, from combined storm and drought, several villages in Oudh lost their cereal crops, and that thus deprived, the villagers, in 1831, took advantage of large growths of *L. sativus*, giving the stalks and leaves to their cattle, and feeding themselves on the seeds. The evil effects of continued subsistence on this food showed themselves in 1833. "The younger part of the population," writes the Colonel, "of the surrounding villages, from the age of thirty downwards, began to be deprived of the use of their limbs below the waist by paralytic strokes, in all cases sudden, but in some more severe than in others. About half the youth of the village, of both sexes, became affected during the years 1833 and 1834, and many of them have lost the use of their lower limbs entirely, and are unable to move. No person once attacked had been found to recover the use of the limbs affected, and my tent was surrounded by great numbers of the youth, in different stages of disease, imploring my advice and assistance under this dreadful visitation. Some of them were very fine-looking young men, of good caste and respectable families, and all stated that their pains and infirmities were confined entirely to the joints below the waist. They described the attack as coming on suddenly, often while the person was asleep, and stated that a greater portion of the young men were attacked than of the young women." One statement puts the proportion as twelve males for one female.

In one of the British expeditions against Cabul, General Elphinstone's troops suffered much owing to their having to mix the seeds of *L. sativus* with their food.

Dr. Kirk, referring to Upper Sindh, says, "The natives know it to be a poison, but they eat it because it is cheap, thinking that they can stop in time to save themselves from its consequences. Dr. Irving gives his experiences in the 'Proceedings of the Government of the North-West Provinces' for 1866, and from a pamphlet published by him, and quoted largely in a very interesting account by Mr. Challenger, of the British Tramway Company, in the August numbers of 'Exchange and Mart,' I take the following:—'One after another about fifty men, more or less lame, were questioned. Without exception they all stated that they had become paralytic during the rains. Men who had gone to bed quite well had awoke in the morning feeling their legs stiff and their loins weak, and from that day they had never recovered the use of their limbs. At first the lameness was trifling, and amounted only to unsteadiness of gait and slight stiffness, chiefly of the knees. After a time the muscles of the thighs commenced to ache and feel weak, and also the loins. Many of the men appeared to be strong looking, and their legs did not seem to be much wasted, if at all so. Those affected stated that the complaint did not lead to other diseases, nor tend to shorten life, unless, indirectly, by preventing the individual working and thus procuring proper means of support.'"

Not only in India have we records of attack, but in the seventeenth and eighteenth centuries edicts were published in Germany and France respectively, forbidding the use of the pulse as food. There seems to be a strong opinion that the pulse may be used as food, provided a certain proportion be not exceeded. Dr. Irving states one-twelfth as able to be mixed in safety with flour and rice, and some put it as high as one-fourth. But I will return to this in dealing with its effects on horses.

How it affects Horses.—A typical instance was the case reported by the Messrs. Leather, of Liverpool, in 1884, where in a stud of 74 cart horses 35 became ill as a result of the Indian mutters being mixed with their food to the quantity of 3 or 4 lbs. a day. Of the 35, 19 died, 2 were killed as useless, and 14 recovered. The symptoms, as described by the Messrs. Leather, were these:—Sometimes the horses said to be affected seemed, when at rest, in perfect health, but on being exercised, particularly if the weather was cold, they were seized with dyspnœa and roaring, some dying from asphyxia, others getting relief when tracheotomy had been performed. There is a great body of evidence that in cases of such attack tracheotomy gives an almost immediate and complete recovery, whereas no medicines have any effect. The Messrs. Leather reported another case from Rouen, where out of 54 horses belonging to an omnibus company, 29 were seized with illness, 9 dying, and tracheotomy being performed on the rest. This company had 300 horses, but only one stable showed attack, the one in which *L. sativus* was used. A closing reference in this connection may be made to the now famous Bristol Tramways Company case, where 123 horses out of a stud of 800 fell ill, owing to feeding on *L. sativus* seeds. As indicating the symptoms of attack, I quote Mr. Challenger, the manager of the Company:—"The horses suffered from what was styled, for want of a better name, 'an epidemic of falling.' They would fall suddenly without any accountable reason. Cab and carriage shafts were broken daily, as also were the car-poles." And again, "A horse being exercised was taken suddenly ill; it roared, its flanks heaved, its mouth was kept wide open, the nostrils were distended, and the tongue hung out and became livid: it stared and staggered, and threatened every moment to fall down strangulated or suffocated, and during this paroxysm, which lasted several minutes, the perspiration ran freely off every part of the horse." Severe exercise, or even ordinary exercise, is not necessarily the precursor of attack. Mere excitement is sufficient to induce a paroxysm. Principal M'Coll, who has had a very large experience in cases of *L. sativus* poisoning, told me of a case at Bristol where he was called in, where a horse accustomed to be fed first was passed over, and his neighbours fed before him. The horse became very excited, and in a moment or two fell down, not recovering till twenty minutes later, when tracheotomy had been performed.

CLIMATIC CONDITIONS.—Just as we saw illustrated in the case of men being attacked, so also in horses, cold weather was the time when the illness asserted itself. In the Messrs. Leather's case the attack was in damp cold weather and biting east winds. In Rouen, the month of January. In cases dealt with by Professor M'Coll, the early winter; and in Bristol, January, February, and March.

As with man so with horses, the lathyrus is a cumulative poison, the symptoms of poisoning showing themselves the sooner the greater the proportion of *L. sativus* seeds in the horses food. Principal M'Coll states that 2 lbs. a day could be continued for six weeks or so before symptoms of attack showed themselves, while, at Liverpool, the Messrs. Leather fed 4 lbs. or 5 lbs. a day out of 20 lbs. of grain for three months. There is generally a certain proportion of horses that do not seem to be affected. Indeed, it is curious to learn from the evidence in the Bristol Tramway Company case that corn merchants in different parts of the country were in the habit of buying quantities of *L. sativus*, and that having sold it in mixtures for horses in proportions varying from two to ten per cent., they had received no complaints. As far as experimental evidence is obtainable, such would seem to show that boiling the seeds before use renders them innocuous.

In a number of cases dealt with in Glasgow and neighbourhood, 100 bolls of the *L. sativus* seeds lay unused for some time until by Principal M'Coll's orders they were boiled, steamed into a pulp, and when fed in quantities of 1½ lbs. per night per horse, no bad effects followed.

Watt in his valuable article points out that there is a "certain capriciousness" in the effects of the poison on different individuals, and, adopting the view that the poisoning effects are due to a volatile alkaloid, he suggests that persons eating cakes made from *L. sativus* grain do not suffer, as all parts of the cake being thoroughly exposed to a high temperature the poison is eliminated, whereas in food preparations exposed to only a moderate temperature sufficient of the poison remains to act injuriously on those partaking of such foods.

In the examples quoted as to injury to human beings in India and to the horses in Liverpool, Glasgow, and Bristol, the small dark coloured seeds caused the harm. But there have been frequent references lately to horses showing the same kind of attack on being fed with mixtures containing the larger white-coloured seeds of *L. sativus*, weisse, the so-called "dog-tooth vetch," in Bedlington, where a number of mine ponies suffered, at Eastwood 20 to 30 horses, at Newcastle 10 or 12, and again near Sheffield 12 horses. I will take the last case as typical of the others, and it will be seen that the symptoms are the same as in the black-seeded variety, which, knowing that the dark and the light coloured seeds are both *L. sativus*, is not surprising. Mr. Abson, of Sheffield, to whom I am indebted for a large sample of the seeds, tells how the Sheffield horses, first fed with the seeds in January, began in April and May to become thick in their wind, how they fell to the ground and how on gentle exercise they were seized with roaring until, as before, tracheotomy was performed to prevent asphyxia.

EFFECTS OF *L. sativus* ON OTHER ANIMALS. In swine, paralysis and spasm. In the herbal mentioned earlier I find it stated that swine fattened on the meal lost the use of their hind limbs, but grew very fat lying on the ground.

Cattle.—Experimentally the records are too meagre to warrant any hard and fast statement, for while one breeder assured me that he fed the seeds ground and scalded, in the proportion of 3 lbs. at a time, to fattened bullocks and they did well, I have heard of cases where the seeds were blamed for injuring milch cows. There is a very large quantity of these seeds sold all over the country, and in use by dairymen, etc. (thousands of bolls). That we have few or no complaints as regards cattle is doubtless due to the fact that it is the custom of dairymen, etc., to scald the cows' "feed" before giving it to the cattle, so as to prevent indigestion.

Sheep have been fed on small quantities without harm.

As to other animals, Watt quotes Don thus: "Pigeons lose their power of flight by feeding on the seed, especially when young. Poultry will not readily eat it, but geese eat it without apparent damage."

THEORIES AS TO THE POISONOUS PRINCIPLE.—1st. A volatile alkaloid not existing in the free state, but produced by some proteid ferment whose action can be destroyed by heat. The presence of ferments in the vegetable world is now generally admitted. Such are present in very minute quantities, and they are only active within well defined ranges of temperature, being killed when exposed to a high temperature, say on boiling. 2nd. May be due to an albumose or globulin. If this were so as suggested, by heat destroying the poisonous principle we could suggest an analogous case where in *Abrus precatorius*, another leguminous plant with poisonous seeds, the poisonous action of which is destroyed by boiling. The seeds of this plant cause weakness and rapid breathing, but no paralysis. Their poisonous effect is gradually lessened as the temperature is raised from 50° C. to 70° C., until at 80° C. the activity is almost entirely reduced. 3rd. Poisoning by organisms. One observer made some cultivations from *L. sativus* seeds similar to those fed to a suffering horse at Liverpool. These cultivations showed a bacillus resembling that of the *mouse septicæmia*, but as the seeds were very dirty, covered with rodent excrement, the bacillus of the cultivations proves nothing. As the washed seeds showed no such organisms on being experimented with, the bacillus theory is no longer upheld.

Whatever the poisonous principle may be, we hope that Mr. Irvine will succeed in demonstrating it and pointing out how the seeds, otherwise nutritious and cheap, may be used with safety. While the large light coloured seeds (*L. sativus*, weisse) come to this country from the Baltic ports, large quantities of the small dark coloured seeds (one Liverpool merchant in the Bristol Tramway Company case stated he had sold 33,950 quarters since July 1890) come to us from India in the shape of ballast. Analysis shows them to be nutritious, while as regards cheapness Mr. Challenger calculated that by being able to use, without fear of evil effects, the *L. sativus* seeds he would save, as regards feed in his stud of 800 horses, a sum of £300 per annum.

Before passing on to review some of the better known home leguminous plants, I would like to make a few remarks on some Indian leguminous crops allied to and sometimes confused in their nomenclature with *L. sativus*. Through the kindness of Mr. Richardson I am able to show you at the same time a series of "slides" illustrating the Leguminosæ mentioned in Church's "Food Grains of India." (*a*) *Cicer arietinum*, the chick pea or common gram, a plant which is erroneously mentioned as having on being fed to horses caused symptoms of poisoning similar to *L. sativus.* Corresponding to some extent in distribution with *L. sativus, Cicer* is well known in Southern Europe, while upwards of fifty names in the vernacular testify to its popularity in India. It is an annual, varying in height from one to two feet, has several pairs of oval leaflets with toothed edges and generally a terminal leaflet. The flowers are whitish or rose coloured, and as you see from the samples I pass round there are, just as in *L. sativus,* different varieties of seeds, some dark red coloured and some paler. Duthie and Fuller in their "Field and Garden Crops of India" mention a very large white-grained kind grown as a curiosity. No matter the colour the seeds are easily distinguished from those of *L. sativus,* as they simulate, often very successfully, the appearance of a ram's head, hence the specific name of the plant *arietinum* (*aries,* a ram).

ITS USES.—(*A*) As food for Man.—Mixed with wheat and barley, in many districts of India it forms the principal crop of the poorer classes. The seeds are prepared for food in different ways. Sometimes ground into meal for cakes and puddings, or, according to Lindley and Moore, used as a substitute for coffee, and again as common in Paris for soups. The roasted seeds may be mixed with sugar and other ingredients, the whole forming a well-known sweetmeat in India; or, again, the roasted seeds are carried, to be used as a sustaining food on long journeys.

The vegetable is known as a medicine in India, although its too frequent use may induce calculi in the bladder in persons predisposed to the disease, owing to the large amount of oxalic acid which is exuded from glandular hairs on leaf and stem. Drury tells us in addition that this exudation is collected by the natives, and used in their curries instead of vinegar. According to Moore "the boots of a person walking through a dewy grain field will be entirely destroyed by the pungency of the acid given out by the leaves."

(*B*) As food for Cattle and Horses.—The plant has considerable use as a fodder for cattle, which is often not very palatable owing to its bitter taste, and Duthie speaks of its being injurious as fodder to milch cows.

For horses Watt strongly recommends the importation of the seeds into Britain, the proportions of albuminoids to starch (21 : 59) being much better balanced than in our ordinary horse feeds. He suggests that oats and grain, or Indian corn and grain, would be found to be much more nutritious and strength-giving than the ordinary English diet, "which contains an excessive amount of starch." Without dwelling on this opinion, I think it may be safely stated that any poisoning effects said to follow the use of its seeds as a feed for horses are quite imaginary. I have made a number of inquiries of gentlemen who have had a large experience in India as veterinary surgeons, both military men and civilians, and I find a unanimous testimony to the value of *Cicer arietinum* as a horse food.

There are two other plants to which the name "gram" is sometimes applied, and which may thus be confused with "gram" proper, viz. (*b*) *Phaseolus Mungo*, or green gram, and (*c*) *Dolichos biflorus*, or horse gram. The former, with several varieties, varying in habit of plant and colour and size of seed, has a wide cultivation. Its seeds are eaten by rich and poor alike, while the stalks and leaves are given to cattle. *Dolichos biflorus*, horse gram, found wild and cultivated, described in Church, where its haulms are said to be a good fodder, but the continued use of its seeds to cause œdematous swellings.

(*d*) *Cajanus indicus*, the pigeon pea or dal, a wholesome and nutritious pulse. Duthie says the husks and broken grain, after being soaked in water, are given to cattle to keep them quiet when being milked.

(*e*) *Dolichos Lablab*. Its green pods are eaten as a vegetable, and its seeds, too, are used.

(*f*) *Vigna Catjang*, the catiang bean. Its green pods are used, but the beans are inferior to those of *Phaseolus Mungo*.

(*g*) *Phaseolus aconitifolius*, the moth bean.

(*h*) *Canavalia ensiformis*, the sword bean.

(*j*) *Glycine Soja*, the dry bean. Rich in albuminoids and oil. After the oil has been squeezed out of them the rest is compressed into a cake for cattle. Many other preparations are made from the beans, while the whole plant is sometimes cut for fodder.

(*k*) *Arachis hypogæa*, the pea nut. With the oil squeezed out, what remains is used as cake for cattle as above. Half their weight is oil.

(*l*) *Lens esculenta* or *Ervum Lens*, the lentil. To get rid of the bitter substance in the seeds, Church recommends their being steeped for a short time in water in which a little carbonate of soda has been dissolved.

To return to the genus *Lathyrus*, I want to note four species, three at least of which may be poisonous.

L. Clymenum.—A species belonging to the Levant region (both Europe and Africa), and also said to be found in Madeira. Its leaflets, nine to fourteen in a leaf, are very much shorter than those of *L. sativus*, and are blunt at the point. The flowers are in small racemes.

There is another species found in Italy and very closely allied to *L. Clymenum*, namely, *L. alatus*, so closely allied that it is sometimes sunk in the last species, and by other authorities is spoken of as synonymous. On the Continent there are records of these two being injurious too.

Then there is *L. Cicera*, with flat pods, a native of South Europe and Northern Africa, and known in these regions as a fodder plant. Its seed when used in quantities produces harmful results, *e.g.*, in France there are records of its use by human beings being followed by paralysis, and an epidemic of paralysis in a tribe of Arabs in Algiers some twelve years ago was traced by French experts to a similar cause. The brown smooth seeds of *L. Cicera* can by a casual observer be very easily mistaken for those of the Indian variety of *L. sativus*, indeed I know of their having been shown in an exhibition as those of *L. sativus*, and without remark.

The last species of *Lathyrus* I will mention is *L. Aphaca*, the yellow vetchling cultivated in different parts of India as a fodder plant for cattle, and also found in this country, being not uncommon in the eastern and southern counties of England. The seeds and pods have been known to be used in soup in their young state and without harm resulting, but the ripe seeds are narcotic and cause sickness and headache. In this connection one might also notice the haricot bean, *Phaseolus vulgaris*, whose unripe pods are much in use as a green vegetable, as are also those of the scarlet runner, *P. multiflorus*. The ripe seeds have been known to cause illness, and some time ago, in Leith I think, several persons suffered from partaking of the raw seeds. The bad effects seem to follow only when the seeds are eaten raw, no harm resulting if the seeds are first cooked.

The Lupines.—None of these are natives of Britain, but several species are well known in Southern Europe and in some parts of Asia. One of the best known is *Lupinus albus*, grown for fodder, or the crop may be ploughed in as manure. Its seeds are eaten by man and also by cattle after steeping and boiling to remove the bitter taste. A bitter principle, probably alkaloidal, seems to be characteristic of the various species, and we have certain knowledge in the case of two at anyrate, viz., *L. albus* and *L. angustifolius*. From the seeds of *L. albus* an alkaloid has been isolated identical with an alkaloid from the seeds of *L. angustifolius*. The alkaloid is called Lupanine. Bitter to the taste, it is said not to be hurtful to man, but it has been shown, experimentally, to be poisonous to frogs.

Sarothamnus scoparius, Broom.—This plant, well known in the Pharmacopœia as diuretic and cathartic, has had isolated from it a volatile liquid alkaloid called Sparteine, which is said to have narcotic properties. One writer speaks of sheep eating the broom pods and suffering from a kind of intoxication, and mentions, too, an old use of the broom tops in Wales as communicating a bitter flavour to beer. But we need not go so far afield, for those who know their Allan Ramsay will remember his "Elegy on Maggy Johnstoun." Last century this Maggy Johnstoun kept an inn near Edinburgh which was a favourite resort on account of a particular kind of clear and intoxicating ale sold there. Ramsay who knew the place well, and recalling his experiences and singing Maggy's praises, writes:—

> "Some say it was the pith of broom
> That she stirr'd in her masking loom
> Which in oor heads raised sic a soom,
> Or some wild seed
> Which aft the chafing-stoup did toom
> But filled our head."

In conclusion, I would refer to two well-known plants, *Ulex europæus*, gorse or whin, and *Cytisus Laburnum*, the laburnum. Gerard has isolated from the seeds of the whin an alkaloid Ulexine (the bark and the young tops also contain it, but in less quantity). The physiological action of Ulexine is interesting, as it may afford the key to the *L. sativus* poison, and therefore I give a few details of experiments made by Dr. Bradford, and reported in the "Journal of Physiology." A very minute quantity of the alkaloid was injected into the dorsal lymph space of a frog, and in five minutes respiratory movements had ceased. There was complete paralysis of all voluntary movement. The muscles, on being stimulated with electricity, directly responded, but the strongest currents applied to the sciatic nerve failed to produce any contraction of leg muscles. The alkaloid was thus shown to be a nerve poison, and administered in larger doses proved a muscle poison as well. Further experiments, with such mammals as dogs and cats, again showed this Ulexine to be a powerful respiratory poison, *e.g.*, 3 mgrs. to a chloroformed cat killed the cat with convulsions in three minutes. The cat could be kept alive as long as artificial respiration was kept up.

It is now admitted, without dispute, that this Ulexine is identical with the alkaloid Cytisine that has been isolated from laburnum seeds, and which has been detected as present in cases of poisoning by *Cytisus Laburnum.* As in the gorse, this alkaloid is not confined to the seeds, but its presence has been demonstrated in the bark, leaves, and flowers, and in this connection it is interesting to find record of a case of poisoning of a family of seven persons who had eaten the flowers of the laburnum in mistake for those of the locust tree, another leguminous tree. The effects of eating the laburnum flowers were giddiness, accelerated respiration, and vomiting. No asphyxia showed itself, and the patients soon recovered.

Cases of laburnum poisoning are not uncommon among children, and cattle and pigs have been known to suffer after browsing on it.

I may add a very curious case of narcotic poisoning due to eating laburnum roots. Fifty-eight boys in an industrial school chewed the roots of an old laburnum tree cut the day before, mistaking it for "liquorice-stick." Soon many showed the symptoms of narcotic poisoning, viz., sleepiness, stupor, and staggering about. On emetics being given, even while in the act of vomiting and holding the basins in their hands, some dropped off to sleep, as did others on their feet while being walked up and down. It was found that in the worst cases no more than half an ounce could have been chewed. The day after, all had recovered.

Report on the Flora of Ile des Aigrettes, Mauritius. By Surgeon-Major H. H. Johnston, Army Medical Staff, D.Sc., F.L.S.

Ile des Aigrettes is situated about $\frac{1}{3}$ mile north-east of Pointe d'Esny, on the south-east coast of Mauritius, from which it is separated by a shallow sea, 2 fathoms deep at the deepest part.

The island is irregularly circular in form, about $\frac{1}{3}$ mile broad, and at the highest part, in the centre, it reaches a height of 45 feet above sea-level. The surface of the island is rather flat, and the margin is considerably undermined by the sea. The island is formed of coralline limestone, and there is no fresh water in it. At the north end there is a lime-kiln and a caretaker's house, in the neighbourhood of which there is some waste ground and a few cultivated plants. The mean annual temperature in the shade is about 75° Fahr., and at Anse Jonchée, about $4\frac{1}{2}$ miles north of Ile des Aigrettes, on the main island of Mauritius, the mean annual rainfall is 88·58 inches.

I botanised on Ile des Aigrettes on three occasions, viz. 18th August 1888, 4th March 1889, and 20th June 1890.

The following table shows the number of identified species in each of the three divisions of the vegetable kingdom:—

Class.	Native.	Naturalised.	Planted.	Total.
Dicotyledones . .	21	17	6	44
Monocotyledones .	8	1	1	10
Cryptogamia . .	1	—	—	1
Total . . .	30	18	7	55

The 30 native species include 16 herbs, 9 shrubs, 3 climbers, 1 parasite, and 1 marine flowering plant.

Ipomœa glaberrima, Bojer, and *Phyllanthus mauritianus*, H. H. Johnston, are the only native species which are not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles." The former was found in Flat Island by Horne in July 1885, and by me in Ile Vakois in 1889, and in Ile Marianne in 1890, in all of which islands it is undoubtedly native. The latter is a new endemic species.

Gymnosporia trigyna, Baker, *Oldenlandia Sieberi*, Baker, and *Phyllanthus mauritianus*, H. H. Johnston, are the only three species I found on Ile des Aigrettes, which are endemic in the Mauritius group of islands, and not found in any other part of the world.

The greater number of the 18 species of more or less naturalised plants occurred on the waste ground near the lime-kiln and caretaker's house. Three of the naturalised species, *Sophora tomentosa*, Linn., *Ipomœa Nil*, Roth., and *Nicotiana Tabacum*, Linn., are not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles," published in 1877.

With the exception of the waste ground at the north end of the island, the surface is clothed with a dense mass of shrubs, intermingled with climbing plants and a parasite, *Cassytha filiformis*, Linn., belonging to the Lauraceæ.

In addition to the plants identified and enumerated in this report, I found one species each of the following genera, viz. *Polyscias* (?), *Diospyros*, *Ficus* (?), *Dracæna*, and *Phyllanthus*, but as the plants were neither in flower nor fruit, they have not been identified. I also observed among the cultivated plants a species of Cucumis and a garden plant, which have not been identified. I was informed by Mr. A. Daruty de Grandpré that he had found an orchid on this island, but it was not observed by me.

As Ile des Aigrettes is easily accessible, I hope to revisit it at some future time, and further investigate its flora, which will probably yield a considerable number of species additional to those recorded by me in my present report.

The remainder of my paper contains a complete list of all the native, naturalised, and cultivated plants which were observed and identified by me in the island. I have followed the nomenclature of Baker's "Flora of Mauritius and the Seychelles." Under several of the species I have entered notes of my own, taken from living specimens. These notes, except in the case of *Premna serratifolia*, Linn., are supplementary to the descriptions contained in Baker's "Flora of Mauritius and the Seychelles," and they are not intended to be complete descriptions of the plants to which they refer.

ABBREVIATIONS.

Bojer, Hort. Maur.—Hortus Mauritianus. By W. Bojer. 1837.
Baker, Flor. Maur. Seych.—Flora of the Mauritius and the Seychelles. By J. G. Baker. 1877.
DC., Prod.—Prodromus Systematis Naturalis Regni Vegetabilis, Parts i.–xvii. By A. P. and A. de Candolle. 1824–1873.

An asterisk before the name of a species or natural order means that all the plants belonging to that species or natural order are not native, but are more or less naturalised in the Mauritius group of islands. The names of cultivated species and natural orders of plants in Ile des Aigrettes are enclosed in brackets, thus [ ].

CLASS I.—DICOTYLEDONES.

* Papaveraceæ.

* Argemone mexicana, Linn.—Baker, Flor. Maur. Seych., p. 5. Common on waste ground, 20th June 1890. Naturalised. A native of America.

[Moringaceæ.]

[Moringa pterygosperma, Gærtn.—Baker, Flor. Maur. Seych., p. 9. Only one tree 20 feet high, planted near the lime-kiln, 20th June 1890. A native of tropical Asia.]

Meliaceæ.

Quivisia mauritiana, Baker, var., *Q. ovata*, Cav.—Baker, Flor. Maur. Seych., p. 46. Coralline limestone, 20 feet above sea-level, 18th August 1888. Native. An erect shrub 7 feet high, with glabrous brown bark. Leaves subcoriaceous, shining green above, paler green beneath. Calyx obscurely thinly-silky on the outside, pale yellow; teeth 4. Petals 4, obscurely densely-silky on the outside, pale yellow with a pale, purplish, yellow base. Stamens 8; filaments united in a cylindrical reddish-purple tube, glabrous except a few short hairs at the rim; anthers sessile, purplish-yellow. Ovary tomentose, pale yellow; style glabrous, whitish tinged with purple; stigma glabrous, whitish.

CELASTRACEÆ.

GYMNOSPORIA TRIGYNA, Baker. — Baker, Flor. Maur. Seych., p. 50. Coralline limestone, 5 feet above sea-level, 18th August 1888. Native. This species is endemic in the Mauritius group of islands.

Branchlets stout, terete, glabrous, greyish-brown. Leaves obtuse or emarginate at the apex, coriaceous, green above, paler green beneath, with a reddish purple margin and petiole. Calyx-teeth 4–5, glabrous, reddish purple, persistent, finally becoming brown. Corolla $\frac{1}{4}$ inch broad when expanded; petals white, round. Disk yellow. Stamens 4–5; filament incurved, glabrous, whitish; anthers pale yellow; pollen ellipsoid, glabrous, yellow. Ovary 3–4-celled, glabrous, pale purplish. Stigma 3–4-lobed, pale purplish yellow. Capsule $\frac{1}{4}$–$\frac{1}{3}$ inch broad, globose, glabrous, pale purplish green, 3–4-celled, dehiscing loculicidally into 3–4 valves, which remain united at the base and become brown. Seeds $\frac{1}{8}$ inch long, ellipsoid, triquetrous, convex on the back, flattened on the sides, glabrous, pale shining green, arillate at the base, turning yellowish brown after the dehiscence of the capsule, 1–2 in each cell of the capsule.

RHAMNACEÆ.

SCUTIA COMMERSONI, Brong.—Baker, Flor. Maur. Seych., p. 51. Coralline limestone, 15–20 feet above sea-level, 18th August 1888. Native. Leaves shining-green above, paler green beneath. Drupe $\frac{4}{12}$–$\frac{5}{12}$ inch broad, globose, glabrous, dark purplish black, juicy; persistent calyx-tube dark brown.

* COLUBRINA ASIATICA, Broug.—Baker, Flor. Maur. Seych., p. 52. Common on coralline limestone, 5 feet above sea-level, 20th June 1890. Naturalised.

This species, which is a native of the Seychelles, Tropical Asia, and Polynesia, is recorded as naturalised at " la Petite Rivière Noire," Mauritius, under *Ceanthus asiaticus*, Linn., in Bojer, Hort. Maur., p. 70.

It is recorded as native on the shore and in the filao (*Casuarina equisetifolia*, Forst.) plantations in Flat Island, in Horne, Notes on Flora of Flat Island, pp. 7 and 8, published in 1886.

It was seen by me growing on coral sand, 5 feet above sea-level, Ile du Morne, on 7th November 1889. Naturalised. Capsules ½ inch broad, globose, glabrous, brown, dehiscing by 3 valves. Seeds ⅕ inch long, triquetrous, with a convex back and flat sides, glabrous, brown.

Leguminosæ.

* Sophora tomentosa, Linn.—DC. Prod. ii. 95. Common on coralline limestone, at the seashore, 5 feet above sea-level, 20th June 1890. Naturalised. Shrub 8–10 feet high, erect. Pod 1–8 seeded.

One plant, 3 feet high, of this species was seen by me growing on coralline limestone, 10 feet above sea-level, Ile Marianne, 19th March 1890. Naturalised.

In Bojer, Hort. Maur., p. 83, it is recorded as naturalised in Ile aux Tonneliers, at the entrance of Port Louis harbour; but it is not recorded from Mauritius in Baker, Flor. Maur. Seych.

S. tomentosa, Linn., is a native of India and the West Indies.

* Cæsalpinia Bonducella, Fleming.—Baker, Flor. Maur. Seych., p. 88. Coralline limestone, at the seashore, 5 feet above sea-level, 20th June 1890. Naturalised. Only one shrub, 5 feet high, was seen by me. Pod 1–2-seeded. This species is spread everywhere in the tropics, but in Mauritius it is naturalised.

* Cassia occidentalis, Linn.—Baker, Flor. Maur. Seych., p. 89. Rare on waste ground, 5 feet above sea-level, 20th June 1890. Naturalised. This species is widely spread in the tropics, but in Mauritius it is naturalised.

[TAMARINDUS INDICA, Linn.—Baker, Flor. Maur. Seych., p. 91. Only one tree 25 feet high, planted near the lime-kiln, 20th June 1890. The native country of the Tamarind is not clearly known.]

LYTHRACEÆ.

PEMPHIS ACIDULA, Forst.—Baker, Flor. Maur. Seych., p. 101. Coralline limestone, at seashore, 5 feet above sea-level, 18th August 1888. Native. Leaves, oblong-oblanceolate, green on both surfaces, slightly succulent. Calyx-teeth 5–6. Petals 5–6. Stamens 10 or 12. Capsule $\frac{1}{5}$ inch long, sub-globose, glabrous, brown, crowned with the persistent brown style. Seeds $\frac{1}{8}$ inch long, oblong, triquetrous, glabrous, shining pale yellow.

* PASSIFLORACEÆ.

* PASSIFLORA SUBEROSA, Linn. — Baker, Flor. Maur. Seych., p. 105. Coralline limestone, 20 feet above sea-level, 18th August 1888. Naturalised. A native of Tropical America.

COMBRETACEÆ.

[TERMINALIA CATAPPA, Linn.—Baker, Flor. Maur. Seych., p. 111. Only one tree 15 feet high, and two young plants planted near the lime-kiln, 20th June 1890. A native of Tropical Asia, the Seychelles, and Rodriguez.]

PORTULACEÆ.

PORTULÆA OLERACEA, Linn.—Baker, Flor. Maur. Seych., p. 125. Common on waste ground, 10 feet above sea-level, and on coralline limestone at the seashore, 4th March 1889. Native.

CUCURBITACEÆ.

[CUCURBITA PEPO, Linn.—Baker, Flor. Maur. Seych., p. 131. Planted near the lime-kiln, 20th June 1890.]

RUBIACEÆ.

OLDENLANDIA SIEBERI, Baker. — Baker, Flor. Maur. Seych., p. 138. Coralline limestone, at seashore, 5 feet above sea-level, 18th August 1888. Native. This species is endemic in the Mauritius group of islands.

Stems $\frac{1}{2}$–6 inches long, terete. Leaves minutely-serrate, glabrous, green above, paler green beneath, sub-coriaceous. Calyx $\frac{1}{16}$ inch long, glabrous, green, persistent, finally becoming brown; teeth 4 as long as the tube, lanceolate, acute. Corolla $\frac{1}{14}$ inch broad when expanded; tube glabrous, white; limb 4-lobed, with 4 spreading, ovate-deltoid, mucronate, glabrous, faintly pinkish-white lobes. Anthers white. Capsule $\frac{1}{12}$ inch long, turbinate-compressed, glabrous, brown, dehiscing at the top between the persistent calyx-teeth. Seeds many, $\frac{1}{60}$ inch long, oblong or angular-globose, glabrous, finely wrinkled, brown.

COMPOSITÆ.

BIDENS PILOSA, Linn. — Baker, Flor. Maur. Seych., p. 169. Waste ground, 15 feet above sea-level, 18th August 1888. Native.

* TRIDAX PROCUMBENS, Linn.—Baker, Flor. Maur. Seych., p. 170. Waste ground, 15 feet above sea-level, and coralline limestone, 18th August 1888. Naturalised. A native of Mexico and the West Indies.

* PARTHENIUM HYSTEROPHORUS, Linn. — Baker, Flor. Maur. Seych., p. 174. Waste ground, 15 feet above sea-level, 18th August 1888. Naturalised. A native of tropical America.

SONCHUS OLERACEUS, Linn. ex parte. — Baker, Flor. Maur. Seych., p. 180. Waste ground, 10 feet above sea-level, 18th August 1888. Native.

GOODENIACEÆ.

SCÆVOLA KŒNIGII, Vahl.—Baker, Flor. Maur. Seych., p. 182. Coralline limestone, 20 feet above sea-level, 18th August 1888. Native.

BORAGINACEÆ.

EHRETIA PETIOLARIS, Lam.—Baker, Flor. Maur. Seych., p. 201. Coralline limestone, 10 feet above sea-level, 18th August 1888. Native.

Shrub 4–7 feet high, with terete, glabrous, brown branches and green branchlets. Leaves green above, paler green beneath. Calyx $\frac{1}{8}$ inch long, 5-toothed, glabrous, green, persistent, finally becoming yellowish-green; teeth deltoid, half as long as the tube. Corolla $\frac{1}{7}$ inch long, glabrous, white. Stamens glabrous, white. Ovary glabrous, green; style glabrous, pale green; stigma capitate, 2-lobed, green. Drupe $\frac{1}{4}$–$\frac{5}{16}$ inch broad, depresso-globose, glabrous, shining-red, juicy, crowned with the persistent black base of the style. Pyrenes 4, $\frac{1}{8}$ inch long, triquetrous, yellowish with a whitish spot on the inner border, flat on the sides, convex on the back, which has 6 prominent longitudinal cartilaginous ridges.

TOURNEFORTIA ARGENTEA, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Coralline limestone, at seashore, 5 feet above sea-level, 20th June 1890. Native. Only one shrub seen by me.

CONVOLVULACEÆ.

*IPOMŒA NIL, Roth. (CONVOLVULUS, Linn. Bot. Reg. t. 276).—Common on waste ground, 5–20 feet above sea-level, 18th August 1888. Naturalised.

It was also found by me on coralline limestone, 10–15 feet above sea-level, rare at the north side of Ile de la Passe, on 26th October 1888. Naturalised.

This species, which occurs round the world in the tropics, is recorded as naturalised in great quantity at "Grand-Port," and in the ravines about "Reduit," Mauritius, under "*Pharbitis Nil*," in Bojer, Hort. Maur., p. 227. It is recorded as naturalised in Rodriguez by Balfour, in Baker, Flor. Maur. Seych., p. 209.

[IPOMŒA BATATAS, Lam.—Baker, Flor. Maur. Seych., p. 210. Planted near the lime-kiln, 20th June 1890. This species is the common cultivated sweet potato.]

Ipomœa pes-capræ, Roth.—Baker, Flor. Maur. Seych., p. 211. Coralline limestone, 5 feet above sea-level, 4th March 1889. Native.

Ipomœa glaberrima, Bojer, in Hook. Journ. i. 357.—Common on coralline limestone at the seashore, 5-10 feet above sea-level, 18th August 1888. Native.

Stems stout, terete, glabrous, pale green, wide twining right to left round shrubs; juice milky. Leaves $2\frac{1}{2}$–5 inches long, $2\frac{1}{4}$–$4\frac{1}{2}$ inches broad, green above, paler green beneath, membranous; petiole 1–4 inches long, pale green. Peduncles 1–3-flowered. Flowers inodorous. Sepals green, with a dark-purple obtuse apex, persistent, finally becoming reflexed, dry, pale brown above, and dark brown beneath. Corolla-tube $2\frac{1}{2}$–3 inches long, pilose on the inside, pale greenish-yellow; limb 3–4 inches broad when expanded, white, with 5 radiating bands, which are pale whitish-yellow above, and pale greenish-yellow beneath. Capsule $\frac{3}{4}$–1 inch broad, depresso-sub-globose, longitudinally grooved on two opposite sides, glabrous, pale yellowish-brown, crowned with the persistent base of the style, 2-celled. Seeds 1–2 in a cell, $\frac{1}{3}$ inch broad, globose-compressed, when one seed in a cell, globose-triquetrous when two seeds in a cell, densely clothed with dark blackish-brown tomentum, encircled with a fringe of long pale brown hairs.

This species was found by me growing common on coralline limestone at the seashore, Ile Vakois, 5th September 1889; and common on coralline limestone at the seashore, on the north side of Ile Marianne, 19th March 1890. Native on both islands.

I. glaberrima, Bojer, which occurs from Polynesia to Zambesi-land, is not recorded from Mauritius in Baker, Flor. Maur. Seych. It is recorded as cultivated in the Royal Botanic Garden, at Pamplemousses, Mauritius, under *Calonyction comosperma*, Boj., in Bojer, Hort. Maur. p. 228. It is recorded as native in Flat Island by Horne in Horne, Notes on Flora of Flat Island, pp. 17 and 18, published in 1886. In Baker, Flor. Maur. Seych., p. 211, it is recorded by Bojer and Wright as native in the Seychelles, in bushy places near the shore.

SOLANACEÆ.

* LYCOPERSICUM GALENI, Miller.—Baker, Flor. Maur. Seych., p. 216. Waste ground, 10 feet above sea-level, 20th June 1890. Scarcely naturalised. This species is the cultivated Cherry Tomato.

* NICOTIANA TABACUM, Linn. — A. DC., Prod., xiii. sect. i. 557. Waste ground, 20th June 1890. Scarcely naturalised.

On 2nd September 1889 I found this species, which is the common cultivated Tobacco plant and a native of South America, growing on coralline limestone, 3–40 feet above sea-level, on Ile aux Fouquets, where it is naturalised and common on the sheltered north-west side of the island.

In Bojer, Hort. Maur., p. 238, *N. Tabacum*, Linn., is recorded as cultivated in Mauritius; and in Baker, Flor. Maur. Seych., p. 218, it is recorded by Balfour as "subspontaneous" in Rodriguez, but it is not recorded from Mauritius, where it is still cultivated.

ASCLEPIADACEÆ.

SARCOSTEMMA VIMINALE, R. Br. — Baker, Flor. Maur. Seych., p. 227. Coralline limestone, 5 feet above sea-level, 18th August 1888. Native. Corolla pale whitish-yellow, with a white outer corona. Stigma faintly 2-lobed at the apex, glabrous, pale green.

TYLOPHORA LÆVIGATA, Dcne.—Baker, Flor. Maur. Seych., p. 228. Coralline limestone, 15 feet above sea-level, 4th March 1889. Native. Stem-juice watery. Calyx $\frac{1}{8}$ inch long, 5-lobed. Corolla $\frac{1}{4}$ inch long, $\frac{3}{8}$ inch broad when expanded, 5–7-lobed, greenish yellow, tinged purplish on both surfaces of the tube. Stamens 5–7. Ovaries 2, free, glabrous, pale green, one only developing into fruit; styles 2, free, as long as the ovaries, subulate, glabrous, pale green; stigma flatly convex on the top with an apical pit and a 5–7-angled margin, glabrous, pale green, except the pale purplish margin. Follicle 2–3$\frac{1}{2}$ inches long, fusiform, acuminate, with a hooked apex, glabrous, pale brownish-green, dehiscing by the ventral suture. Seeds numerous, ascending, $\frac{1}{4}$ inch long, oblong-ovate, with a compressed margin and truncate apex bearing a tuft of long white silky hairs, glabrous, brown.

Verbenaceæ.

Stachytarpheta indica, Vahl.—Baker, Flor. Maur. Seych., p. 251. Coralline limestone, 20 feet above sea-level, 18th August 1888. Native. The plants of this species observed by me in Ile des Aigrettes, and near the sea-level round Port Louis, Mauritius, had decumbent stems and paler blue corollas than those in the higher elevations of Mauritius, where the plants are more robust, with erect stems and deep blue corollas.

* Lantana Camara, Linn.—Baker, Flor. Maur. Seych., p. 253. Waste ground, 20 feet above sea-level, 18th August 1888. Naturalised. Corolla yellow. A native of Tropical America, now very common in Mauritius.

Premna serratifolia, Linn,—Baker, Flor. Maur. Seych., p. 254. Coralline limestone, 5 feet above sea-level, 18th August 1888. Native.

An erect shrub 4–5 feet high, with stout, terete, glabrous, brown branchlets. Leaves opposite, 3–5$\frac{1}{2}$ inches long, 2–4 inches broad, oblong, rounded or slightly cordate at the base, narrowed to a short point at the apex, entire, glabrous, shining green above, paler green beneath, coriaceous, penninerved, with 4–6 prominent erecto-patent main veins on each side of the midrib; petiole $\frac{1}{2}$–2$\frac{1}{2}$ inches long, glabrous, pale green or purplish-green. Flowers copious, minute, in much-branched, peduncled, terminal, trichotomous cymes 2–4 inches broad. Bracts $\frac{1}{12}$ inch long, deltoid, puberulent beneath, pale green. Pedicels very short, puberulent. Calyx $\frac{1}{12}$ inch long, campanulate, 4-toothed, puberulent on the outside, marked with radiating veins on the inside, pale green, persistent, remaining pale green; teeth minute, broadly deltoid, obtuse. Corolla $\frac{1}{8}$ inch long, campanulate, 4-lobed, glabrous, except the pilose throat, pale green; lobes nearly as long as the tubes, spreading, broadly oblong, obtuse. Stamens 4, inserted in the throat of the corolla-tube, alternate with the corolla lobes, exserted, glabrous;

filament pale green; anther pale greenish-yellow. Ovary superior, glabrous, pale green, 4-celled, with 1 ovule in each cell; style exserted, filiform, glabrous, pale green, bifid, with 2 short recurved branches. Drupe $\frac{1}{8}$–$\frac{1}{4}$ inch in diameter, globose, shining black, juicy; endocarp bony, warted, 4-celled, with 1 seed in each cell.

AMARANTHACEÆ.

* AMARANTHUS GANGETICUS, Linn.—Baker, Flor. Maur. Seych., p. 267. Waste ground, 10 feet above sea-level, 4th March 1889. Naturalised. This species is commonly cultivated in the tropics of the Old World.

[ALTERNANTHERA PARONYCHIOIDES, A. St.-Hil.—A. DC. Prod. xiii., sect. ii. 358. Planted in a border at a roadside, 4th March 1889. A native of America.]

* CHENOPODIACEÆ.

* CHENOPODIUM AMBROSIOIDES, Linn.—Baker, Flor. Maur. Seych., p. 270. Waste ground, 10 feet above sea-level, 4th March 1889. Naturalised. A cosmopolitan weed, probably of Tropical American origin.

LAURACEÆ.

* TETRANTHERA LAURIFOLIA, Jacq.—Baker, Flor. Maur. Seych., p. 292. Coralline limestone, 15 feet above sea-level, 20th June 1890. Naturalised. Only two shrubs, 8 feet high, observed by me. A native of tropical Asia.

CASSYTHA FILIFORMIS, Linn.—Baker, Flor. Maur. Seych., p. 292. Parasitic on shrubs, 10–20 feet above sea-level, 18th August 1888. Native.

Stems $\frac{1}{24}$–$\frac{1}{16}$ inch in diameter, terete, striate, glabrous, green or greenish-yellow. Peduncle obscurely pilose, terete, striate, green, with 3 minute ovate ciliate bracts at the base. Bracteoles and outer perianth-lobes ovate, pale whitish-green, glabrous except the pale brown ciliate margin. Inner perianth-lobes glabrous, greenish-white. Anthers orange-yellow, introrse, dehiscing by two flaps from below upwards. Ovary ovoid, glabrous, green; style and stigma glabrous, pale whitish-green. Persistent perianth-tube $\frac{4}{12}$–$\frac{5}{12}$ inch broad, globose, glabrous, green, crowned with the persistent dark brown perianth-lobes. Fruit $\frac{1}{4}$ to under $\frac{1}{3}$ inch broad, ovoid-globose, glabrous, finely wrinkled, black, crowned with the persistent black base of the style.

* Casuarineæ.

* Casuarina equisetifolia, Forst.—Baker, Flor. Maur. Seych., p. 294. Waste ground, 5–15 feet above sea-level, 4th March 1889. Naturalised. Only one tree 15 feet high, and one young plant observed by me. A native of the Malay Archipelago.

Euphorbiaceæ.

Euphorbia pilulifera, Linn.—Baker, Flor. Maur. Seych., p. 303. Waste ground, 10 feet above sea-level, 4th March 1889. Native.

Phyllanthus mauritianus, n. sp.—Coralline limestone, 5 feet above sea-level, 4th March 1889. Native.

Stems $\frac{1}{2}$–$4\frac{1}{2}$ inches long, erect. Leaves green above, glaucous beneath, with a purplish margin. Bracts pale purple. Male and female flowers 1–2 in the axils of the leaves, either two flowers of the same sex, or one flower of each sex, in the same axil. Perianth-lobes 6, pale green, with a purple apex. Stamens 3; anther pale yellow. Ovary green; styles 3, spreading, bifid at the apex, pale green. Capsule $\frac{1}{20}$ inch broad, depresso-globose, glabrous, pale brownish-green.

A full description of this new species will be published by me in Trans. Bot. Soc. Edin., vol. xx., February 1895, in my "Report on the Flora of the Outlying Islands in Mahébourg Bay, Mauritius."

Phyllanthus Niruri, Linn.—Baker, Flor. Maur. Seych., p. 309. Waste ground, 5–15 feet above sea-level, 20th June 1890. Native.

* Ricinus communis, Linn.—Baker, Flor. Maur. Seych., p. 316. Waste ground, 15 feet above sea-level, 18th August 1888. Scarcely naturalised. The castor oil plant is a native of tropical Asia.

CLASS II.—MONOCOTYLEDONES.

NAIADACEÆ.

HALOPHILA OVATA, Gaud.—Baker, Flor. Maur. Seych., p. 393. Submarine coral sand, uncovered at ebb tide, 20 yards from the shore, 20th June 1890. Native. Common.

GRAMINEÆ.

PASPALUM DISTICHUM, Burm.—Baker, Flor. Maur. Seych., p. 431. Coralline limestone at the seashore, 5 feet above sea-level, 20th June 1890. Native. Stems 3–4 feet long, decumbent at the base, then erect.

PANICUM SANGUINALE, Linn.—Baker, Flor. Maur. Seych., p. 435. Waste ground, 5 feet above sea-level, 20th June 1890. Native.

* PANICUM MAXIMUM, Jacq.—Baker, Flor. Maur. Seych., p. 436. Waste ground, 20 feet above sea-level, 18th August 1888. Naturalised. A native of Guinea.

STENOTAPHRUM COMPLANATUM, Schrank.—Baker, Flor. Maur. Seych., p. 440. Common on coralline limestone, 20th June 1890. Native.

ELEUSINE INDICA, Gærtn.—Baker, Flor. Maur. Seych., p. 451. Waste ground, 18th August 1888. Native.

DACTYLOCTENIUM ÆGYPTIACUM, Willd. — Baker, Flor. Maur. Seych., p. 452. Waste ground, 15 feet above sea-level, 18th August 1888. Native. Stems tufted. Spikes 2–3, $\frac{1}{4}$–$\frac{1}{2}$ inch long. Stigmas whitish. Inner empty glumes oblong, deeply boat-shaped, awned.

CHLORIS BARBATA, Sw.—Baker, Flor. Maur. Seych., p. 453. Waste ground, 5–20 feet above sea-level, 4th March 1889. Native.

ERAGROSTIS TENELLA, Beauv.—Baker, Flor. Maur. Seych., p. 455 (fide J. G. Baker). Coralline limestone, 10 feet above sea-level, 20th June 1890. Native. Stems $\frac{1}{4}$–$1\frac{1}{2}$ foot long, tufted, spreading. Leaf-blades 1–$5\frac{1}{2}$ inches long. Panicle $1\frac{1}{2}$–9 inches long, with a tuft of long white bristles at the base of the branches. Spikelets $\frac{1}{16}$ inch long. Flowering glume not ciliated. Pale conspicuously ciliated.

[Zea Mays, Linn.—Baker, Flor. Maur. Seych., p. 458. Planted near the lime-kiln, 20th June 1890. This species is the common cultivated maize.]

CLASS III.—CRYPTOGAMIA.

Filices.

Polypodium Phymatodes, Linn.—Baker, Flor. Maur. Seych., p. 508. Coralline limestone, 10 feet above sea-level, 18th August 1888. Native.

Report on the Flora of Les Benitiers, Mauritius. By Surgeon-Major H. H. Johnston, Army Medical Staff, D.Sc., F.L.S.

Les Bénitiers are two small rocky islets, situated about $\frac{1}{4}$ mile west of Ile du Morne, near the south-west corner of Mauritius. The two islets lie north and south of each other, at a distance of about 200 yards apart. Between them and Ile du Morne the sea is only $\frac{1}{2}$ fathom deep, and the bottom is formed of coral sand. The outer margin of the shallow coral reef, on which Les Bénitiers are situated, lies about $\frac{3}{4}$ mile farther out to the west of the islets.

The north islet is the larger of the two. It is 11 yards long and 8 yards broad. It rises to a height of 14 feet above the sandy sea-bottom and 11 feet above sea-level. The edge of the islet is undermined by the sea. The south islet is 6 yards across at the broadest part, and it rises 10 feet above the sandy sea-bottom, and 7 feet above sea-level.

Both islets are formed of solid blocks of coralline limestone, which rise abruptly out of the sea. The surface of the rock projects upwards in sharp honeycombed pinnacles, and there is very little soil, composed of limestone débris, with a scanty clothing of vegetation. There is no fresh water on the islets.

The west coast of the Black River district, to which Les Bénitiers belong, has a much drier climate than that of other parts of Mauritius, on account of its being situated on the leeward side of the island, and, therefore, sheltered from the prevailing moisture-laden south-east trade wind, which blows during the greater part of the year. The mean annual temperature in the shade is about 75° Fahr.; and the mean annual rainfall at Wolmar, in this district, is only 28·34 inches, whereas at Cluny, in the district of Grand Port, on the windward side of Mauritius, it is 144·24 inches.

In company with Mr. William Scott, Assistant-Director of Woods and Forests in Mauritius, I visited Les Bénitiers, on 20th January 1890, and botanised on both islets.

FLORA OF NORTH ISLET.

On the north islet I found 13 species of plants. The following table shows the number of species in each of the three divisions of the vegetable kingdoms:—

CLASS.	Native.	Naturalised.	Total.
Dicotyledones . . .	6	3	9
Monocotyledones . . .	1	—	1
Cryptogamia . . .	3	—	3
Total . . .	10	3	13

Of the 10 native species of plants, the Dicotyledons include 6 species, or three-fifths of the total number. There is only one species of Monocotyledons, so that these are only in the proportion of one to six of the Dicotyledons, whereas in the flora of Mauritius, they are in the proportion of one to two of the Dicotyledons. The 10 native species belong to 8 natural orders. Solanaceæ and Filices include 2 species each, and the remaining 6 natural orders 1 species each.

One of the 3 naturalised species, *Erigeron canadense*, Linn., a native of North America, is not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles," published in 1877.

CLASS I.—DICOTYLEDONES.

Ficoideæ.

Sesuvium Portulacastrum, Linn.—Baker, Flor. Maur. Seych., p. 108. Native. Common.

Portulaceæ.

Portulaca oleracea, Linn.,—Baker, Flor. Maur. Seych., p. 125. Native. Common.

Compositæ.

Erigeron canadense, Linn.—DC. Prod. v. 289. Only one plant on the islet, 6 feet above sea-level. Naturalised. Stem 8 inches long, erect.

This species was also found by me on waste ground, 1880 feet above sea-level, Curepipe, Mauritius, 9th July 1888. Naturalised. Stem 1–3 feet long, erect.

E. canadense, Linn., a native of North America, now widely dispersed, is not recorded from Mauritius in Baker, Flor. Maur. Seych.

Sonchus oleraceus, Linn. ex-parte.—Baker, Flor. Maur. Seych., p. 180. Native. Common.

Boraginaceæ.

Tournefortia argentea, Linn. fill.—Baker, Flor. Maur. Seych., p. 201. Native. Common.

Solanaceæ.

Solanum nigrum, Linn.—Baker, Flor. Maur. Seych., p. 214. Native. Only two plants on the islet.

Lycium tenue, Willd., var., Sieberi, Duval.—Baker, Flor. Maur. Seych., p. 216. Native. Only one plant on the islet.

Verbenaceæ.

*Lantana Camara, Linn.—Baker, Flor. Maur. Seych., p. 253 Naturalised. Common. Corolla-limb yellow. A native of tropical America, now widely dispersed in the Old World, and very common in Mauritius.

Casuarineæ.

*Casuarina equisetifolia, Forst.—Baker, Flor. Maur. Seych., p. 294. Naturalised. Only four plants on the islet, one 7 feet high and in flower, the others smaller and neither in flower nor fruit. A native of the Malay Archipelago.

CLASS II.—MONOCOTYLEDONES.

Gramineæ.

Dactyloctenium ægyptiacum, Willd.—Baker, Flor. Maur. Seych., p. 452. Native. Common.

CLASS III.—CRYPTOGAMIA.

Filices.

At 7 feet above sea-level I found one dead plant of a native fern, which had grown on the islet; but the species to which it belongs has not been identified.

Polypodium lycopodioides, Linn.—Baker, Flor. Maur. Seych., p. 507. Native. Rare.

Algæ.

Chætomorpha sp. (fide C. H. Wright). Rare on the coralline limestone, 3–6 feet above sea-level. Native. Plant green.

FLORA OF SOUTH ISLET.

CLASS I.—DICOTYLEDONES.

FICOIDEÆ.

SESUVIUM PORTULACASTRUM, Linn.—Baker, Flor. Maur. Seych., p. 108. Native. Common.

PORTULACEÆ.

PORTULACA OLERACEA, Linn.—Baker, Flor. Maur. Seych., p. 125. Native. Common.

CLASS III.—CRYPTOGAMIA.

ALGÆ.

CHÆTOMORPHA sp. (fide C. H. Wright). Native. Rare. Plant green.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF NOVEMBER 1894. By ROBERT LINDSAY, Curator.

The past month of November has been exceedingly mild for the season, comparatively little frost occurred. No snow fell, and there was an absence of severe gales. There was a large amount of bright sunshine, and altogether the month was one of the most favourable Novembers on record. A good number of plants are in flower on the rock-garden, but only two varieties came into flower during November, viz. :—*Helleborus albicans* and *H. purpurascens.*

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF NOVEMBER 1894.

Distance from Sea, 1 Mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours.		Hygrometer.		Direction of Wind.	Clouds.			Rainfall. (Inches.)
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·556	60·0	44·8	55·0	52·2	S.W.	Cir.	6	S.W.	0·150
2	29·394	58·0	50·3	56·2	53·8	S.W.	Cir.	1	S.W.	0·000
3	29·469	61·2	50·3	52·8	50·2	S.E.	Cir.	5	S.W.	0·090
4	29·481	56·9	47·1	48·6	45·5	S.W.	...	0	...	0·070
5	29·400	54·9	48·7	52·9	49·1	S.W.	...	0	...	0·000
6	29·841	53·9	46·0	49·0	46·1	S.W.	Cir. St.	8	N.W.	0·000
7	29·434	54·8	49·0	54·7	51·0	S.W.	Cir. St.	10	S.W.	0·150
8	29·255	54·8	42·1	43·1	41·2	S.W.	...	0	...	0·045
9	29·398	49·2	43·0	47·8	45·6	S.W.	Cir. St.	10	W.	0·050
10	29·235	51·9	43·6	46·4	43·2	W.	Cir.	1	W.	0·060
11	29·092	50·0	40·5	42·1	40·8	S.W.	Cir.	2	W.	0·000
12	28·959	49·1	42 0	45·0	42·0	W.	Cir. St.	2	W.	0·010
13	29·412	48·0	36·7	38·0	35·8	S.W.	...	0	...	0·340
14	28·743	50·7	37·3	43·0	40·7	W.	...	0	...	0·000
15	29·000	48·8	39·8	42·9	39·8	S.W.	...	0	...	0·000
16	29·484	48·1	39·1	44·0	40·9	S.W.	Cir. St.	1	W.	0·000
17	29·700	50·0	43·6	50·0	46·9	S.W.	Cir. St.	10	S.W.	0·000
18	29·970	55·0	39·7	41·6	39·1	S.E.	Cir.	1	W.	0·030
19	30 016	50·2	41·3	46·7	45·6	S.W.	St.	10	S.W.	0·020
20	29·706	54·1	46·7	53·1	50·9	S.W.	Nim.	10	S.W.	0·175
21	30·150	54·6	39·4	43 0	41·1	W.	Cir. St.	8	W.	0·005
22	29·941	52·7	42·8	52·7	49·0	S.W.	St.	10	S.W.	0·000
23	30·182	54·4	33·9	34·1	34·0	S.W.	...	0	...	0·005
24	30·441	49·2	33·0	38·1	38·1	S.E.	Fog.	10	...	0·000
25	30·396	45·9	37·8	45·8	45·1	Var.	St.	10	S.E.	0·000
26	30·379	48·0	33·0	33·1	32·9	W.	...	0	...	0·000
27	30·416	40·8	28·8	32·0	32·0	S.W.	St.	8	S.W.	0·000
28	30·218	47·1	31·9	47·1	46·1	W.	St.	10	W.	0·000
29	30·049	51·2	47·0	51·1	49·4	S.W.	...	0	...	0·000
30	30·434	52·8	36·1	37·7	36·9	W.	...	0	...	0·000

Barometer.—Highest Observed, on the 24th, = 30·441 inches. Lowest Observed, on the 14th, = 28·743 inches. Difference, or Monthly Range, = 1·698 inch. Mean = 29·705 inches.

S. R. Thermometers.—Highest Observed, on the 3rd, = 61°·2. Lowest Observed, on the 27th, = 28°·8. Difference, or Monthly Range, = 32°·4. Mean of all the Highest = 51°·9. Mean of all the Lowest = 41°·2. Difference, or Mean Daily Range, = 10°·7. Mean Temperature of Month = 46°·5.

Hygrometer.—Mean of Dry Bulb = 45°·6. Mean of Wet Bulb = 43°·5.

Rainfall.—Number of Days on which Rain fell = 14. Amount of Fall = 1·200 inch. Greatest fall in 24 hours, on the 13th, = 0·340 inch.

A. D. RICHARDSON,
Observer.

III. Stem-Ringing Experiments on Broad-Leaved (Dicotyledonous) Deciduous Trees. By A. D. Richardson.

The experiments detailed here were made, at Professor Balfour's suggestion, in the winter of 1893–94, in order to ascertain what effects would be produced on broad-leaved trees possessing a heart-wood (duramen), as compared with those possessing no heart-wood, by the removal from their stems of a cylinder of bark along with a certain amount of the underlying wood. At the same time the familiar operation of ringing the bark was performed for purposes of comparison.

For the experiments ten trees, consisting of five kinds, viz., two maples, two beeches, two horse-chestnuts, two laburnums, and two oaks (common and Turkey) were selected. From one tree of each kind there was removed a cylinder of bark (rind) and wood about six inches long, and from the other a cylinder of bark of the same length. The thickness of the cylinder of bark and wood varied with the kind of tree. In the maple, beech, and horse-chestnut its cross-sectional area amounted to one-half that of the whole stem (including bark) at the part operated upon; but in the oak and laburnum it consisted of the bark and underlying sapwood (alburnum) only, which in the oak amounted to two-thirds, and in the laburnum to one-third of the cross-sectional area of the stem.

Briefly, the results which followed these experiments were:—

In no case, as was to be expected, was any perceptible effect upon leafage produced by the removal of bark only; nor was any perceptible effect produced by the removal of both bark and wood in the case of those kinds which form no true heart-wood, viz., maple, beech, and horse-chestnut. Foliation and defoliation took place in these cases quite normally, and the density of the foliage did not seem in any instance to be less than usual. The oak and laburnum from which both bark and wood were removed fared differently. The oak was killed above the part operated upon, but continued to live below that part. The laburnum, however, was killed outright.

The results of these experiments point to the following conclusions:—

1st. In those species which form no true heart-wood, the water ascends freely through the central portion of the stem as well as through the outer portion.

2nd. In those species which form a true heart-wood (duramen), the ascent of the water is confined to the region of the sapwood (alburnum).

The results are the outcome of one year's observation only, but the subsequent fate of the trees will be recorded.

The following appearances were produced during the succeeding summer on the stems at the parts which had been operated upon:—

Horse-chestnuts (*Æsculus Hippocastanum*, Linn.).—Where the bark only had been removed, a callus was formed at the cut edge of the cambium both above and below, and from the under one a thick crop of shoots was produced. Where both bark and wood had been removed, a callus was formed both above and below, but from the under one a few shoots only were produced.

Maples (*Acer Pseudo-Platanus*, Linn.).—Where the bark only had been removed, a callus was formed above, but none was formed below. Where both bark and wood had been removed, a callus was formed both above and below, and a few shoots were produced from the under one.

Beeches (*Fagus sylvatica*, Linn.).—Where the bark only had been removed, a callus was formed both above and below (principally above), but no shoots were produced. Where both bark and wood had been removed, a slight callus was formed below, but none was formed above. No shoots were produced.

Oaks (*Quercus Cerris*, Linn., and *Q. Robur*, Linn.).—In the Turkey oak, from which the bark only had been removed, a callus was formed both above and below, but no shoots were produced. (It may be interesting to note that in this case small isolated patches of phloëm, which had been left adhering to the stem in the operation of barking, developed a well-marked callus all round their edges. The supplies of nourishment which these received must have been conveyed through the medullary rays.) In the British oak, from which the bark and all the underlying sap-wood had been removed, no callus was produced below, although the stem beneath continued to live and to send out shoots from its sides.

Laburnums (*Laburnum vulgare*, Presl).—Where the bark only had been removed, a callus was formed above and a very slight one below, but no shoots were produced.

IV. On Plants in the Plant Houses. By R. L. Harrow.

The dull days of November have brought a large reduction in the number of flowering plants in the houses of the Royal Botanic Garden, not more than fifty species having during that period produced their flowers. In the cool houses, the chrysanthemums, acacias, and other winter-flowering plants have done much to relieve the dense green of the foliage. The mild weather experienced during that time having considerably hastened the blooms of several of the late winter and spring flowering plants. A group of Cypripediums and the deciduous Calanthes, especially *C. Veitchii* and *C. vestita*, var. *oculata*, have given a rather pretty effect. Among the most interesting of the plants that have flowered are:—

Bignonia venusta, Ker-Gawl. A Brazilian species, ranking amongst the most lovely of the genus; and, although introduced to cultivation in 1816, seldom seen in our gardens. It is a vigorous growing climber, shoots nearly thirty feet in length having this year been made in the Palm House. The foliage at the base of the shoots is occasionally ternate, while at the extremities tendrils only are often produced. The inflorescences are clustered on short axillary branches, the flowers being of a rich orange colour, the tube of the corolla about two inches long.

Melastoma malabathricum, Linn. This also is seldom seen in cultivation, and is a native of India and Malaya. In the "Botanical Magazine," t. 529, this species is stated to be the one upon which the genus was founded by Professor Burman. The habit is shrub-like, the foliage possessing the prominent veins common to the order Melastomaceæ. The flowers are solitary and terminal; the petals dark purple.

Luculia gratissima, Sweet. The genus *Luculia* contains only two species, the one under notice, which inhabits temperate regions of the Himalayas, and *L. Pinceana*, Hook., a native of the Khasia Hills. *L. gratissima* is one of the handsomest of our winter-flowering greenhouse plants; the inflorescence forming terminal cymes of light pink flowers, which, as the specific name implies, are strongly perfumed. *L. Pinceana* is distinguishable from it by closer veins upon the foliage, and by the small interpetaline lobes upon the corolla. The genus is evidently heterostylic. Our plant of *L. gratissima* is short-styled, our plants of *L. Pinceana* are long-styled.

Of other plants that have flowered the following may be mentioned:—*Cattleya Bowringiana*, Veitch,—a native of Honduras; and *C. labiata*, Lindl.,—a variable species from tropical America, one of the best of winter-flowering orchids; *Oldenlandia Deppeana*, DC.,—a small-growing white-flowered plant of the order Rubiaceæ, inhabiting Mexico; *Clitoria Ternatea*, Linn.,—with pretty blue papilionaceous flowers, common in the tropics.

MEETING OF THE SOCIETY,

Thursday, January 10, 1895.

Professor F. O. Bower, President, in the Chair.

Mr. R. Stewart MacDougall, B.Sc., was elected Resident Fellow of the Society.

Intimation was made of the death of Lady Henry Grosvenor, Resident Fellow of the Society.

Mr. Dunn exhibited branches of *Cedrus Libani*, with cones, from Dalkeith Gardens; also fruits of *Amygdalus communis*, from open air at Dalkeith.

Mr. R. Turnbull exhibited specimens of a hybrid between the swede turnip and the green kail.

Surgeon-Major H. H. Johnston exhibited specimens of *Hieracium auratum*, Fr., from Orkney, a plant new to its flora.

Specimens of inflorescence of *Musa coccinea*, and of species of *Hæmanthus*, were exhibited from the Royal Botanic Garden.

The following papers were read:—

Supplementary Notes (No. 2) on the Marine Algæ of the Orkney Islands. By George Wm. Traill.

ISLAND OF NORTH RONALDSAY.

("*Rinansey*" *of the Saga.*)

This is the most northerly of the Orkney group, and is about fifteen miles in circumference, measuring by the shore line. The coast is, in general, rocky and exposed, and is surrounded on all sides by rapid currents.

Issued November 1895.

The locality is of great interest to the Algologist, and is well deserving of being thoroughly explored, not only on account of the luxuriance of the Algæ, but for the information to be gained relative to the geographical distribution of species. The species will often be found to have different habitats,—as well as different host-plants,—from those commonly observed in the southern islands, and in Scotland generally. They are altogether more northern in character.

At the west of the island, where the dip of the argillaceous-sandstone strata is at a gentle angle to the west, the pools between tide marks are numerous at all levels, and are of greatly varying depths. In these pools, especially, the Algæ are to be found growing in luxuriance, representing many species.

Notwithstanding indifferent health and failing sight, I succeeded in collecting 123 distinct species, including many rarities, in the course of a fortnight's work last August; but that number would doubtless have been considerably increased had my time been less limited. Of these, the following ten have not hitherto been observed in Orkney:—

1. *Dictyosiphon Chordaria*, Aresch.; *forma gelatinosa*, Reinke.—In shallow pools at a high level. Not uncommon at Risegjo, also at Noustar, and at South Bay, S.E. from Howmae, sometimes in bushy, robust specimens. Mr. E. Batters, to whom I am greatly indebted for his kindness in examining part of my North Ronaldsay collection, and in identifying this, amongst other doubtful species, informs me that these correspond with the specimens gathered by Reinke and sent out by him in the "Phycotheca Universalis," and that they, probably, should be referred to his *forma gelatinosa*, which comes very near to *Dictyosiphon Mesogloia*, Aresch., and forms a connecting link between the two species. *Dictyosiphon Chordaria* was first found in Britain by Mr. Batters at Berwick-on-Tweed, and he subsequently found it at Cumbrae, while on the British Museum Working Committee, which was formed for the investigation of the Marine Flora of western Scotland. It is properly a Scandinavian species.

2. *Codiolum pusillum* (Lyngb.), Fosl. (*non* Kjellm. Alg. Arct. Sea).—In shallow pools between tide marks, at a high level, near the "Natural Bridge," in abundance; also at Scarvigjo.

This Codiolum, after a careful examination, by Messrs. Batters and Foslie, has been referred to *C. pusillum* (Lyngb.), Fosl. The so-called species of *Codiolum*, however, run into each other in a very puzzling manner. They differ chiefly in measurements, and—as Mr. Batters remarks—measurements are somewhat uncertain tests, especially if taken, as in the present case, from barren plants.

Mr. Foslie writes to me as follows:—"In my opinion your Codiolum is most nearly related to *C. pusillum* (Lyngb.), Fosl. (*non* Kjellm. Alg. Arct. Sea). It differs from *C. gregarium*, according to A. Braun's description in 'Alg. Unicell.,' in that the stipe most often passes into the club without any limit, and the latter thinner in proportion to the length than in *C. gregarium*. It is slightly larger than the form of *C. pusillum* collected by Lyngbye at the Faröe Islands, and agrees better with the form of that species found in Finmarken, and recorded by me in 'Contrib.' I., p. 151, and not identical with the species mentioned by Kjellman under the same name in 'Alg. Arct. Sea,' which I have called *C. cylindraceum*. These two species are certainly nearly related, but cannot in my opinion (and Kjellman's) be considered as forms of *C. gregarium*."

Professor Kjellman, in "Alg. Arct. Sea," p. 319, writes:—"The genus *Codiolum* has shown itself of late to possess, in the northern seas, a considerable number of forms that are only slightly differentiated, and should possibly be justly regarded as forms of one and the same species. It is evidently a genus in the course of developing species. Nevertheless, the species distinguished ought to be kept up until more forms shall have been discovered at other places. This will, no doubt, happen now, since more attention has been directed to these small and easily overlooked Algæ."

3. *Hydrocoleum lyngbyaceum*, Kütz., *forma rupestris*, Kütz.—At Noustar, in shaded crevices, at a high level.

This form has been found only at two other localities, namely, Berwick and Cumbrae, by Mr. Batters; but the typical form is found at several stations along the coast.

4. *Ceramium circinnatum* (Kütz.), J. Ag.—In pools between tide marks at Risegjo, Noustar, etc., sometimes epiphytic on *Codium tomentosum*, and other small Algæ; also in caverns, and damp shaded places.

5. *Cladophora utriuscula*, Kütz.—In clear shaded pools between tide marks at a high level, with *Lithothamnia* and *Corallina officinalis*; especially in the vicinity of Risegjo. Common.

6. *Enteromorpha minima*, Näg.—On rocks between tide marks, at a high level, at Sealskerry; at the Lighthouse pier; and at the north end of the Island, generally.

7. *Phyllophora Traillii* (Holm.), Batt.—On rocks north of the lighthouse at low water, in the shade, in abundance, and often in well-grown specimens; also at Noustar, in dark crevices. All the year. Fruits in winter.

8. *Ectocarpus erectus*, Kütz.—Growing out of minute cracks or flaws in the smooth rock at the bottoms of shallow pools, at Noustar, near high-water mark.

9. *Ectocarpus terminalis*, Kütz.—Epiphytic on *Corallina officinalis, Cladophora rupestris*, etc., in pools between tide marks. Risegjo, etc.

10. *Polysiphonia pulvinata*, Phyc. Britt.—In pools between tide marks at the "Natural Bridge," rare.

Ectocarpus velutinus (Grev.), Kütz. (*Elachista velutina*, Fries.).—Epiphytic on *Himanthalia lorea*; usually associated with *Elachista scutulata*. Annual. June to October. Fruits usually in July and August. Omitted in my South Ronaldsay list.

The following, though not new, are deserving of mention as specialties of the island:—

Ceramium ciliatum, Ducluz.—In shallow pools at a high level, a little to the north of Risegjo; common, but of small size. This species was included in my "Marine Algæ of Orkney," on Harvey's authority, but no definite locality has been recorded until now.

Desmarestia ligulata (Light.), Ag.—Cast ashore in considerable abundance after gales, and often of large size. Fronds from 3 to 6 feet long.

Cladophora arcta (Dillw.), Kütz.—Abundant everywhere, and in various forms, in pools between tide marks.

Callithamnion tetragonum (With.), Ag.—Cast ashore at the west of the island, after gales, in great abundance, and in fine specimens; epiphytic on *Laminaria hyperborea.* These specimens are often associated with a *Porphyra* considered by Mr. Batters to be a variety of *P. miniata,* J. G. Ag.; *non Diploderma miniata,* Kjellm.

After giving effect to the ten new species before mentioned, and to those which I found in South Ronaldsay on a former occasion, the total for Orkney now amounts to 253.

GNAPHALIUM UNDULATUM, L., A CUDWEED NEW TO THE "LONDON CATALOGUE," FROM JERSEY. By A. SOMERVILLE, B.Sc., F.L.S.

During the past summer (1894) there has been found growing on the island of Jersey a composite, *Gnaphalium undulatum,* not included in our Floras nor in the "London Catalogue" of British vascular plants. As it seemed quite naturalised where met with, it may probably hereafter be included as an addition to the British flora. I have received dried specimens both from Miss Dawber, of Guernsey, and from the Rev. J. D. Gray, author of a "Flora of Suffolk," and these I have the pleasure to show to-night.

Specimens of the plant have been submitted to Mr. J. G. Baker, F.R.S., Keeper of the Herbarium at the Royal Gardens, Kew. He confirms their identification, and in writing of the species says: "It is a native of the Cape of Good Hope. We have a French specimen labelled 'A plant indigenous to the Cape of Good Hope, naturalised now for forty years at Plouescat, and beginning to spread along the coast.'"

On a reference to Nyman's "Conspectus of the Floras of Europe," I find *G. undulatum,* L., stated to be a Cape plant, but also now a colonist on the western coast of France, occurring at Cherbourg, Lannevez, and elsewhere.

THE GENUS GLOIOPELTIS.* By Professor FR. SCHMITZ, Greifswald.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF DECEMBER 1894. By ROBERT LINDSAY, Curator.

The weather during December was exceedingly mild, with comparatively little frost or snow, and but for the severe gales which occurred towards the close of the month it would have been one of the most favourable Decembers on record. Owing to the mildness, spring-flowering bulbous plants, such as *Iris reticulata*, *Narcissus incomparabilis*, *N. minor*, *N. triandrus*, *Crocus vernus*, *Galanthus nivalis*, etc., were well started into growth, the young shoots, in some cases, being nearly an inch above the ground. *Rhododendron Nobleanum*, *Garrya elliptica*, *Jasminum nudiflorum*, *Schizostylis coccinea*, and varieties of primrose were in flower during the month.

On the rock-garden no new plants came into flower during December. The total number of species and varieties which have flowered on the rock-garden during the year 1894 amounts to 1143, as against 1114 for 1893. The largest number came into flower during the month of June.

The number of species which came into flower each month was as follows:—January, 22; February, 41; March, 75; April, 153; May, 227; June, 288; July, 193; August, 94; September, 30; October, 18; November, 2; December, 0—total, 1143.

* Owing to the untimely death of the author, it has not been possible to have this paper prepared for publication in this part of the "Transactions," but it is hoped it may appear in a subsequent one.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF DECEMBER 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	30·378	45·7	37·8	42·8	41·2	S.W.	Cir.	4	N.W.	0·000
2	30·309	44·9	39·5	39·7	38·8	S.W.	St.	10	S.W.	0·000
3	30·036	39·8	32·3	36·8	36·8	S.E.	Fog.	8	...	0·000
4	29·801	36·8	31·1	36·7	35·7	S.E.	St.	10	S.E.	0·020
5	29·830	42·9	35·0	35·0	35·0	S.E.	Cir.	8	S.E.	0·020
6	29·811	43·2	35·0	39·6	38·2	W.	St.	10	W.	0·020
7	29·598	43·7	39·2	41·1	40·1	E.	Nim.	10	E.	0·060
8	29·823	47·0	35·2	35·6	35·2	W.	...	0	...	0·000
9	29·950	43·8	29·0	36·9	35·6	S.	Fog.	1	...	0·020
10	29·683	50·6	36·1	49·9	47·8	S.W.	Cir.	3	S.W.	0·000
11	29·766	53·4	47·9	53·4	50·1	S.	St.	10	S.	0·265
12	29·764	54·0	40·6	41·4	40·9	S.W.	Cir.	6	N.W.	0·000
13	29·484	54·2	40·8	53·1	50·1	S.W.	Nim.	10	S.W.	0·135
14	29·852	55·3	43·3	45·0	42·8	S.W.	St.	10	S.W.	0·095
15	29·603	47·1	39·0	39·2	37·8	W.	Cir.	6	N.W.	0·070
16	29·952	43·3	35·0	35·8	35·0	W.	Cir.	3	N.W.	0·350
17	29·678	43·2	34·5	42·1	41·2	W.	Nim.	10	W.	0·190
18	29·003	48·6	40·4	40·9	39·1	W.	Cir. St.	10	W.	0·010
19	29·182	41·8	35·1	37·9	35·9	W.	Cir. St.	8	N.	0·000
20	30·015	45·3	37·7	39·9	36·9	W.	...	0	...	0·000
21	29·791	47·1	34·1	43·6	40·4	S.W.	Cir.	6	N.W.	0·480
22	28·319	51·8	38·8	45·6	43·1	W.	Nim.	10	W.	0·020
23	29·874	46·0	36·2	42·6	40·0	S.W.	Cir.	6	N.W.	0·000
24	29·964	45·1	35·2	39·8	39·8	N.W.	Fog.	8	...	0·010
25	30·259	47·4	38·5	47·4	46·8	W.	St.	10	W.	0·000
26	30·256	50·7	47·2	48·9	47·7	S.W.	Cir. St.	9	W.	0·000
27	30·490	49·0	37·6	40·0	36·8	W.	St.	5	N.W.	0·000
28	29·972	44·7	37·2	43·0	41·6	S.W.	St.	10	S.W.	0·230
29	28·876	47·9	32·0	33·6	32·3	N.W.	...	0	...	0·000
30	29·308	38·7	30·4	35·7	32·4	W.	...	0	...	0·000
31	29·756	36·9	29·4	32·3	30·0	N.W.	St.	5	N.	0·000

Barometer.—Highest Observed, on the 27th, = 30·490 inches. Lowest Observed, on the 22nd, = 28·319 inches. Difference, or Monthly Range, = 2·171 inch. Mean = 29·754 inches.

S. R. Thermometers.—Highest Observed. on the *14th, = 55°·3. Lowest Observed, on the 9th, = 29°·0. Difference, or Monthly Range, = 26°·3. Mean of all the Highest = 46°·1. Mean of all the Lowest = 36°·8. Difference, or Mean Daily Range, = 9°·3. Mean Temperature of Month = 41°·4.

Hygrometer.—Mean of Dry Bulb = 41°·1. Mean of Wet Bulb = 39°·5.

Rainfall.—Number of Days on which Rain fell = 16. Amount of Fall = 1·995 inch. Greatest Fall in 24 hours, on the 21st, = 0·480 inch. First fall of snow for season, on night of 28th. A. D. RICHARDSON, *Observer.*

* The date inserted here, in this and in all previous monthly reports, is that on which the reading was observed, and is that following the occurrence of the maximum. After now the date upon which the monthly maxima actually occur will be inserted.

III. ABSTRACT OF METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING 1894.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-level, 76·5 feet. Hour of Observation, 9 A.M.

Months.	Barometer, corrected and reduced to 32°. (Inches.)						Thermometers, protected, 4 feet above grass.												Rainfall. (Inches.)			
	Highest Observed.		Lowest Observed.		Range	Mean.	Self-Registering Thermometers. Highest Observed.		Lowest Observed.		Range	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Mean Temperature.		Hygrometer. Mean of Dry Bulb.	Mean of Wet Bulb.	No. of Days on which Rain fell.	Amount.	Greatest Fall in 24 Hours.	
	Date.	Reading.	Date.	Reading.			Date.	Reading.	Date.	Reading.											Date.	Amount
January,	3	30·683	20	28·898	1·785	29·566	12	52°·8	7	11°·8	41°·0	43°·0	32°·3	10°·7	37°·6		37°·0	35°·3	23	2·330	27	0·360
February,	19	30·350	12	28·968	1·382	29·680	7	53·8	14	23·9	29·9	45·0	34·0	11·0	39·5		38·6	37·1	22	6·697	16	1·650
March,	23	30·419	13	28·786	1·633	29·723	31	65·6	17	28·1	37·5	50·9	34·7	16·2	42·8		41·8	40·1	14	1·480	1	0·340
April,	5	30·217	17	29·289	0·928	29·803	11	63·0	2	32·1	30·9	54·3	40·2	14·1	47·2		47·4	45·0	16	1·670	18	0·350
May,	24	30·411	10	29·370	1·041	29·879	26	63·1	21	31·7	31·4	54·0	40·1	13·9	47·0		48·2	44·6	26	2·805	14	0·480
June,	30	30·385	11	29·556	0·829	29·890	27	72·7	6	38·2	34·5	60·8	47·9	12·9	54·3		55·8	52·4	16	2·555	10	0·820
July,	1	30·278	12	29·129	1·149	29·762	*7	76·9	21	45·8	31·1	64·5	52·1	12·4	58·3		58·1	55·5	19	2·542	2	0·570
August,	25	30·190	15	29·083	1·107	29·745	9	69·0	23	42·3	26·7	63·4	50·2	13·2	56·8		57·0	53·5	18	3·380	2	1·135
September,	30	30·478	23	29·816	0·662	30·145	1	65·7	28	36·6	29·1	58·7	46·0	12·7	52·3		52·9	49·8	11	0·455	23	0·225
October,	1	30·426	24	29·189	1·237	29·855	13	64·3	23	25·4	38·9	53·0	39·8	13·2	46·4		46·0	44·0	17	2·785	23	0·595
November,	24	30·441	14	28·743	1·698	29·705	3	61·2	27	28·8	32·4	51·9	41·2	10·7	46·5		45·6	43·5	14	1·200	13	0·340
December,	27	30·490	22	28·319	2·171	29·754	14	55·3	9	29·0	26·3	46·1	36·8	9·3	41·4		41·1	39·5	16	1·995	21	0·480
For Year,	Jan. 3	30·683	Dec. 22	28·319	2·364	29·792	*July 7	76·9	Jan. 7	11·8	65·1	53·8	41·3	12·5	47·5		47·5	45·0	212	29·894	Feb. 16	1·650

* See note on preceding page.

A. D. RICHARDSON, *Observer.*
W. DAVIDSON, *Interim Observer.*

IV. ON METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING 1894.

PRESSURE.

The mean atmospheric pressure, reduced to 32° at 9 A.M., for the year was 29·792 inches, being 0·002 inch above the average of the three previous years.

TEMPERATURE.

The highest shade temperature for the year was 76°·9, on the afternoon of 6th July, being the lowest maximum for four years.

The lowest shade temperature for the year was 11°·8, on the morning of 7th January, being the highest minimum for four years, with the exception of 1891.

The range of the shade temperature for the year was 65°·1, being the least for four years, with the exception of 1891.

The mean of all the highest shade temperatures for the year was 53°·8, being 0°·7 above the average of the three previous years.

The mean of all the lowest shade temperatures for the year was 41°·3, being 1°·0 above the average of the three previous years.

The mean shade temperature for the year was 47°·5, being 0°·8 above the average of the three previous years.

July was the warmest month of the year, with a mean shade temperature of 58°·3 ; January the coldest, with a mean of 37°·6.

Frost was registered in the shade at 4 feet above the ground on forty-three days during the year.

RAINFALL.

The number of days on which rain fell during the year was 212, being the greatest number in any year for four years, with the exception of 1892. The total fall was 29·894 inches, being the greatest for four years, and

4·607 inches above the greatest of the three previous years (1891).

September was the driest month, with a fall of 0·455 inch; February the wettest, with a fall of 6·697 inches.

GENERAL REMARKS.

The outstanding features of the year were the unprecedentedly heavy rainfall for February; the excessively light rainfall for September; the high mean temperature of November (46°·5); and the great gale of the 21st and 22nd of December.

A. D. RICHARDSON,
Observer.

V. ON VARIATION IN THE LEAVES OF THE WHITE BEAM TREE (PYRUS ARIA, LINN.), WITH EXHIBITION OF DRIED SPECIMENS. By A. D. RICHARDSON.

The occurrence of two kinds of leaves in this species was observed in the autumn of 1894, when the leaves were falling from the trees. It was observed in two trees, one about 18 and the other about 16 feet in height. Whether it is a constant character in trees of all ages of this species I am as yet unable to say, as at the time it was observed in these two plants most of the trees had shed their leaves.

The leaves, which differ from the normal type of *Pyrus Aria*, are produced at the bases of the terminal buds on the elongated vegetative shoots, *i.e.*, they are the last leaves produced on these shoots for the season. They differ from the type in having fewer primary lateral veins, and in these being less prominent on the under side of the leaf. Also, the primary veins in these leaves are less regularly parallel to each other in arrangement, and the secondary veins are more prominent than those of the type, so that the venation as a whole has a more reticulated appearance than that of the typical leaf.

It would appear that this fact may not be without significance, inasmuch as so much importance is attached to venation in the discrimination of the forms of this and allied species of *Pyrus*.

VI. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

December may be considered as the least floriferous of the year, and not more than twenty-five species of plants have, during that time, produced their flowers in the plant houses. The majority of these are natives of the tropics. Among them the most interesting are the following:—

Hæmanthus albiflos, Jacq.—A native of the southern provinces of Cape Colony, and an old, but seldom seen, introduction. Its stout peduncles, about 9 inches long, bear a dense umbel of white flowers, picked out by the protruding bright yellow anthers.

Crinum Macowani, Baker.—This species, which in some respects resembles *C. Moorei*, Hook, f., is a robust growing species, with a large bulb; the leaves attaining a length of from two to three feet. The peduncles are strong, of three or more feet in height, carrying an umbel of large, pinkish flowers. It was first figured from a plant flowered at Kew in 1878, but Mr. Baker, F.R.S., states in the "Gardeners' Chronicle" that the plant had been known to him in cultivation at Kew for several years previous; he was, however, unaware of its history until dried specimens were received from Professor M'Owan, of M'Gill College, Cape Colony.

Others worthy of note are:—*Anthurium Andræanum*, Linden,—a native of Columbia, possessing a large, red spathe, and one of the most showy species of the genus; *Oberonia iridifolia*, Lindl.,—an orchid of quaint appearance, with its flowers in dense cylindrical spikes, a native of India; *Trevesia palmata*, Vis.,—a member of the order Araliaceæ, which, in its native habitat, India, is said to reach a height of 15 feet.

MEETING OF THE SOCIETY.

Thursday, February 5, 1895.

WILLIAM OLIPHANT GIBB was elected Resident Fellow of the Society.

The death of FR. SCHMITZ, Professor of Botany in the University and Director of the Botanic Garden, Greifswald, was intimated.

Twigs of *Erica australis*, showing frost-crack, were exhibited from the Royal Botanic Garden.

The following papers were read:—

REPORT ON THE FLORA OF THE OUTLYING ISLANDS IN MAHÉBOURG BAY, MAURITIUS. By Surgeon-Major H. H. JOHNSTON, Army Medical Staff, D.Sc., F.R.S.E., F.L.S.

On the south-east side of Mauritius there is a wide inlet of the Indian Ocean named Mahébourg Bay, which is protected by a broad coral reef from the surf caused by the prevalent south-east trade wind. This reef extends 13 miles, in a north-easterly direction, from Pointe Vacoas, in Grand Port, to a point 2 miles distant from the mouth of the Grand River South-East in Flacq. Between the reef and the south-east coast of Mauritius there is a shallow sea 3–20 fathoms deep. The reef itself is from $\frac{3}{4}$–2 miles wide, and a considerable part of it is uncovered by the sea at low spring tides. Towards the south-west end of the reef there is a broad gap, 600 yards wide and 34 fathoms deep, called the South Entrance to Grand Port. At the outer margin of the reef, extending in a north-easterly direction from the South Entrance, there is a linear group of six small islands, lying between 20° 22′

and 20° 24′ south latitude. On their south-east or windward side the sea becomes suddenly deep, and the 100-fathom line of soundings is reached at a distance of 2 miles from the shore. The surf breaks with considerable force on the windward side of the islands, and it continually bathes them with fine clouds of saline spray.

The islands range from 40–300 yards in length, and from 12–40 feet in height above sea-level at the highest part. They are all formed of the same kind of coralline limestone, and their formation is entirely different from the igneous basaltic rock of the main island of Mauritius. The surface of the limestone is considerably honeycombed by the action of the weather and sea-spray, and in many places the rock projects upwards in numerous sharp pinnacles. Beyond a little limestone débris here and there and a sprinkling of blown calcareous sand at some parts, there is no soil covering the surface of the rock; and, at some parts of the islands, it is remarkable to see how well the rocky surface is clothed with luxuriant vegetation of a littoral character.

There are no springs of fresh water on any of the islands, and when rain falls it quickly disappears through the porous limestone.

The mean annual temperature in the shade is about 75° Fahr. The mean annual rainfall at Anse Jonchée on the adjacent coast of Mauritius, for the 9 years 1880–1888, was 88·58 inches, and the mean annual number of days of rainfall, during the same period, was 142; but it is probable that the rainfall of these islands is less, on account of their greater distance from the hills of Mauritius.

I visited the islands of the group on three occasions, viz., in the cool dry season in October 1888 and September 1889, and in the hot rainy season in March 1890, and I thoroughly investigated the flora at these different seasons. During my last two visits I resided for four days on each occasion in the lighthouse on Ile aux Fouquets.

I am not aware of any published report on the flora and physical features of these islands, and I have, therefore, entered more into detail than I otherwise would have done, had the flora of the group been better known.

The following table shows the number of species in each of the three divisions of the vegetable kingdom:—

Class.	Native.	Naturalised.	Planted.	Total.
I. Dicotyledones .	17	8	7	32
II. Monocotyledones .	10	—	—	10
III. Cryptogamia .	11	—	—	11
Total . .	38	8	7	53

Of the 38 native species of plants, the Dicotyledons include 17 species, or less than half of the total number. There are 10 species of Monocotyledons, so that these are in the proportion of 1 to $1\frac{7}{10}$ of the Dicotyledons; whereas, in the flora of Mauritius, the proportion of these two classes to each other is as 1 to 2. There are 11 species of Cryptogams (including 1 marine Alga), but these are by no means abundant. The 38 native species belong to 20 natural orders, or almost 2 species to an order on an average. The number of species in the larger orders are:—Gramineæ, 7; Lichenes, 6; Algæ, 4; and Portulaceæ, Compositæ, Boraginaceæ, Convolvulaceæ, and Euphorbiaceæ, 2 each. Of the 27 native species of Phanerogams, the following 6 species are not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles," viz.:—*Sida diffusa*, *Portulaca psammotropha*, *Ipomœa glaberrima*, *Phyllanthus mauritianus*, *Fimbristylis obtusifolia*, and *Lepturus repens*. Of these, *Phyllanthus mauritianus* is a new species.

The following table shows the number of species in each island of the group:—

Island.	Native.	Naturalised.	Planted.	Total.
Ile de la Passe . .	14	3	—	17
Ile Vakois . . .	25	—	—	25
Ile aux Fouquets . .	19	4	6	29
Ile aux Fous . .	1	—	—	1
Ile Marianne . .	26	1	2	29
Rocher des Oiseaux .	1	—	—	1

Of the 38 native species, *Sesuvium Portulacastrum* is the only one which grows in all the six islands of the group; and in the two small rocky islets of Ile aux Fous and Rocher des Oiseaux this species is the only one which occurs.

The native flora of this group of islands is of a tropical maritime character. The number of species is small. The rocky coralline limestone, the absence of fresh water, and the frequent saturation of the ground with saline spray, are all conditions unfavourable to the growth of a large number of species. The number of species to a natural order is only 2 on an average; and the 38 native species belong to 35 different genera. *Portulaca, Ipomœa*, and *Ramalina* contain 2 species each, and the remaining 32 genera only 1 species each. There is an entire absence of trees, and the tallest shrub does not exceed 6 feet in height. All the plants of *Boerhaavia diffusa*, growing on the coralline limestone have a pale green perianth-limb, with white lobes and white filaments, whereas all the plants of the same species, observed by me, growing on the volcanic tuff in Round Island in 1889, had a purple perianth and dark purple filaments.

There are 8 naturalised species, which all belong to the Dicotyledons. They occur in the two inhabited islands of Ile aux Fouquets and Ile Marianne, and in Ile de la Passe, which was formerly occupied by trôops. *Sophora tomentosa* in Ile Marianne, *Opuntia monacantha* and *Ipomœa Nil*, in Ile de la Passe, and *Nicotiana Tabacum* in Ile aux Fouquets, are not recorded as naturalised in Mauritius by Baker.

There are 7 planted species, which all belong to the Dicotyledons. They occur in the two inhabited islands of Ile aux Fouquets and Ile Marianne, near the lighthouse and caretaker's house respectively.

The remainder of my paper contains a complete list of all the plants observed by me in each of the six islands of the group. I have followed the nomenclature of Baker's "Flora of Mauritius and the Seychelles," so far as the species are described in that book. The Cryptogams were identified by Mr. G. Massee and Mr. C. H. Wright, of Kew Herbarium, and I am also indebted to Mr. N. E. Brown and Dr. O. Stapf, of the same institution, and to Mr. C. B. Clarke, for the identification of some critical species.

Under many of the species I have entered notes of my own, taken from living specimens.

An asterisk before the name of a species means that the plants of that species are naturalised. The names of planted species are enclosed in brackets, thus [ ].

ILE DE LA PASSE.

Ile de la Passe is situated at the South Entrance to Grand Port, and it lies three miles north-east of Pointe d'Esny, and the same distance south-west of Old Grand Port, on the main island of Mauritius. The island is about 200 yards long from east to west, about 150 yards broad at the widest part, and 30 feet above sea-level at the highest part. At the south side of the island there is an overhanging cliff, 15 feet high, against which the ocean surf continually breaks. A considerable part of the surface is covered with the ruins of an old fort; but the island has not been inhabited for a good many years past. The sheltered parts of the island are fairly well clothed with vegetation, mostly of an herbaceous character, with a less quantity of low shrubby plants. I botanised on Ile de la Passe on 26th October 1888, and 18th March 1890.

The following table shows the number of species in each of the three divisions of the vegetable kingdom :—

CLASS.	Native.	Naturalised.	Total.
I. Dicotyledones . .	9	3	12
II. Monocotyledones . .	4	—	4
III. Cryptogamia . . .	1	—	1
Total . . .	14	3	17

The 14 native species belong to 11 natural orders, or little more than 1 species to an order on an average. The number of species in the larger orders are Gramineæ 3, and Portulaceæ 2. Of the 13 native species of Phanerogams, the following 5 species are not recorded from Mauritius by Baker, viz. :—*Sida diffusa*, *Portulaca psammotropha*, *Phyllanthus mauritianus*, *Fimbristylis obtusifolia*, and *Lepturus repens*.

SIDA DIFFUSA, H. B. K.—Baker, Flor. Maur. Seych., p. 19. 26th October 1888. Very common. This species is recorded as native in the Seychelles by Mr. John Horne, but it is not recorded from Mauritius.

PEMPHIS ACIDULA, Forst.—Baker, Flor. Maur. Seych., p. 101. Seashore, 26th October 1888. Common at the north side of the island.

SESUVIUM PORTULACASTRUM, Linn.—Baker, Flor. Maur. Seych., p. 108. Seashore, 26th October 1888. Common.

PORTULACA OLERACEA, Linn.—Baker, Flor. Maur. Seych., p. 125. 26th October 1888. Common. Stems $\frac{1}{4}$–1 foot long, procumbent.

PORTULACA PSAMMOTROPHA, Hance (*fide* N. E. Brown). 18th March 1890. Rare. For a description of this species, see under Ile aux Fouquets, in this report.

* CUCUMIS sp. Only one plant, in flower, observed by me at the south side of the island, 18th March 1890. Corolla yellow. The genus *Cucumis* is not native in Mauritius.

* OPUNTIA MONACANTHA, Haw. 26th October 1888. This species, which is a native of South America, is not recorded from Mauritius by Baker. It was also observed by me naturalised on a pasture, 10 feet above sea-level, Flat Island, 11th November 1887.

SONCHUS OLERACEUS, Linn. ex parte.—Baker, Flor. Maur. Seych., p. 180. 26th October 1888. Common.

TOURNEFORTIA ARGENTEA, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Seashore, 26th October 1888. Common.

* IPOMŒA NIL, Roth.—Baker, Flor. Maur. Seych., p. 209. 26th October 1888. Rare at the north side of the island. This species, which is dispersed throughout the tropics, is not recorded from Mauritius in Baker, Flor. Maur. Seych., though it was found naturalised in Rodriguez by Balfour according to Baker; but in Bojer, Hort. Maur., p. 227, it is recorded, under the name of *Pharbitis Nil*, as naturalised in great quantity at "Grand-Port," and in the ravines about "Reduit," Mauritius. It was also observed by me naturalised in Ile des Aigrettes, on 18th August 1888, and recorded in Trans. Bot. Soc. Edin., vol. xx., 1894.

IPOMŒA PES-CAPRÆ, Roth.—Baker, Flor. Maur. Seych., p. 211. 26th October 1888. Common. Stem-juice milky. Corolla pale purple, with a dark purple throat.

PHYLLANTHUS MAURITIANUS, H. H. Johnston, in Trans. Bot. Soc. Edin., vol. xx., p. 329. 26th October 1888. Very common.

Roots fibrous, brown. Stem short, with numerous simple, wiry, terete, glabrous, procumbent or rarely erect, leafy branches $\frac{1}{2}$–6 inches long. Leaves moderately close, alternate, shortly petioled, $\frac{1}{8}$–$\frac{1}{5}$ inch long, obovate or roundish-obovate, entire, very obtuse, with a rounded or cuneate base, glabrous, dark green above, glaucous or pale purplish-green beneath, sub-coriaceous, penni-nerved; petiole $\frac{1}{48}$ inch long, glabrous; stipules $\frac{1}{48}$ inch long, lanceolate, acute, entire, glabrous. Flowers monœcious, one male and one female together in the axils of most of the leaves, or rarely two male flowers without a female flower in the same axil, shortly pedicellate. Female flowers borne on glabrous pedicels $\frac{1}{36}$ inch long. Perianth deeply 6-lobed, persistent; lobes 3 outer and 3 inner, $\frac{1}{48}$ inch long, oblong-obovate, obtuse, entire, glabrous. Glands 3, opposite the inner perianth-lobes, oblong, truncate, entire, glabrous, membranous. Ovary glabrous, 3-celled, with 2 ovules in each cell; styles 3, bifid, spreading, glabrous. Capsules $\frac{1}{20}$–$\frac{1}{16}$ inch broad, depresso-globose, glabrous crowned with the persistent styles. Seeds $\frac{1}{40}$ inch long, triquetrous, with flat sides and convex back, glabrous, brown, finely ribbed longitudinally and transversely barred on the back. Male flowers smaller and borne on shorter pedicels than the female flowers. Perianth deeply 6-lobed; lobes 3 outer and 3 inner, $\frac{1}{60}$ inch long, oblong-obovate, obtuse, entire, glabrous. Glands 6, alternate with the perianth-lobes, roundish, glabrous. Stamens 3, central, without a rudimentary ovary.

P. mauritianus is distinguished from *P. Urinaria*, Linn., by having glabrous branches; small obovate or roundish-obovate, non-mucronate leaves, $\frac{1}{8}$–$\frac{1}{5}$ inch long; smooth capsules $\frac{1}{20}$–$\frac{1}{16}$ inch broad; and triquetrous seeds $\frac{1}{40}$ inch long, transversely and longitudinally ribbed on the convex back, without any pits on the sides. In *P. Urinaria* the branches are minutely hispid; leaves $\frac{1}{4}$–$\frac{1}{2}$ inch long, oblong, mucronate; capsule $\frac{1}{10}$ inch broad, rugose; seeds $\frac{1}{20}$ inch long, transversely but not longitudinally ribbed on the convex back, with 2–3 deep pits on each side.

P. mauritianus is endemic in Ile de la Passe, Ile Vakois, Ile aux Fouquets, Ile Marianne, and Ile des Aigrettes.

FIMBRISTYLIS OBTUSIFOLIA, Kunth (*fide* C. B. Clarke). Very common, 26th October 1888. This species is not recorded from Mauritius by Baker; and the description of *F. glomerata*, Nees, in Baker, Flor. Maur. Seych., p. 418 appears to refer to *F. spathacea*, Roth, Nov. Pl. Sp., p. 24.

PASPALUM DISTICHUM, Burm.—Baker, Flor. Maur. Seych., p. 431. 18th March 1890. Rare at the north and south sides of the island.

STENOTAPHRUM COMPLANATUM, Schrank.—Baker, Flor. Maur. Seych., p. 440. 26th October 1888. Very common.

LEPTURUS REPENS, R. Br. (*fide* E. Hackel). 18th March 1890. Rare at the south side of the island. See remarks on this species, under Ile Marianne, in this report.

CHÆTOMORPHA sp. Coralline limestone, 18th March 1890. Common.

ILE VAKOIS.

Ile Vakois is situated about 200 yards east of Ile de la Passe, from which it is separated by a shallow channel only a few feet deep. The island is about 200 yards long from east to west, about 70 yards broad at the widest part, and 15 feet above sea-level at the highest part. The surface of the ground is well clothed with low shrubs of *Suriana maritima*, and a coarse grass, *Stenotaphrum complanatum*, except at the east end of the island, where there are only scattered tufts of the fleshy-leaved *Sesuvium Portulacastrum*, among the bare sharp rocks, which are continually drenched with the spray of the ocean surf. Ile Vakois derives its name from the *Voçoas* (formerly spelt *Vakois*) or *Pandani*, which once grew on the island, but which have been exterminated by the fishermen, with the exception of one small plant I saw growing at the west end of the island. The island has never been inhabited; and all the plants I observed in it were native. I botanised on Ile Vakois on 5th September 1889, and 18th March 1890.

The following table shows the number of species in each of the three divisions of the vegetable kingdom:—

Class.	Native.
I. Dicotyledones	13
II. Monocotyledones . . .	4
III. Cryptogamia	8
Total	25

There are 8 species of Cryptogams; but with the exception of the two Algæ, *Chlorococcus*? and *Chætomorpha* sp., these are rare on the island. The 25 native species belong to 18 natural orders, or about $1\frac{1}{3}$ species to an order on an average. The number of species in the larger orders are Lichenes and Algæ 3 each, and Portulaceæ, Convolvulaceæ, and Gramineæ 2 each. Of the 17 native species of Phanerogams, the following 6 species are not recorded from Mauritius by Baker, viz.:—*Sida diffusa, Portulaca psammotropha, Ipomœa glaberrima, Phyllanthus mauritianus, Fimbristylis obtusifolia, Lepturus repens.*

The flora of Ile Vakois is remarkable in containing no naturalised plants. On the main island of Mauritius the naturalised species of Phanerogams amount to about a quarter of the total number. A common species of British sow-thistle, *Sonchus oleraceus*, grows on the seashore in Ile Vakois, where the mean annual temperature in the shade is about 75° Fahr. It is undoubtedly native in this locality.

Sida diffusa, H. B. K.—Baker, Flor. Maur. Seych., p. 19. 5th September 1889. See remarks on this species, under Ile de la Passe, in this report.

Suriana maritima, Linn.—Baker, Flor. Maur. Seych., p. 42. Very common. 5th September 1889.

Pemphis acidula, Forst.—Baker, Flor. Maur. Seych., p. 101. 5th September 1889. Common at the west end of the island, and rare at the north side.

SESUVIUM PORTULACASTRUM, Linn.—Baker, Flor. Maur. Seych., p. 108. Very common on the seashore, 5th September 1889.

PORTULACA OLERACEA, Linn.—Baker, Flor. Maur. Seych., p. 125. Common, 5th September 1889. Stems $\frac{1}{4}$–$2\frac{1}{2}$ feet long. See remarks on this species, under Ile aux Fouquets, in this report.

PORTULACA PSAMMOTROPHA, Hance (*fide* N. E. Brown). Common, 5th September 1889. For a description of this species, see under Ile aux Fouquets, in this report.

SONCHUS OLERACEUS, Linn. ex parte.—Baker, Flor. Maur. Seych., p. 180. Rare, 5th September 1889.

SCÆVOLA KŒNIGII, Vahl.—Baker, Flor. Maur. Seych., p. 182. Common at the west end of the island, 5th September 1889.

TOURNEFORTIA ARGENTEA, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Common at the west end of the island, 5th September 1889.

IPOMŒA PES-CAPRÆ, Roth.—Baker, Flor. Maur. Seych., p. 211. Common, 5th September 1889. Capsule not developed.

IPOMŒA GLABERRIMA, Bojer.—Baker, Flor. Maur. Seych., p. 211. Common at the seashore, 5th September 1889. This species is not recorded from Mauritius in Baker, Flor. Maur. Seych. It is recorded by me from Ile des Aigrettes in Trans. Bot. Soc. Edin., vol. xx. p. 325, and from Ile Marianne in this report, in both of which islands it is native.

BOERHAAVIA DIFFUSA, Linn.—Baker, Flor. Maur. Seych., p. 264. Common, 5th September 1889. See remarks on this species, under Ile Marianne, in this report.

PHYLLANTHUS MAURITIANUS, H. H. Johnston, in Trans. Bot. Soc. Edin., vol. xx. p. 329. Common, 5th September 1889. For a description of this species, see under Ile de la Passe, in this report.

PANDANUS sp. Only one plant, neither in flower nor fruit, at the west end of the island, 5th September 1889.

Plant 4 feet high, entirely supported on adventitious roots. Leaves coriaceous, shining green above, glaucous beneath, with the purplish-green midrib and dark purplish-red margin armed with copious sharp spines, which are dark purplish red at the base and pale yellow or reddish-yellow at the apex.

This plant is probably *P. Vandermeerschii*, Balf. fil., which is recorded in Baker, Flor. Maur. Seych., p. 389, as native in Round Island, Amber Island, Flat Island, and Coin de Mire, but not in the main island of Mauritius.

I was informed by Mr. Albert Rose, assistant lighthouse keeper at Ile aux Fouquets, that the fishermen had told him that formerly *Vocoas* (*Pandani*) were common in Ile Vakois, but that they had been used as firewood by the fishermen, and at the time of my visit in 1889 only one plant was left in the island.

Fimbristylis obtusifolia, Kunth. Common, 5th September 1889. See remarks on this species, under Ile de la Passe, in this report.

Stenotaphrum complanatum, Schrank.—Baker, Flor. Maur. Seych., p. 440. Very common, 5th September 1889.

Lepturus repens, R. Br., Prod., ed. i. p. 207 (*fide* E. Hackel). Rare at the rocky seashore, at the north side and west end of the island, 5th September 1889. See remarks on this species, under Ile Marianne, in this report.

"Moss too imperfect to determine" (*fide* C. H. Wright). Rare on coralline limestone, 18th March 1890.

The following three species of lichens were very rare, on the branch of a dead shrub, at the seashore, at the north side of the island, 5th September 1889:—

Ramalina homalea, Ach. (*fide* G. Massee).

Lecidea leucoplaca, Fries (*fide* G. Massee).

Pertusaria sp. (*fide* G. Massee). Plants sterile.

Polyporus sanguineus, Meyer (*fide* J. G. Baker). Very rare, on the dead stem of *Scævola Kœnigii*, Vahl, at the north side of the island, 18th March 1890. Red on both surfaces.

SCYTONEMA sp. (*fide* C. H. Wright). Coralline limestone, 18th March 1890.

CHLOROCOCCUS ? (*fide* C. H. Wright). Common on the living and dead branches of *Suriana maritima*, at the north side of the island, 18th March 1890. Native. Plant yellow.

CHÆTOMORPHA sp. Common on coralline limestone, at the north side of the island, 18th March 1890.

ILE AUX FOUQUETS.

Ile aux Fouquets is situated about 500 yards north-east of Ile Vakois, from which it is separated by a shallow channel only a few feet deep. The island is about 300 yards long from north-east to south-west, about 100 yards broad at the widest part, and 40 feet above sea-level at the highest part. It is the largest and highest island of the group. The south-west end rises abruptly out of the ocean in an overhanging cliff, 35 feet high. In this cliff I observed fossil shells embedded in the coralline limestone. The lighthouse is situated on the summit of the island, and it is inhabited by the keeper and his assistants. The north-east end of the island is lower, and only reaches a height of 15 feet above sea-level at the highest part. The island is lowest at the middle, where there are some patches of coral sand, which has been washed up by the sea. At some places the ground is well clothed with low shrubs of *Suriana maritima*. The island derived its name from a sea-bird, called the Fouquet (*Puffinus chlororhynchus*), which nests in the crevices of the rocks. I resided in the lighthouse, on the island, from 2nd to 5th September 1889, and from 17th to 20th March 1890.

The following table shows the number of species in each of the three divisions of the vegetable kingdom :—

CLASS.	Native.	Naturalised.	Planted.	Total.
I. Dicotyledones .	13	4	6	23
II. Monocotyledones .	4	—	—	4
III. Cryptogamia .	2	—	—	2
Total . . .	19	4	6	29

There are only two species of Cryptogams, viz., *Squamaria* (?) and a land Alga, *Chætomorpha* sp., both of which are common. The 19 native species belong to 15 natural orders, or about $1\frac{1}{4}$ species to an order on an average. The number of species in the larger orders are Gramineæ 3, and Portulaceæ 2. Of the 17 native species of Phanerogams, the following 4 species are not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles," viz.:—*Sida diffusa*, *Portulaca psammotropha*, *Phyllanthus mauritianus*, and *Fimbristylis obtusifolia*.

The 6 species of introduced plants occurred on the sheltered side of the island, in the lee of the lighthouse, where a portion of the ground has been walled in, and an attempt made to form a garden.

Sida diffusa, H. B. K.—Baker, Flor. Maur. Seych., p. 19. 2nd September 1889. Rare at the north end of the island, and at the middle of the island. See remarks on this species, under Ile de la Passe, in this report.

Suriana maritima, Linn.—Baker, Flor. Maur. Seych., p. 42. Common all over the island, 2nd September 1889. The flowers are much frequented by small brown ants.

Pemphis acidula, Forst.—Baker, Flor. Maur. Seych., p. 101. 2nd September 1889. Only two plants observed by me at the north-west side of the island. Flowers visited by small brown ants.

Sesuvium Portulacastrum, Linn.—Baker, Flor. Maur. Seych., p. 108. Seashore, 2nd September 1889. Common at the north-east end of the island.

[Terminalia Catappa, Linn.—Baker, Flor. Maur. Seych., p. 111. Only one young tree, 3 feet high, near the lighthouse, 4th September 1889. Mr. Albert Rose, assistant lighthouse-keeper at Ile aux Fouquets, informed me that he brought the seed of this species from Old Grand Port, Mauritius, and sowed it in Ile aux Fouquets, in 1887. *T. Catappa*, Linn., is a native of the Seychelles and tropical Asia, and Baker records it as "much planted in Mauritius."]

Portulaca oleracea, Linn.—Baker, Flor. Maur. Seych., p. 125. Common, 2nd September 1889. In my herbarium specimen the roots are 4 feet long.

PORTULACA PSAMMOTROPHA, Hance; in Walp., Ann., vol. ii. p. 660 (*fide* N. E. Brown). Common, 4th September 1889.

This species, which is also a native of Prata Island, in the China Sea, is not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles." It was also observed by me in Ile de la Passe, Ile Vakois, and Ile Marianne.

A diffuse much-branched glabrous plant, with procumbent stems 1–4 inches long. Leaves $\frac{1}{6}$–$\frac{1}{4}$ inch long, obovate-oblong, sub-acute or obtuse, thick, fleshy, purplish-green, shortly petioled; stipules reduced to bristles. Flowers terminal, solitary, enclosed by 5 ordinary leaves and 2 minute undeveloped leaves at the base of the ovary. Sepals 2, $\frac{1}{5}$ inch long, oblong-deltoid, caducous. Petals 5–6, $\frac{1}{4}$ inch long, obovate, emarginate. Stamens 11–17; style cylindrical, divided two-thirds down into 4–5 simple papillose branches. Capsule $\frac{1}{12}$ inch broad, depresso-globose. Seeds $\frac{1}{40}$ inch long, reniform, finely wrinkled, glabrous, black.

P. psammotropha is specifically distinguished from *P. oleracea* by having small obovate-oblong leaves, $\frac{1}{6}$–$\frac{1}{4}$ inch long, with stipules reduced to bristles, solitary terminal flowers, and a depresso-globose capsule, $\frac{1}{12}$ inch broad, which is not beaked at the apex. In *P. oleracea* the leaves are $\frac{1}{2}$–1 inch long, obovate, and exstipulate, the flowers are in terminal clusters, and the capsule is $\frac{1}{6}$ inch long, oblong, obconic at the base, with a small conical beak $\frac{1}{36}$ inch long at the apex.

Typical plants of *P. oleracea* are common in the four islands in which *P. psammotropha* occurs; and I did not observe any intermediate forms between the two species.

[MOMORDICA CHARANTIA, Linn. Rare near the lighthouse, 5th September 1889. This species, which is widely spread through the tropics of both hemispheres, is recorded as cultivated in vegetable gardens in Mauritius, in Bojer, Hort. Maur., p. 148.]

[Two plants of a gourd were observed by me, planted near the lighthouse, on 5th September 1889. The species was not determined.]

* Parthenium Hysterophorus, Linn.—Baker, Flor. Maur. Seych., p. 174. 10 feet above sea-level, 5th September 1889. Rare at the south-west end of the island, near the lighthouse. This species is a native of Tropical America, and it is recorded as naturalised in Mauritius and Rodriguez by Mr. Baker.

Scævola Kœnigii, Vahl.—Baker, Flor. Maur. Seych., p. 182. Rare, 2nd September 1889.

Tournefortia argentea, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Only one plant observed by me at the centre of the island, 2nd September 1889.

Heliotropium indicum, Linn.—Baker, Flor. Maur. Seych., p. 204. Rare near the lighthouse, 4th September 1889.

Ipomœa Pes-capræ, Roth.—Baker, Flor. Maur. Seych., p. 211. 2nd September 1889. Very common at the south-west end of the island. Capsule not developed.

[Lycopersicum Galeni, Miller.—Baker, Flor. Maur. Seych., p. 216. One young plant, 2 inches high, near the lighthouse, 5th September 1889, and several plants in the same locality, 18th March 1890. This species is cultivated in Mauritius.]

* Datura alba, Nees.—Baker, Flor. Maur. Seych., p. 218. 4th September 1889. Rare at the south-west end of the island. This species, which is widely spread through the tropics of the Old World, is also recorded as naturalised in Mauritius and Rodriguez by Baker.

* Nicotiana Tabacum, Linn.—Baker, Flor. Maur. Seych., p. 218. 2nd September 1889. Common on the sheltered north-west side of the island. Stems 2–6 feet high, erect.

Mrs. Batterby, wife of the chief lighthouse keeper at Ile aux Fouquets, informed me that, in 1874, there were only five tobacco plants in the island, and that since then the plants have spontaneously sowed their seeds and spread over the ground.

In Bojer, Hort. Maur., p. 238, *N. Tabacum* is recorded as cultivated in Mauritius. It is recorded by me in Trans. Bot. Soc. Edin., vol. xx., p. 326, as scarcely naturalised on waste ground, Ile des Aigrettes, 20th June 1890. Baker records it, on Balfour's authority, as "sub-spontaneous" in Rodriguez.

The common cultivated tobacco plant is a native of South America.

[SARCOSTEMMA VIMINALE, R. Br.—Baker, Flor. Maur. Seych., p. 227. Only one plant, which was brought from Anse Jonchée, Mauritius, and planted near the lighthouse in Ile aux Fouquets, in February 1887, where I observed it on 5th September 1889. *S. viminale*, R. Br., is a native of Mauritius, Rodriguez, and Tropical Africa.]

STACHYTARPHETA INDICA, Vahl.—Baker, Flor. Maur. Seych., p. 251. Rare at the north-west side of the island, 4th September 1889.

BOERHAAVIA DIFFUSA, Linn.—Baker, Flor. Maur. Seych., p. 264. Only three plants observed by me at the south-east side of the island, 2nd September 1889.

* AMARANTUS GANGETICUS, Linn.—Baker, Flor. Maur. Seych., p. 267. Rare at the south-west end of the island, 17th March 1890.

[PERSEA GRATISSIMA, Gærtn.—Baker, Flor. Maur. Seych., p. 290. One young plant, 1 foot high, in a dying condition, planted near the lighthouse, observed by me on 5th September 1889. This species, which is the Avocado pear and a native of tropical America, is cultivated in Mauritius.]

PHYLLANTHUS MAURITIANUS, H. H. Johnston, in Trans. Bot. Soc. Edin., vol. xx., p. 329. Common, 2nd September 1889. For a description of this species, see under Ile de la Passe, in this report.

FIMBRISTYLIS OBTUSIFOLIA, Kunth (*fide* C. B. Clarke). Very common on 2nd September 1889. See remarks on this species, under Ile de la Passe, in this report.

PASPALUM DISTICHUM, Burm.—Baker, Flor. Maur. Seych., p. 431. 4th September 1889. Common at the north-east and south-west ends of the island.

Stenotaphrum complanatum, Schrank.—Baker, Flor. Maur. Seych., p. 440. Common at the north-east end of the island, 2nd September 1889.

Stenotaphrum subulatum, Trin.—Baker, Flor. Maur. Seych., p. 440 (*fide* O. Stapf). Rare, 4th September 1889.

All the plants of *S. subulatum* growing on Ile aux Fouquets are in a very reduced state, on account of the poverty of the soil and the exposed position of the island. In my herbarium I have a specimen of *S. subulatum*, which is intermediate in size and habit between the dwarfed Ile aux Fouquets plant and the typical form. It was collected by me on a rocky cliff at the seashore, 10 feet above sea-level, at Le Gris Gris, Savanne, on the main island of Mauritius, on 14th January 1890.

Squamaria ? (*fide* C. H. Wright). Common, 18th March 1890. Plants green, barren.

Chætomorpha sp. (*fide* C. H. Wright). Common, 17th March 1890. Plant green.

ILE AUX FOUS.

Ile aux Fous is situated on the outer margin of the coral reef, about 1 mile north-east of Ile aux Fouquets. The island is about 100 yards long from east to west, about 40 yards broad, and it slopes up from west to east to a height of 20 feet above sea-level. In the limestone are numerous large cauldrons, worn out by the ocean-surf, which almost continually breaks over the island. The island derives its name from a sea-bird called the Fous, several of which were on it at the time of my visit, on 19th March 1890. At high tide the surf breaks round the whole island, and it is impossible to land on it from a boat. I reached it at low spring tide by wading across from Ile Marianne, which lies about 150 yards north of Ile aux Fous.

I observed only one species of plant, *Sesuvium Portulacastrum*, which, however, was common on the island.

ILE MARIANNE.

Ile Marianne is about 250 yards long from east to west, about 100 yards broad at the widest part, near the west end, and 20 feet above sea-level at the highest part. The island is flattish on the top, and the surface is pretty well clothed with a coarse grass, *Stenotaphrum complanatum*. On 27th August 1887 a ship, laden with coals, was wrecked on the reef near Ile Marianne, and the coals recovered from the wreck were deposited on the west end of the island. A caretaker's house was erected the same year, and it was inhabited up to the date of my last visit in March 1890. I botanised on Ile Marianne on 3rd September 1889, and 19th March 1890.

The following table shows the number of species in each of the three divisions of the vegetable kingdom:—

Class.	Native.	Naturalised.	Planted.	Total.
I. Dicotyledones .	15	1	2	18
II. Monocotyledones .	7	—	—	7
III. Cryptogamia .	4	—	—	4
Total . . .	26	1	2	29

One of the Monocotyledons, *Halophila ovata*, is a marine plant, and grows on the submarine coral sand, about 300 yards from the shore. There are 4 species of Cryptogams, one of which is a marine Alga, *Caulerpa plumaris*, and grows on the submarine coral sand, about 500 yards from the shore. The remaining 3 species belong to the Lichenes, and only one of them, *Lepraria flava*, is common. The 26 native species belong to 17 natural orders, or about $1\frac{1}{2}$ species to an order on an average. The number of species in the larger orders are Gramineæ 5, Lichenes 3. and Portulaceæ, Convolvulaceæ, and Euphorbiaceæ 2 each. Of the 22 native species of Phanerogams, the following 6 species are not recorded from Mauritius in Baker's "Flora of Mauritius and the Seychelles," viz.:—*Sida diffusa*, *Portulaca psammotropha*, *Ipomœa glaberrima*, *Phyllanthus mauritianus*, *Fimbristylis obtusifolia*, and *Lepturus repens*.

Sida diffusa, H. B. K.—Baker, Flor. Maur. Seych., p. 19. Very common, 3rd September 1889. See remarks on this species, under Ile de la Passe, in this report.

SURIANA MARITIMA, Linn.—Baker, Flor. Maur. Seych., p. 42. Common.

[MANGIFERA INDICA, Linn.—Baker, Flor. Maur. Seych., p. 63. Only one seedling near the caretaker's house at the west end of the island, 19th March 1890. The Mango is cultivated in Mauritius.]

*SOPHORA TOMENTOSA, Linn. Only one shrub, 3 feet high, at the west end of the island, 19th March 1890.

S. tomentosa, Linn., is not recorded from Mauritius by Baker. In Bojer, Hort. Maur., p. 83, it is recorded as naturalised in Ile aux Tonneliers, at the entrance of Port Louis harbour. It is recorded by me as naturalised in Ile des Aigrettes, 20th June 1890, in Trans. Bot. Soc. Edin., vol. xx. p. 321.

This species is a native of India and the West Indies.

PEMPHIS ACIDULA, Forst.—Baker, Flor. Maur. Seych., p. 101. Seashore, 3rd September 1889. Common at the north side of the island; only one plant at the south side.

SESUVIUM PORTULACASTRUM, Linn.—Baker, Flor. Maur. Seych., p. 108. Common at the seashore, 3rd September 1889.

PORTULACA OLERACEA, Linn.—Baker, Flor. Maur. Seych., p. 125. Common, 3rd September 1889.

PORTULACA PSAMMOTROPHA, Hance (*fide* N. E. Brown). 19th March 1890. Common at the east end of the island. For a description of this species, see under Ile aux Fouquets, in this report.

BIDENS PILOSA, Linn.—Baker, Flor. Maur. Seych., p. 169, Only one plant at the west end of the island, 19th March 1890.

SCÆVOLA KŒNIGII, Vahl.—Baker, Flor. Maur. Seych., p. 182. 3rd September 1889. A large clump and one detached shrub at the north side of the island.

TOURNEFORTIA ARGENTEA, Linn. fil.—Baker, Flor. Maur. Seych., p. 201. Common, 3rd September 1889.

IPOMŒA PES-CAPRÆ, Roth.—Baker, Flor. Maur. Seych., p. 211. 3rd September 1889. Common at the west end and north side of the island. Capsule not developed.

IPOMŒA GLABERRIMA, Bojer.—Baker, Flor. Maur. Seych., p. 211. Seashore, 19th March 1890. Common at the north side of the island. See remarks on this species, under Ile Vakois, in this report.

[LYCOPERSICUM GALENI, Miller.—Baker, Flor. Maur. Seych., p. 216. Only three young plants, near the caretaker's house at the west end of the island, 19th March 1890.]

STACHYTARPHETA INDICA, Vahl.—Baker, Flor. Maur. Seych., p. 251. Only one plant, near the caretaker's house, at the west end of the island, 19th March 1890.

BOERHAAVIA DIFFUSA, Linn.—Baker, Flor. Maur. Seych., p. 264. Common all over the island, 3rd September 1889.

EUPHORBIA PROSTRATA, Ait.—Baker, Flor. Maur. Seych., p. 302. Near the caretaker's house at the west end of the island, 3rd September 1889.

PHYLLANTHUS MAURITIANUS, H. H. Johnston, in Trans. Bot. Soc. Edin., vol. xx. p. 329. Very common, 3rd September 1889. For a description of this species, see under Ile de la Passe, in this report.

HALOPHILA OVATA, Gaud.—Baker, Flor. Maur. Seych., p. 393. Common on submarine coral sand, uncovered at ebb tide, about 300 yards from the shore of Ile Marianne, 3rd September 1889.

FIMBRISTYLIS OBTUSIFOLIA, Kunth. Common, 3rd September 1889. See remarks on this species, under Ile de la Passe, in this report.

STENOTAPHRUM COMPLANATUM, Schrank.—Baker, Flor. Maur. Seych., p. 440. Very common, 3rd September 1889.

ZOYSIA PUNGENS, Willd.—Baker, Flor. Maur. Seych., p. 442. 3rd September 1889. Common at the south side of the island.

ELEUSINE INDICA, Gærtn.—Baker, Flor. Maur. Seych., p. 451. 19th March 1890. Rare at the west end of the island.

Dactyloctenium ægyptiacum, Willd.—Baker, Flor. Maur. Seych., p. 452. 3rd September 1889. Rare at the west end of the island.

Lepturus repens, R. Br. (*fide* E. Hackel). Common at the rocky seashore, 3rd September 1889.

Stems $\frac{1}{3}$–3 feet long, decumbent, rooting at the lower nodes. Spikelets 2-flowered, the upper flower hermaphrodite, the lower flower a mere rudiment. Empty glumes 2. Upper hermaphrodite flower with a flowering glume and palea. Stamens 3.

This species, which is also a native of Australia and the islands of the South Pacific Ocean, is not recorded from Mauritius in Baker, Flor. Maur. Seych.

In Bojer, Hort. Maur., p. 372, *Stenotaphrum subulatum*, Trin., is erroneously recorded as *Lepturus repens*, R. Br. See Baker, Flor. Maur. Seych., p. 440, and *Lepturus repens* in Index Kewensis iii., p. 66.

Ramalina homalea, Ach. (*fide* G. Massee). Living branches of *Suriana maritima*, 3rd September 1889. Rare at the north side of the island.

Ramalina usneoides, Fries (*fide* G. Massee). Living branches of *Suriana maritima*, 3rd September 1889. Rare at the north side of the island.

Lepraria flava, Ach. (*fide* C. H. Wright). Common on the living branches of *Tournefortia argentea*, 19th March 1890. Plant greenish yellow.

Caulerpa plumaris, C. A. Agardh. Submarine coral sand, in shallow water, about 500 yards from the shore of Ile Marianne, 19th March 1890. Plant green.

ROCHER DES OISEAUX.

Rocher des Oiseaux is situated at the outer margin of the coral reef, about 80 yards east of Ile Marianne. The island is about 40 yards long from east to west, about 20 yards broad, and 12 feet above sea-level at the highest part. In the limestone are numerous large cauldrons worn out by the ocean-surf, which almost continually break over the island. In one of these cauldrons, full of sea-water, I observed a cuttle-fish. I botanised on Rocher des Oiseaux on 19th March 1890. I reached the island, with difficulty, by wading across, through the surf, from Ile Marianne at low spring tide. The island forms a resting-place for sea-birds, hence the name Rocher des Oiseaux, or the Bird Rock.

I observed only one plant of *Sesuvium Portulacastrum* on the island, at 8 feet above sea-level.

EXCURSION OF THE SCOTTISH ALPINE BOTANICAL CLUB TO TYNDRUM, IN 1894. By WILLIAM CRAIG, M.D., F.R.S.E., F.R.C.S.E., Secretary of the Club.

On Monday, 6th August last, the Scottish Alpine Botanical Club met in Stewart's Royal Hotel, Tyndrum, for a few days' botanizing. There were ten members of the Club present, including our esteemed President, Mr. Boyd. We were most comfortably entertained, and the charges were very moderate.

At the business meeting in the evening, reference was made to the losses the Club had sustained by the deaths of the two honorary members, Mr. Charles Jenner and Dr. Robert Walker. It was Mr. Charles Jenner, at a meeting of this Society on 12th March 1868, who first suggested the idea of such a Club, and Dr. Walker was one of the original members of the Club, and was present at its first excursion.

Tuesday, 7th August.—The morning was wet and the hills were enveloped in mist, and consequently the day was quite unsuitable for mountaineering, and it was agreed that no hills should be climbed that day. As this was the first day that the West Highland Railway was opened for traffic, certain of the members resolved to explore the country through which this railway passes as far as Roy Bridge, chiefly with the object of ascertaining how much of the country between Tyndrum and Glen Spean could be explored from Tyndrum as a centre. Some of the members went as far as Roy Bridge, whilst others went only as far as Inverlair.

Near Roy Bridge the following plants were gathered:—*Potentilla tormentilla*, Scop., var. *procumbens*, Sibth.; *Circæa alpina*, L.; *Veronica scutellata*, L.; and the rare fungus *Boletus satanas*. Near Inverlair the following plants were gathered:—*Habenaria albida*, R. Br., and *Sparganium minimum*, Fries.

Two of the members, instead of going with the others on the railway, spent the day fishing and botanising on Lochan Bhe, a small loch near Tyndrum. It is situated in Argyllshire, and is 822 feet above sea-level. They collected some fine specimens of *Lobelia Dortmanna*, L., and abundance of a peculiar submerged form of a plant which was found by the Club in this loch during an excursion in 1891. On that occasion specimens were submitted to Bennett, of Croydon, and other botanists, who pronounced it *Scirpus fluitans*, L. The plant was in great abundance in many parts of the loch, but always in deep water, and though careful search was made, no specimens were obtained in flower or fruit. No plants of this *Scirpus* could be found on the sides of the loch. If the plant be *Scirpus fluitans*, it is certainly a very remarkable form.

Wednesday, 8th August.—The morning was fine, but the day did not look promising, nevertheless the Club resolved to visit Beinn Laoigh. We drove in a waggonette about eight miles down the valley of the Lochy to a point near the foot of Beinn Laoigh. From this point it is a very easy walk to the rocks on the west side of the mountain. The first part of the day was fine, but the after part was very wet and misty. On account of the mist we confined our examination to the rocks on the west and north of the mountain. We saw most of the alpine plants which are known to grow on these rocks, among which may be mentioned a small form of *Cochlearia alpina*, Wats.; *Triglochin palustre*, L., at an elevation of 2500 feet, being 500 feet above the height mentioned in the last edition of Hooker's Flora; *Juncus triglumis*, L.; *J. biglumis*, L.; *J. castaneus*, L.: *Kobresia caricina*, Willd.; *Carex pulla*, Good.; *Woodsia hyperborea*, R. Br.; *Cystopteris montana*, Link., in several places; *Polypodium Phegopteris*, L., with some of the fronds crested. So far as the members of the Club knew, this was a new station for *Kobresia*.

As we were leaving the rocks the mist became very dense, but we all got down safely. We found the Lochy in flood, and had to wade a deep water before we could reach our carriage. We were all drenched, but got back to the hotel in good time for dinner, and none of the party suffered afterwards from the drenching.

Thursday, 9th August.—The morning was fine, and we resolved to visit Loch Lomond and Ben Voirlich. Accordingly we left Tyndrum about 8 A.M., *per* West Highland Railway, for Ardlui, at the head of Loch Lomond, which was reached in forty-one minutes. Here the party divided. One party botanised on the sides of Loch Lomond, and amongst other plants collected may be mentioned *Drosera anglica*, Huds.; *Circæa alpina*, L.; *Carum verticillatum*, Koch.; *Scutellaria galericulata*, L.; *Hymenophyllum tunbridgense*, Sm.; *H. unilaterale*, Willd.; and the moss *Diphyscium foliosum.* The other party ascended Ben Voirlich, a mountain 3092 feet high, being exactly 100 feet lower than Ben Lomond. The day was very hot, and consequently mountaineering was somewhat arduous. We reached the top about 1.30 P.M., and had a fine view from the summit. We saw most of the alpine plants which are known to grow on this mountain, a record of which is found in Vol. XI. of the Society's Transactions, at page 70, by the late Professor Balfour. We met with no plants not mentioned in that list, but we found a large quantity of *Pteris aquilina*, L., with the fronds all crested. There would be at least an acre of the hillside covered with this fern, and nearly every plant was abnormal. It is somewhat remarkable that this variety had not been recorded previously from Ben Voirlich when we consider its abundance, and the fact that the hill has been so frequently visited by botanists. Several plants were dug up, and it is hoped that some of them will grow. This variety is not unknown to cultivators of ferns, but, so far as I am aware, is not common in a wild state.

Friday, 10th August.—The morning was again fine, and after an early breakfast we started for Beinn Laoigh and Ben Oss. The whole party travelled together as far as the farm of Coninish, when we separated into two parties, one going towards Beinn Laoigh, with the view of examining the rocks to the *south* of the great corrie, a portion of the mountain which had not been previously botanised by the Club. On the way up to the corrie they found *Kobresia caricina*, Willd., on the well-known station for this plant, which is a very different part of the mountain from the place where the plant was found by the Club two days previously. They did not enter the great corrie, but at once proceeded to examine the rocks to the south of this corrie. Among the plants collected may be mentioned *Arabis petræa*, Lamk.; *Draba incana*, L.; *Dryas octopetala*, L.; *Saxifraga nivalis*, L.; *Hieracium lingulatum*, Backh.; *H. vulgare*, Fries; *H. holosericeum*, Backh.; *H. Oreades*, Fries; *Veronica humifusa*, Dicks.; *Bartsia alpina*, L.; *Carex vaginata*, Tausch.; *Asplenium viride*, Huds.; and the moss *Leskea rufescens*. The *Hieracia* were indentified by Bennett, of Croydon. A very curious form of *Arabis* was obtained on the rocks, which differed much from the ordinary form of *Arabis petræa*. The plants were all seedlings, and they are being cultivated with the view of identifying the species. These plants were sent to Bennett, and he has planted some of the specimens, and if the plant flowers we will ascertain whether or not it is a mere form of *Arabis petræa*.

The day was remarkably fine, and the party went in the afternoon to the summit of the mountain, from which they had a magnificent view of the surrounding country.

The other party crossed the river by the bridge at Coninish farmhouse, and went to Ben Oss, a mountain not previously examined by the Club. It is 3374 feet high, and is situated south-west of Beinn Laoigh. We found the rocks very unproductive. We saw many of the more common alpine plants, but only those which are found on almost all our Highland mountains. The best plant observed was *Saxifraga nivalis*, L., and even this plant was rare. It was very difficult climbing among the rocks, but we all reached the top in safety, from which an excellent view was obtained. We were anxious not only to examine the mountain, but also Loch Oss, a small loch situated due east from the summit of Ben Oss. It is 2084 feet above sea-level, and the river from it runs into Glen Falloch, a short distance above the head of Loch Lomond. The loch, like the mountain, was somewhat disappointing. The two best plants obtained were *Callitriche hamulata*, Kütz., and *Potamogeton* *nitens*, Weber, both of which plants were identified by Bennett.

After examining the loch, we retraced our steps to the ridge a little to the east of the summit. It was a stiff climb, and from the summit of this ridge we descended by a steep and difficult ravine, in which we saw some of the more common alpine plants, such as *Saussurea alpina*, DC., and several others, but none which can be called rare. We managed to get to the bottom of the rocks in safety, and after a long walk we reached our hotel in good time for dinner, greatly delighted with our excursion.

Saturday, 11th August.—To-day the excursion came to an end, and the members returned home, all greatly delighted with our sojourn in Tyndrum.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF JANUARY 1895. By ROBERT LINDSAY, Curator.

The weather of last month was more severe than any we have experienced in January since 1881. All open air vegetation has been held completely in check. It is fortunate that it was so, when such unusually severe weather has been protracted into the present month, else many plants would have suffered much more severely.

Not a single plant came into flower during January, while last year there were 20 during that month. Not since 1881 has there been a January without our having some plants in flower to record.

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of January 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 a.m.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·991	35·2	29·0	33·0	30·5	N.W.	Cir. St.	10	N.	0·010
2	29·617	40·1	32·7	36·0	34·0	W.	...	0	...	0·000
3	29·546	39·0	27·6	29·5	29·0	W.	Cir. St.	3	N.	0·000
4	30·143	37·1	28·4	31·6	29·9	W.	...	0	...	0·000
5	30·025	35·7	24·8	30·6	30·0	W.	Cir. St.	10	N.	0·050
6	29·689	34·8	30·2	34·6	33·0	W.	Cir. St.	8	N.	0·015
7	29·841	37·2	27·0	35·8	33·2	N.	St.	10	N.	0·000
8	29·954	35·9	31·2	32·2	30·9	N.E.	Cir. St.	8	N.E.	0·000
9	29·904	34·7	19·4	20·7	20·6	W.	St.	10	W.	0·000
10	29·863	29·3	15·4	16·7	16·6	W.	St.	10	W.	0·000
11	29·777	26·0	15·8	25·7	24·7	S.E.	Cir. St.	9	S.W.	0·000
12	29·524	33·5	22·4	26·8	24·8	S.E.	Cir.	9	S.E.	0·010
13	29·107	37·1	24·6	35·7	34·1	E.	Nim.	10	E.	0·130
14	28·934	40·1	34·0	40·0	38·0	S.E.	Nim.	10	S.E.	0·155
15	29·037	40·1	36·8	37·8	37·2	E.	Nim.	10	E.	0·245
16	28·969	38·8	36·0	37·1	37·0	E.	Nim.	10	E.	0·080
17	28·942	39·9	31·8	33·7	33·7	W.	Nim.	10	W.	0·280
18	29·278	36·4	33·2	36·2	35·0	W.	...	0	...	0·000
19	29·734	40·7	29·9	30·2	30·0	N.	Cir. St.	9	...	0·260
20	29·694	40·6	30·0	37·2	36·4	E.	Nim.	10	E.	0·060
21	29·912	38·1	31·6	32·3	30·0	N.	...	0	...	0·040
22	29·732	38·1	30·2	36·2	35·0	W.	Cir.	5	N.	0·000
23	29·647	41·4	33·2	33·5	31·2	N.	St.	2	N.	0·060
24	28·927	39·0	29·7	36·0	35·1	W.	Cir. St.	10	N.W.	0·050
25	29·536	38·9	29·6	29·6	26·8	N.W.	Cir.	1	N.	0·020
26	29·648	32·9	27·1	28·9	28·7	W.	Nim.	10	W.	0·135
27	29·593	32·9	21·1	20·8	19·5	W.	...	0	...	0·005
28	30·047	35·2	17·9	18·8	17·5	S.W.	...	0	...	0·110
29	30·028	32·2	18·2	31·5	31·1	E.	Nim.	10	E.	0·020
30	30·663	34·3	16·2	24·8	23·5	E.	St.	2	E.	0·005
31	30·506	35·0	16·0	30·8	28·8	N.E.	Cir.	1	N.E.	0·110

Barometer.—Highest, 30·663 inches, on the 30th. Lowest, 28·927 inches, on the 24th. Monthly Range, 1·736 inch. Mean, 29·671 inches, being 0·085 inch below the average for January for four preceding years.

Protected S. R. Thermometers.—Highest, 41°·4, on the 22nd. Lowest, 15°·4, on the 10th. Monthly Range, 25°·3. Mean of all the Highest, 36°·5. Mean of all the Lowest, 26°·8. Mean Daily Range, 9°·7. Mean Temperature of Month, 31°·6, being 5°·0 below the average for January for four preceding years. Frost occurred on 25 days.

Hygrometer.—Mean of Dry Bulb, 31°·1. Mean of Wet Bulb, 29°·9. Temperature of Dew-point, 26°·7. Mean Humidity, 83·3 %.

Radiation Thermometers.—Highest in Sun, 98°·2, on the 27th. Lowest on Grass, 10°·8, on the 10th and 11th. Frost occurred on Grass on 30 days.

Sunshine.—Total recorded for month, 36 hours 30 minutes, being 15·5 % of the possible amount. The sunniest day was the 21st, with 5 hours 35 minutes, being 71·6 % of the possible amount. None was recorded on 13 days.

Rainfall.—Rain or snow fell on 21 days. Total Fall, 1·850 inch, being 0·705 inch above the average for January for four preceding years. Greatest fall in 24 hours, 0·280 inch, on the 17th.

A. D. RICHARDSON, *Observer.*

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

The severe weather experienced during January has retarded considerably the growth and flowering of the plants in the houses of the Royal Botanic Garden, rather more than forty species, however, have flowered during the month. The new plant houses, constructed in the autumn, are devoted to the culture of tropical plants, orchids, succulents, and filmy ferns; the corridor connecting them being planted with creepers and wall plants, and special efforts have been made to furnish them so that they may shortly be opened to the public. From among the number of plants flowered may be noted the following:—

Impatiens auricoma, Baillon. This plant, which is a native of Madagascar, was first described by Prof. Baillon, of Paris, to whom specimens were sent by Mons. Leon Humblot, to whom we are indebted for its introduction to cultivation in a rather indirect manner. In a package of plants of orchids and tree-ferns forwarded by him to a friend in Paris, which arrived at their destination dead, some stray seeds of this plant had been entangled with the stems of the ferns, and these germinated, the plant proving to be the species which had been described some ten years previously. In habit like others of the genus, the plant has yellow flowers with a curious spur. It is interesting to note that *I. Sultani*, Hook. f., a tropical African species, was also introduced accidentally in a Wardian case of plants sent by Sir J. Kirk to Kew some years ago.

Brachyglottis repanda, Forst. This plant, of loose shrubby habit, belonging to the Compositæ, is a native of New Zealand, and has the foliage silvery pubescent on the under side, the leaves being ovate in shape. The flowers are about six in a head and these form large panicles. The stamens are coloured yellow. The flowers are strongly fragrant, of a violet perfume. It was introduced in 1834.

Steudnera discolor, N. E. Brown. This is a member of a small genus of aroids inhabiting Burmah. The inflorescence possesses a yellow spathe with a reddish brown blotch at the base. The leaves are petiolate, peltate in form, the under side being marked with purple patches between the veins.

Vaccinium erythrinum, Hook. Introduced in 1852 from Java. This plant is still an uncommon one in gardens. It is a compact bush-like plant, with alternate coriaceous leaves, which when young are of a reddish tint, as are also the young twigs. The inflorescences are in terminal racemes, the corollas of a deep red colour, almost filled with nectar.

Others worthy of note are:—*Cymbidium giganteum*, Wall.,—a strong growing species from the Himalayan regions. *Selenipedium Dominianum*, Hort.,—with curious tail-like petals, a hybrid between *S. caricinum* and *S. caudatum*. *Vanda Amesiana*, Rchb.,—from the Shan States of Burmah. The flowers, which are in racemes, are very fragrant. *Dalechampia Roezliana*, Muell.,—a native of Mexico, belonging to the order Euphorbiaceæ. The curious inflorescences are enclosed between two large coloured bracts. This species is probably the only one at present under cultivation. *Begonia* "Gloire de Sceaux," Hort.,—a pretty flowering hybrid between *B. socotrana*, Balf. f., and *B. subpeltata*, Wight.

MEETING OF THE SOCIETY,

Thursday, March 14, 1895.

Surgeon-Major H. H. Johnston in the Chair.

George King, M.D., C.I.E., LL.D., F.R.S., F.L.S., Director of the Royal Botanic Garden, Calcutta, was, on the recommendation of the Council, chosen British Honorary Fellow of the Society.

Dr. Ed. Bornet, Member of the Institute, Paris; Dr. Wilhelm Pfeffer, Geh. Hofrat, Professor of Botany, and Director of the Royal Botanic Garden, Leipzig; Charles S. Sargent, Professor of Arboriculture, and Director of the Arboretum, Harvard; Dr. M. Treub, Professor in the School of Agriculture, and Director of the Botanic Garden, Buitenzorg; and Dr. H. De Vries, Professor of Physiology in the University, Amsterdam, were, on the recommendation of the Council, chosen Foreign Honorary Fellows of the Society.

Dr. O. Brefeld, Professor of Botany in the University, and Director of the Botanic Garden, Munster; Dr. F. Elving, Professor of Botany in the University, Helsingfors; A. Franchet, Attaché in the Museum of Natural History, Paris; L. Guignard, Professor of Botany, Paris; Dr. E. Stahl, Professor of Botany in the University, and Director of the Botanic Garden, Jena; Dr. H. Trimen, M.B., F.R.S., F.L.S., Director of the Botanic Garden, Paradeniya, Ceylon; and Dr. H. Vöchting, Professor of Botany in the University, and Director of the Botanic Garden, Tübingen, were, on the recommendation of the Council, chosen Corresponding Fellows of the Society.

Intimation of the death of Thomas Alexander Goldie Balfour, M.D., Resident Fellow of the Society, was made by the Chairman.

Issued November 1895.

Specimens of *Leucojum*, *Hepatica*, *Daphne Mezereum*, etc., sent by Mr. CAMPBELL from his garden at Ledaig, Argyllshire, were exhibited.

Surgeon-Major H. H. JOHNSTON exhibited a complete series of specimens illustrating his paper on the Flora of Mauritius, subsequently read at the Meeting.

Cut blooms of *Paulo-Wilhelmia speciosa*, *Impatiens auricoma*, *Burchellia capensis*, *Rhododendron argenteum*, *R. ponticum* × *R. arboreum*, and *Thyrsacanthus rutilans*, were exhibited from the Royal Botanic Garden.

The following papers were read :—

NOTES ON A BOOK OF PHOTOGRAPHS AND MEASUREMENTS OF REMARKABLE AYRSHIRE TREES, presented by Mr. GEORGE PAXTON to the LIBRARY of the ROYAL BOTANIC GARDEN, EDINBURGH. By Dr. D. CHRISTISON.

The volume that I have the pleasure of presenting to the Library of the Royal Botanic Garden, in the name of the author, Mr. George Paxton, furnishes one of the first, if not the first, record of the remarkable trees in a whole county, made by means of photographic views combined with measurements. When Mr. Paxton began to take photographs of the best examples of the different species around Kilmarnock he had not the intention of producing so complete a work; but, encouraged by the Rev. Mr. Landsborough, he was induced to extend his operations, until he overtook the whole of Ayrshire so exhaustively that probably very few of the larger trees in the county have escaped his notice.

By Mr. Paxton's request, in presenting the volume, I have drawn up the following brief review of the general results of his labours, and I have also prepared a table of the trees, represented in the volume, showing their localities and measurements, the species being arranged in the order of the size to which they happen to have attained, although, of course, it may be by mere accident that one species has outstripped another in this respect.

Date of Measurement.	Species.	Locality.	Girth in Feet. At 5 Feet.	Girth in Feet. At Base.	Remarks.
Feb. 1891	Ulmus montana	Galston	..	*27·0	* Measured A.D. 1800. "The Boss Tree." 18 ft. 8½ in. at 5 ft., and 18 ft. 5 in. at 6 ft. in 1881 (Landsborough).
Sept. 1894	Do.	Eglinton Castle	11·2	..	
Sept. 1894	Ulmus campestris	Do.	12·7	..	
Sept. 1892	Do.	Sorn	11·9	..	
Sept. 1892	Tilia europæa	Kirkmichael House	18·10	28·6	
April 1892	Do.	Montgreenan	..	21·6	Not measurable higher, from undergrowth of twigs on the stem.
Sept. 1892	Castanea vesca	Cloncaird Castle	18·5	25·0	
Aug. 1892	Fagus sylvatica	Stair House	18·2	..	86 ft. high.
Sept. 1894	Do.	Eglinton Castle	17·3	31·0	
June 1894	Do.	Auchans	..	25·0	15 ft. 3 in. at 3 ft. Short stem.
Oct. 1892	Fraxinus excelsior	Hunterston	16·1	..	
July 1892	Do.	Richardland, Kilmarnock	3·10	..	Weeping Ash. Circumference of branches, 100 ft.
June 1894	Æsculus Hippocastanum	Cloncaird Castle	13·10	20·6	
Oct. 1892	Acer Pseudo-platanus	Cassilis House	13·8	..	"The Dule Tree."
June 1891	Do.	Old Auchans	13·4	24·0	
June 1891	Salix alba	Coodham, Kilmarnock	13·6	..	Two of precisely this girth at gate of house.
June 1894	Quercus Robur	Old Auchans	12·9	..	
Aug. 1891	Do. Ilex	Fullarton House	..	11·9	
Aug. 1891	Ilex Aquifolium	Do.	12·6	..	
Sept. 1894	Carpinus Betulus	Eglinton Castle	..	..	14 ft. 3 in. at 1 ft. Stem divides into three at about 18 in.
Sept. 1892	Juglans regia	Kirkmichael House	10·7	..	
June 1894	Betula alba	Old Auchendrane	9·8	11·4	A most beautiful, lofty, wide-spreading tree. Only about 70 years old (Landsborough).
Aug. 1894	Abies pectinata	Old Auchendrane	14·9	..	Planted 1797 (Landsborough).
Sept. 1892	Do.	Sundrum	13·4	..	
June 1894	Taxus baccata	Loudoun Castle	14·2	..	14 ft. 1¾ in. on higher side at 3 ft. 3 in.; 13 ft 4¾ in. on lower side at 1 ft.; height of trunk, 20 ft.; height to first branch, 6 ft.; height of tree, 45 ft.; branch spread, 76 ft. (Landsborough, 1894).
April 1892	Taxus hibernica (Hooker)	Netherplace, Mauchline	..	10·10	Narrowest at ground.
June 1894	Pinus sylvestris	Cloncaird Castle	..	17·0	12 ft. 10 in. at 2 ft. of short stem. "The Bell Tree."
June 1894	Larix europæa	Kirkmichael House	12·1	..	
Aug. 1894	Sequoia sempervirens	Milrig House	6·5	..	About the narrowest, 40 ft. high.
Aug. 1892	Araucaria imbricata	Cloncaird Castle	5·5	..	55 ft. high.

Taking a general view of the table and of the photographs, it is evident that Ayrshire is not remarkable for venerable ruins, such as in other counties testify, by their vast size, wasted limbs, and hollow stem, to a descent from remote antiquity. There is, indeed, but one veteran of the kind among Mr. Paxton's subjects, "The Boss Tree" at Galston, a Wych elm, of which merely the hollow stump remains. Mr. Paxton has not girthed it, but gives an old measurement at the base of 27 feet, taken about the beginning of the century. The photograph shows a stump about 10 feet high, and of tolerably uniform size from top to bottom. It has much the appearance of having been pollarded. Probably the largest Wych elm in a vigorous condition in the county now is at Loudoun Castle. It girthed 15 ft. 2 in. at 5 ft. in 1879 (Landsborough).

The English elm (*Ulmus campestris*), that stately species so conspicuous in Gloucester, Somerset, Wilts, and other south-western English counties, is rare in Scotland, where it has nowhere attained any remarkable size. Indeed, as far as I know, the two largest are in Mr. Paxton's list, and their girth is only 12 ft. 7 in. and 11 ft. 9 in. The largest of the two, moreover, at Eglinton Castle, has evidently seen its best days. The smaller one, with a tall cylindrical stem, at Sorn, seems still vigorous.

Some of the other larger forest species have fine representatives in the county. The lime at Kirkmichael House, the Spanish chestnut at Cloncaird Castle, and the beech at Stair House, all girth between 18 and 19 feet, fairly measured at 5 feet from the ground, and are apparently healthy, growing trees. A magnificent, tall and spreading beech at Eglinton Castle, 17 ft. 3 in. in girth, and a lime at Montgreenan, not measurable from a dense growth of twigs at the foot of the stem, follow not far behind these giants.

But the remaining larger forest species are poorly represented, as far as size goes. The handsome Hunterston ash, 16 ft. 1 in. in girth, 5 feet up, gives promise, indeed, of climbing in no long time into the foremost rank, and an ash at Lanfine, 15 ft. 10 in. in girth at 5 feet, in 1879 (Landsborough), ought by this time to have surpassed the Hunterston tree. But if Mr. Paxton's Cloncaird Castle horse chestnut (*Æsculus Hippocastanum*), Cassilis House sycamore (*Acer Pseudo-platanus*), Coodham willow (*Salix alba*), and Old Auchan's oak (*Quercus Robur*), are indeed the largest of their kind in the county, it will be long before Ayrshire can have the chance of showing giant specimens of these species, as the girth of the reputed premiers range only between 13 ft. 10 in. for the horse chestnut and 12 ft. 9 in. for the oak. The Cassilis House sycamore, 13 ft. 8 in. in girth, is indeed exceeded by one at Stair, 14 ft. 6 in., and another at Loudon Castle, 14 ft. 2 in.; but these are not great girths for the species, and Mr. Paxton has preferred the slightly smaller Cassilis tree for illustration, as it is a finer specimen. One does not expect so much from the walnut as from the other larger forest species in Scotland, but the Kirkmichael House specimen, although a fine tree, with a straight clean bole about 20 feet high, is only 10 ft. 7 in. in girth at 5 feet, and falls far short of several examples in other counties.

Although, however, we must admit the deficiency among these larger species, the county can boast of some of the best Scottish examples of two of the smaller species. The Old Auchendrane birch (*Betula alba*) is, indeed, inferior in girth to the Newton-Don tree, in Roxburgh, with its altogether exceptional measurement of 13 ft. 1 in. But this is at the narrowest part of a very short stem, only 2½ feet in length, and, as far as I have been able to ascertain, the Ayrshire tree, 11 ft. 4 in. in girth at the base, and 9 ft. 8 in. at 5 feet of a longer stem, is well entitled to the second place among Scottish birches, particularly as Mr. Paxton's photograph shows it to be a singularly handsome, well-clothed tree, lofty and wide-spreading, its height being about 70 feet and the branch-spread about 55 feet, as far as can be judged by comparison with the figures introduced in the view. Nor is this the only fine birch in the county, as Mr. Paxton has photographed a weeping one at Rosemount, Ayr, with a stem 10 feet long before it gives off a branch, and 8 ft. 1 in. in girth half way up, also a very handsome tree.

The holly (*Ilex Aquifolium*) at Fullarton House appears also to be one of the finest Scottish examples of its kind. It girths 12 ft. 6 in. at 5 feet up, but seems to be one of those trees that are narrowest near the base, as some years before Mr. Paxton measured it Mr. Landsborough made it only 9 ft. 8 in., 1 foot from the ground. Taking the two measurements together, however, it is doubtful if there is a larger stemmed holly in Scotland.

Another remarkable tree of the lesser species is the Eglinton Castle hornbeam (*Carpinus Betulus*). Its girth at 1 foot from the ground is no less than 14 ft. 3 in., but, as almost immediately above this it divides into three, there may be a question whether these may not originally have been separate trees, which subsequently grew together at the base. However, I have not been able to find any notice of other large hornbeams in Scotland with which to compare it, and the only English one recorded that I know of was as far back as 1764, by Mr. R. Marsham, at Writtle, Essex, girthing 12 feet at 5 feet up.

The evergreen oak (*Quercus Ilex*) at Fullarton is said by Mr. Landsborough to be the largest in the south-west of Scotland. Its girth is 11 ft. 9 in. at the base, and, according to Mr. Landsborough, was 10 ft. 11 in. at 5 feet up, in 1879; but there is one at Castle-Kennedy, Wigtownshire, that girths 15 feet at 1 foot, 14 feet at 3 feet, and 15 feet at 5 feet.

The ordinary forest pines, the Scots fir (*Pinus sylvestris*), larch (*Larix europæa*), and silver fir (*Abies pectinata*), are but poorly represented by premier specimens, girthing respectively 12 ft. 10 in. at 3 ft. up, on a very short stem, 12 ft. 1 in., and 14 ft. 9 in.; but of more recently introduced species, the *Araucaria imbricata* at Cloncaird Castle, taking together its girth, 5 ft. 6 in. at 5 ft., and height, 55 feet, is well to the front among Scottish examples; and the *Taxodium sempervirens*, 6 ft. 5 in. in girth at 5 ft., about its narrowest, and 40 feet high, appears to be exceeded only by the remarkable trees at Murthly Castle, 8 ft. 10 in. in girth, and 45 feet high, and at Dupplin, 7 ft. 9 in. in girth, and 60 feet high.

The yew (*Taxus baccata*) at Loudoun Castle, although exceeded in girth by several others in Scotland, is certainly one of the finest of the species that we have. It has a beautifully fluted stem, 6 feet high, and nowhere more than a few inches under 14 feet in girth. In its branch spread of 74 feet, it seems to be surpassed only by the short-stemmed yew at Craigends, Renfrew. Of Irish yews (*Taxus hibernica*) I have no records, but the one at Netherplace, Mauchline, 10 ft. 10 in. in girth at the ground, breaking at once into many branches, must be an unusually large specimen.

As to the probable age of these premier trees, it is questionable if any of them, with the exception of the Boss elm and the Loudoun Castle yew, exceed much, if at all, two centuries. It may seem startling to limit the age of such giants as the lime, horse chestnut, and beech in the table to a couple of centuries, but there is no reason to assign a greater age to them, as my general observations tend greatly to prove that large trees have been unusually quick growers. Moreover, I have shown that the great beech at Newbattle Abbey, the largest in Scotland, is probably not above 250 years old.

But the age of a huge decaying stump, such as that of the Boss elm, may very well be much greater, as some large trees seem to take nearly as long to decay as to arrive at maturity. As the yew is undoubtedly a comparatively slow grower, a prodigious age is often attributed to such large specimens as the one at Loudoun Castle, and legend often associates them with events of a very remote antiquity. It is rarely, however, that these legends can stand the test of a strict examination. Thus it is said that one of the family charters was signed beneath the shade of the Loudoun Castle yew in the reign of William the Lion, nearly 700 years ago, but there can hardly be a doubt that the tree did not exist till at least two centuries later. Measurements taken by Mr. Landsborough in 1864 and 1894, show that the tree during that period was still increasing in girth at the annual rate of a third of an inch. Now, even if no greater rate had been maintained for its whole life, the age would only be 510 years. But it is well ascertained that the rate of yews, like that of other trees, is much greater in early life than subsequently. There are several well ascertained instances of a rate exceeding three-quarters of an inch annually for more than the first hundred years; and I found the rate of a yew in the Edinburgh Botanic Garden, 6 feet in girth, to be very nearly half an inch for the last fifteen years. Taking this rate for the Loudoun yew till it was 6 feet in girth, and its own present rate of one-third of an inch as the subsequent rate, the age would be reduced to 438 years. But as the Botanic Garden tree cannot be compared with the other for apparent vigour and favourable circumstances, four centuries may be assumed as a very probable age for the Loudoun Castle yew.

The rate of growth of two of the trees seems remarkable. The Auchendrane birch is said to be only about seventy years old. This will yield an annual girth-increase of 1·65 inch. The few birches I have observed do not grow nearly so fast as this, and it is desirable that the alleged age of the Ayrshire tree should be verified if possible. The silver fir at Auchendrane is said to have been planted in 1797, giving an annual rate of 1·88 inch, which, although unusually high, I believe, is not unprecedented in Scotland.

To complete this view of remarkable Ayrshire trees, I take the following examples of species, not included in Mr. Paxton's book, from Mr. Landsborough's observations:—

Date.	Species.	Locality.	Girth at 5 Feet.	Remarks.
			Ft. In.	
1879	Acer saccharinum	Craig, Ayr	..	11 ft. 2½ in. at 2 feet.
,,	Acer platanoides	Loudoun Castle	8 10	
,,	Liriodendron tulipifera	do.	..	7 ft. 7 in. at 4 feet.
,,	Cratægus Oxyacantha	do.	5 9	
,,	Pyrus Aucuparia	do.	6 10	
,,	Robinia Pseudacacia	do.	4 0	Bole, 12 ft.; Height, 51 ft. Planted about 1834.
,,	Hedera Helix	do.	..	3 ft. at 1 foot.
1893	Do.	Maybole	..	2 ft. 2½ in. at 2 feet.
1879	Pinus strobus	Loudoun Castle	8 6	
,,	Pinus Pinaster	Bellfield, Ayr	5 10	
,,	Cedrus Libani	Loudoun Castle	14 7	

I cannot conclude without remarking how much the value of Mr. Paxton's measurements would have been enhanced had he been able to mark the trees at the measured point. We should thus have been able in a very few years to determine the probable, or at least possible, rate of girth-increase in very large trees of the different species, a point on which we have hardly any reliable information. Unfortunately, it is not sufficient to record in print the height above ground at which the girth was taken without marking the place, because at a subsequent observation the precise point may be missed, and a very slight change in the position may yield very different results, also because there is often a considerable difference of level in the ground at opposite sides of a tree, so that even the approximate point of the recorded girth is uncertain. Perhaps Mr. Paxton may yet see his way to have the trees marked, with the co-operation of the proprietors and foresters, as this can be done without either injury or disfigurement. After a long period, indeed, say of twenty or thirty years, remeasuring of unmarked trees, at the recorded level, may yield tolerably satisfactory results. But when marked, and when the measurement is made with a reliable tape, a more precise result can be got in two or three years.

Finally, it is to be hoped that Mr. Paxton's example may be followed by other observers, with the requisite leisure and skill with the camera, so that we may gradually acquire a knowledge of the finest trees in other counties, similar to that which he has so fully given us in his beautiful presentation volume of portraits and measurements of the remarkable trees of Ayrshire.

Additions to the Flora of Mauritius, as recorded in Baker's "Flora of Mauritius and the Seychelles." By Surgeon-Major H. H. Johnston, D.Sc., F.R.S.E., F.L.S.

During a three and a half years' residence in Mauritius, from February 1887 to July 1890, I collected specimens of 485 species and varieties of plants. Of this number 103 are not recorded in Baker's "Flora of Mauritius and the Seychelles," published in 1877; but 25 of these belong to the Vascular Cryptogams, which are not included in Baker's Flora.

The following table shows the number of species in each of the three divisions of the vegetable kingdom:—

Class.	Native.	Naturalised.	Casuals and Escapes from Cultivation.	Total.
I. Dicotyledones .	8	31	12	51
II. Monocotyledones	18	5	4	27
III Cryptogamia . .	25	—	—	25
Total . . .	51	36	16	103

Of the 51 native species 2 are new, viz. *Phyllanthus mauritianus*, H. H. Johnston, and *Carpha costularioides*, C. B. Clarke.

Except where otherwise noted, the Phanerogamia have been identified by Mr. J. G. Baker, Keeper of the Herbarium, Royal Gardens, Kew, and author of the above-mentioned work, to whom I am particularly indebted for his universal kindness in naming most of the specimens sent to Kew for identification.

As the present paper forms the fifth and last of my reports on the flora of Mauritius, I take this opportunity of expressing my gratitude to Mr. W. T. Thiselton Dyer, Director of the Royal Gardens, Kew, on whose recommendation every facility for making botanical collections was rendered me by the military authorities at Mauritius, and to whose Herbarium staff at Kew I am indebted for the identification of most of the plants. I am also much indebted, for kind assistance, to Mr. C. B. Clarke; Messrs. H. & J. Groves; Dr. E. Hackel; Mr. J. Horne, late Director of Woods and Forests at Mauritius; Mr. W. Scott, present Director of Woods and Forests at Mauritius; and M. A. Daruty de Grandpré, Secretary of the Royal Society of Arts and Sciences of Mauritius.

EXPLANATIONS.

An * before the name of a species means that the plants of that species are naturalised in the Mauritius group of islands.

A † before the name of a species means that the plants of that species are either mere casuals, or escapes from cultivation, which have not become naturalised.

* FUMARIA MURALIS, Sonder.—Border of a sugar-cane field, 1070–1100 feet above sea-level, Plaines Wilhelms, Mauritius, 3rd September 1888. Stems 3–5 feet long. A common European weed.

* CAPSELLA BURSA-PASTORIS, Medic.—Roadside, 1070 feet above sea-level, Plaines Wilhelms, Mauritius, 3rd September 1888. A common European weed, recorded as cultivated at "la Rivière Noire," Mauritius, in Bojer, Hort. Maur., p. 11.

*RAPHANUS SATIVUS, Linn.—Fallow sugar-cane field, 1100 feet above sea-level, Plaines Wilhelms, Mauritius, 10th September 1888. Two forms, one with purple and the other with yellow petals. This species is the common cultivated radish, which is recorded as cultivated in vegetable gardens, in Mauritius, in Bojer, Hort. Maur., p. 16.

†SAPONARIA VACCARIA, Linn.—Cultivated ground, 1880 feet above sea-level, Curepipe, Mauritius, 7th September 1888.

*SILENE ARMERIA, Linn.—Roadside, 1850 feet above sea-level, Mauritius, 21st November 1888. A widely spread species, originally European, which has become established at roadsides, near gardens, at Curepipe. Recorded as cultivated in Mauritius, in Bojer, Hort. Maur., p. 23.

*SILENE GALLICA, Linn.—Roadside, 1380 feet above sea-level, Plaines Wilhelms, Mauritius, 17th September 1888. A native of Europe, now widely dispersed.

*SAGINA APETALA, Linn.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 8th October 1888. A native of Europe, now widely dispersed.

SIDA DIFFUSA, H. B. et K.—Ile de la Passe, 26th October 1888; Ile aux Fouquets, 2nd September 1889; Ile Marianne, 3rd September 1889; Ile Vakois, 5th September 1889. Trans. Bot. Soc. Edin., vol. xx. p. 358.

CARDIOSPERMUM MICROCARPUM, H. B. et K.—Wood, 90 feet above sea-level, Montagne de Port Louis, Mauritius, 28th March 1887; and field-side, 250 feet above sea-level, Pamplemousses, Mauritius, 27th May 1887. In Baker, Flor. Maur. Seych., p. 56, this species is recorded from the Seychelles by Perville and Horne, and from Rodriguez by Balfour; and the following note occurs:—"No doubt will be found also in Mauritius if looked for." It is found throughout the tropics. This is now considered a variety of *C. Halicacabum*.

*MEDICAGO LUPULINA, Linn.—Roadside, 1390 feet above sea-level, Plaines Wilhelms, Mauritius, 10th September 1888. A native of Europe and Asia.

* MEDICAGO DENTICULATA, Willd.—Roadside, 1390 feet above sea-level, Plaines Wilhelms, Mauritius, 10th September 1888. A native of Europe.

† CICER ARIETINUM, Linn.—Cultivated ground, 1880 feet above sea-level, Curepipe, Mauritius, 24th August 1888; and a road, 1820 feet above sea-level, Curepipe, 5th December 1888. Widely cultivated in tropical regions in the Old World, and occurs at Curepipe as a mere casual. It is recorded as accidentally cultivated in Mauritius, in Bojer, Hort. Maur., p. 102; and as naturalised in Flat Island in Horne's Notes on Flora of Flat Island, pp. 7 and 8, published in 1886.

* VICIA ANGUSTIFOLIA, Roth, var. SEGETALIS, Thuill.—Roadside, 1080 feet above sea-level, Plaines Wilhelms, Mauritius, 17th September 1888. A native of Europe.

* LATHYRUS APHACA, Linn.—Cultivated ground, 1880 feet above sea-level, Curepipe, Mauritius, 17th August 1888. A native of Europe, now widely dispersed.

* MUCUNA PRURIENS, DC.—River-side, 15 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 10th August 1887. Recorded as cultivated in the Royal Botanic Garden at Pamplemousses, and at Bois Chéri, in Bojer, Hort. Maur., p. 108. Vernacular name, *Pois á gratter.*

* SOPHORA TOMENTOSA, Linn.—Ile Marianne, 19th March 1890; Ile des Aigrettes, 20th June 1890. See Trans. Bot. Soc. Edin., vol. xx. pp. 321 and 371. In Bojer, Hort. Maur., p. 83, it is recorded as naturalised in Ile aux Tonneliers, at the entrance of Port Louis harbour. A native of India and the West Indies.

† ROSA sp.—Roadside near abandoned habitations, 1700 feet above sea-level, Curepipe, Mauritius, 5th December 1888. An escape from cultivation. Shrub 2–6 feet high. Petals pink. With reference to specimens forwarded by me to the Royal Gardens, Kew, Mr. J. G. Baker sent me the following note:—"*Rosa* probably a hybrid, of which *indica* is the predominating parent." In Bojer, Hort. Maur., p. 128, *Rosa indica,* and 14 other species of *Rosa* are recorded as cultivated in gardens in Mauritius.

† Cuphea procumbens, Cav.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 8th October 1888. It is a native of Mexico, and a common garden annual.

* Œnothera rosea, Soland. — Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 8th October 1888. Valves of dehiscent capsule recurved in the living plant, incurved in the dried plant. A native of Mexico, and recorded as cultivated at "la Rivière Noire," in Mauritius, in Bojer, Hort. Maur., p. 135.

Portulaca psammotropha, Hance (*fide* N. E. Brown).—In Trans. Bot. Soc. Edin., vol. xx. p. 366, this species is described by me and recorded from the following islands:—Ile aux Fouquets, 4th September 1889; Ile Vakois, 5th September 1889; Ile de la Passe, 18th March 1890; Ile Marianne, 19th March 1890.

† Momordica Charantia, Linn.—Stream-side, 15 feet above sea-level, Port Louis, Mauritius, 18th June 1887. An escape from vegetable gardens which has not become naturalised in Mauritius. This species is recorded as cultivated in gardens in Mauritius, in Bojer, Hort. Maur., p. 148. With reference to a specimen sent by me to the Royal Gardens, Kew, Mr. J. G. Baker wrote that this species had been sent by Mr. Neville from the Seychelles, and that it is widely spread through the tropics of both hemispheres.

* Opuntia monacantha, Haw.—Pasture, 10 feet above sea-level, Flat Island, 11th November 1887; and Ile de la Passe, 26th October 1888, as recorded in Trans. Bot. Soc. Edin., vol. xx. p. 358.

This species is erroneously recorded from Flat Island as the nearly allied *O. Tuna*, Miller, in Horne, Notes on Flora of Flat Island, pp. 13 and 14, published in 1886. *O. Tuna*, Miller, is naturalised in the main island of Mauritius.

* Opuntia Ficus-indica, Miller.—River-side, 15 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 2nd November 1887. This species is recorded as almost naturalised in Mauritius, in Bojer, Hort. Maur., p. 156. Vernacular name, *Raquette*.

Oldenlandia Heynii, G. Don.—Pasture, 1880 feet above sea-level, Curepipe, Mauritius, 5th June 1889. Also a native of Tropical Africa, Natal, and India.

† Morinda citrifolia, Linn.—Stream-side, 15 feet above sea-level, Port Louis, Mauritius, 18th June 1887. An escape from cultivation which has not become naturalised in Mauritius. This species, which is recorded as native from the Seychelles by Bojer and Horne in Baker, Flor. Maur. Seych., p. 153, is said to be cultivated in Mauritius, by Bojer.

* Galinsoga parviflora, Cav.—Roadside, 1100 feet above sea-level, Plaines Wilhelms, Mauritius, 17th September 1888. A native of South America.

* Erigeron canadensis, Linn.—Waste ground, 1880 feet above sea-level, Curepipe, Mauritius, 9th July 1888; and coralline limstone, 6 feet above sea-level, north islet of Les Bénitiers, 20th January 1890. A native of North America, now widely dispersed. See Trans. Bot. Soc. Edin., vol. xx. p. 333.

* Erigeron philadelphicus, Linn.—Abandoned plantation, 1300 feet above sea-level, Deux Mamelles, Pamplemousses, Mauritius, 18th July 1889. A native of North America.

† Erigeron mucronatus, DC.—Road, 1880 feet above sea-level, Curepipe, Mauritius, 21st November 1888. A native of Mexico. Is cultivated in the gardens at Curepipe, and also occurs as an escape.

† Boltonia indica, Benth.—Waste ground, 1870 feet above sea-level, Curepipe, Mauritius, 8th December 1888; and roadside, 1610 feet above sea-level, Vacoa, Mauritius, 14th June 1889. A native of China and Japan, which has scarcely become naturalised in Mauritius.

* Dichrocephala latifolia, DC.—Common along roadsides and on waste ground, 1880 feet above sea-level, Curepipe, Mauritius, 5th June 1889. This species is a widely dispersed weed, and it also occurs in Madagascar.

* Taraxacum officinale, Wigg.—Roadside, 1880 feet above sea-level, Curepipe, Mauritius, 15th March 1888. This species is recorded as cultivated at "la Rivière Noire,"

Mauritius, in Bojer, Hort. Maur., p. 192, under "*Leontodon Taraxacum*, L." Vernacular name, *Pissenlit d'Europe.* The Mauritius plants belong to the type of the species.

* IPOMŒA PURPUREA, Roth.—River-side, 40 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 30th August 1887; and edge of a forest, 1880 feet above sea-level, Curepipe, Mauritius, 13th March 1888. This common garden plant, a native of America, is recorded as cultivated at "la Rivière Noire," Mauritius, under the name of *Pharbitis purpurea*, in Bojer, Hort. Maur., p. 227. It is recorded as naturalised in Rodriguez by Balfour, on Mr. Baker's authority.

*IPOMŒA NIL, Roth; Baker, Flor. Maur. Seych., p. 209).—Ile des Aigrettes, 18th August 1888; Ile de la Passe, 26th October 1888. See Trans. Bot. Soc. Edin., vol. xx. pp. 324 and 358.

IPOMŒA GRANDIFLORA, Lam. (*Ipomœa glaberrima*, Bojer, cf. Baker, Flor. Maur. Seych., p. 211).—Ile des Aigrettes, 4th March 1889; Ile Vakois, 5th September 1889; Ile Marianne, 19th March 1890. See Trans. Bot. Soc. Edin., vol. xx. pp. 325 and 362.

This species, which occurs from Polynesia to Zambesi-land, is recorded as cultivated in the Royal Botanic Garden at Pamplemousses, Mauritius, under "*Calonyction comosperma*, Boj.," in Bojer, Hort. Maur., p. 228. It s recorded as native in Flat Island by Horne in his Notes on Flora of Flat Island, pp. 17 and 18, published in 1886. In Baker, Flor. Maur. Seych., p. 211, it is recorded by Bojer and Wright as native in the Seychelles, "in bushy places near the shore."

* CUSCUTA REFLEXA, Roxb.—Parasitic on shrubs, 1100 feet above sea-level, Moka, Mauritius, 18th June 1887; and in a forest 1350 feet above sea-level, Deux Mamelles, Pamplemousses, Mauritius, 18th July 1889. Common. A native of India.

† SOLANUM SODOMÆUM, Linn.—Footpath, 10 feet above sea-level, near a mill for grinding grain from India and Australia, La Grande Rivière Nord Ouest, Mauritius, 10th August 1887. One plant only was found by me. This

species, which is common in Tropical Asia, is recorded as cultivated in gardens, in Mauritius, in Bojer, Hort. Maur., p. 241.

*NICOTIANA TABACUM, Linn.—Ile aux Fouquets, 2nd September 1889; and Ile des Aigrettes, 20th June 1890. See Trans. Bot. Soc. Edin., vol. xx. pp. 326 and 367.

TRICHOSANDRA BORBONICA, Dcne. (*fide* N. E. Brown).—Round Island, 27th November 1889. Barkly and Horne, in Trans. Roy. Soc. Maur., 1869, pp. 118 and 136, record this plant from Round Island, under "No. 2 Streptocaulon species." See Trans. Bot. Soc. Edin., vol. xx., 1894, p. 254. It has not been found in the main island of Mauritius; but it is recorded from Bourbon, 100 miles distant, by Petit-Thouars and Lépervenche-Mezières, in De Candolle's Prodromus viii., 626, published in 1844.

† CALCEOLARIA MEXICANA, Benth.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 8th October 1888. A native of Mexico, frequently cultivated in gardens, and also found as an escape, in Mauritius.

* ANTIRRHINUM ORONTIUM, Linn.—Fallow sugar-cane field, 1100 feet above sea-level, Plaines Wilhelms, Mauritius, 10th September 1888. A native of Europe, Asia Minor, and North Africa.

* STEMODIA PARVIFLORA, Ait.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 8th October 1888. This weed, which is a native of Tropical America, was first found in Mauritius, at Curepipe, by Horne, on 8th November 1887.

† CAPRARIA BIFLORA, Linn. (*Capraria peruviana*, Feuill.; cf. Baker, Flor. Maur. Seych., p. 240.)—Stream-side, 5 feet above sea-level, Port Louis, Mauritius, 18th June 1887. This species is a native of South America, and it is also recorded as naturalised in the Seychelles, by Horne, in Baker's Flora.

* STACHYTARPHETA MUTABILIS, Vahl.—Stream-side, 1400 feet above sea-level, Vacoa, Mauritius, 25th April 1889. This species, which is a native of Tropical America, is recorded as cultivated in gardens, in Mauritius, in Bojer, Hort. Maur., p. 254. In Baker, Flor. Maur. Seych., p. 251, it is recorded as naturalised in the Seychelles.

†COLEUS ATROPURPUREUS, Benth.—Roadside, 1880 feet above sea-level, Curepipe, Mauritius, 14th March 1888. A native of Tropical Asia, which is frequently cultivated in gardens in Mauritius.

*MENTHA AQUATICA, Linn., var. CITRATA, Ehrh.—Marshy border of a forest, 1880 feet above sea-level, Curepipe, Mauritius, 8th February 1889. This species is the Bergamot mint of gardens.

*EMEX SPINOSUS, Campd.—Roadside, 1070 feet above sea-level, Plaines Wilhelms, Mauritius, 3rd September 1888. A native of the Mediterranean region, etc.

*RUMEX CRISPUS, Linn.—Roadside, 1700 feet above sea-level, Curepipe, Mauritius, 5th December 1888. A native of Europe, now widely dispersed.

*PILEA MUSCOSA, Lindl.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 21st November 1888. A native of Tropical America.

BŒHMERIA MACROPHYLLA, D. Don.—Forest stream-side, 1840 feet above sea-level, Curepipe, Mauritius, 12th February 1889. This species is also a native of India and Burmah.

PHYLLANTHUS MAURITIANUS, H. H. Johnston.—Ile de la Passe, 26th October 1888; Ile des Aigrettes, 4th March 1889; Ile aux Fouquets, 2nd September 1889; Ile Marianne, 3rd September 1889; Ile Vakois, 5th September 1889. See remarks on this new species in my "Report on the Flora of Ile des Aigrettes, Mauritius," in Trans. Bot. Soc. Edin., vol. xx. p. 329. For a full description, see under Ile de la Passe, in my "Report on the Flora of the Outlying Islands in Mahébourg Bay, Mauritius," in Trans. Bot. Soc. Edin., vol. xx. p. 359.

HYDRILLA VERTICILLATA, Presl.—River, 20 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 26th September 1887; River, 1100 feet above sea-level, Rivière de Moka, Mauritius, 7th July 1889; River, 740 feet above sea-level, La Grande Rivière Sud Est, Mauritius, 19th November 1889.

With reference to specimens of this species forwarded by me to the Royal Gardens, Kew, Mr. J. G. Baker wrote that specimens had been received at Kew, from Mauritius, from Colonel Pike, author of "Sub-Tropical Rambles," since his "Flora of Mauritius and the Seychelles" was written.

The order Hydrocharideæ is new to the flora of Mauritius. *H. verticillata* is also a native of Central Europe, Madagascar, Tropical Asia, and Australia.

VALLISNERIA SPIRALIS, Linn.—River, 10–50 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 10th August 1887. Common in running water. All the plants observed by me were male, and on 5th December 1887 I observed the male flowers floating on the surface of the water in the eddies of the river. This species is a native of the warm regions in the Old and New Worlds.

† HEDYCHIUM CORONARIUM, Koen.—Near abandoned habitations, 1770 feet above sea-level, Curepipe, Mauritius, 12th February 1889. Fruit not developed. This species, which is a native of Tropical Asia, is recorded as cultivated in the Royal Botanic Garden, Pamplemousses, and at Réduit, in Bojer, Hort. Maur., p. 329.

* TRIMEZA LURIDA, Salisb.—Forest, 1830 feet above sea-level, Rivière de la Terre Rouge, Moka, Mauritius, 31st July 1888. A native of Tropical America.

† YUCCA ALOIFOLIA, Linn—Waste ground, 10 feet above sea-level, Baie du Tombeau, Mauritius, 29th November 1887. Scarcely naturalised. Fruit not developed. This species, which is a native of America, is recorded as cultivated at "Bois Chéri," "la Rivière Noire," and "Mon Plaisir," in Mauritius, in Bojer, Hort. Maur., p. 343. Vernacular name, *Youcca à feuilles étroites.*

† ASPARAGUS OFFICINALIS, Linn.—Forest, 1870 feet above sea-level, Curepipe, Mauritius, 4th June 1888. It is recorded as cultivated in vegetable gardens, in Mauritius, in Bojer, Hort. Maur., p. 350. Vernacular name, *Asperge.*

ERIOCAULON LONGIFOLIUM, Nees.—Stream-side in forest, 1870 feet above sea-level, Good End, Mauritius, 23rd January 1888; and forest swamp, 1920 feet above sea-level, near the Mare aux Vacoas, Mauritius, 28th September 1888. Leaves erecto-patent. Scapes 3–16 inches long, erect, 7-ribbed. Flower-heads whitish. Flowers dimerous, with 2 sepals, 2 petals, 4 stamens, and 2 stigmas.

In Bojer, Hort. Maur., p. 361, this species is recorded as native from the neighbourhood of "Grand-Bassin," Mauritius, but it is erroneously named *E. quinquangulare*, L.

In Baker, Flor. Maur. Seych., p. 390, "*E. quinquangulare*, Bojer, non Linn.," and "*E. longifolium*, Nees," are erroneously given as synonyms of "*E. repens*, Lam." Baker's description of *E. repens*, Lam., has been made up partly from this species, but chiefly from *E. longifolium*, Nees.

In Bojer, Hort. Maur., p. 361, *E. repens* is recorded as native in Mauritius, from the same station as *E. longifolium*, Nees. *E. repens*, Lam., was found by me in a forest stream, 1920 feet above sea-level, near the Mare aux Vacoas, Mauritius, on 28th September 1888. Leaves recurved-patent. Scapes 6–13 inches long, erect, marked with 6 longitudinal green lines, alternating with 6 paler green lines. Flower-heads greenish-brown. Flowers trimerous, with 3 sepals, 3 petals, 6 stamens in two rows of 3 each, and 3 stigmas.

With reference to specimens of *E. longifolium*, Nees, and *E. repens*, Lam., forwarded by me to the Royal Gardens, Kew, Mr. J. G. Baker wrote, in November 1888, that Bentham pointed out some time ago that these are distinct species, the former having dimerous and the latter trimerous flowers.

E. longifolium is also a native of Madagascar.

NAIAS GRAMINEA, Delile.—River, 1100 feet above sea-level, Rivière de Moka, Mauritius, 23rd October 1888. Also a native of Africa. The genus *Naias* is new to the flora of Mauritius.

*TYPHONODORUM LINDLEYANUM, Schott.—River-side, 1100 feet above sea-level, Rivière de Moka, Mauritius, 6th December 1889. A native of Madagascar.

PYCREUS POLYSTACHYUS, Beauv. var. LAXIFLORUS, Benth. (*fide* C. B. Clarke).—Swamp, 1870 feet above sea-level, Curepipe, Mauritius, 15th March 1888.

CYPERUS STOLONIFERUS, Retz. (*fide* C. B. Clarke).—Coral seashore, 5 feet above sea-level, Baie du Tombeau, Mauritius, 29th November 1887. This species is recorded from Mauritius, under the erroneous name of *Cyperus tuberosus*, Rottb., in Baker, Flor. Maur. Seych., p. 410.

* CYPERUS MADAGASCARIENSIS, Roem. et Schult. var. IMERINENSIS, C. B. Clarke, in Durand et Schinz, Conspect. Fl. Afric., vol. v. p. 568 (*fide* C. B. Clarke).—River-side, 1100 feet above sea-level, Rivière de Moka, Mauritius, 12th October 1887. This variety is a native of Madagascar.

KYLLINGA EXIGUA, Boeck. "forma explicata" (*fide* C. B. Clarke).—Waste ground and roadsides, 1880 feet above sea-level, Curepipe, Mauritius, 22nd April 1888.

CARPHA COSTULARIOIDES, C. B. Clarke, MS. in Herb. Kew. "Panicula elongata, oblonga; spiculis longe-pedicellatis; glumis inferioribus 5–6 vacuis; flore uno perfecto; setis 6, longis, antice scabris; nuce levi luteo-brunescente; rostro cum nuce subæquilongo, conico, scabro; stylo ipso vix ullo, cum 3 stigmatibus longis atro-rubro. *C. Aubertii*, Nees, var. *β explicatior*, Durand et Schinz, Conspect. Fl. Afr., vol. v. p. 655."

Rhizome simple or once bifurcated, $\frac{1}{4}$–$\frac{3}{4}$ inch thick, clothed with the decaying bases of the old leaves. Stems 4–6 feet high, tufted at the apex of the rhizome, erect or suberect, terete-compressed, glabrous, leafy. Lower leaves $1\frac{1}{2}$–2 feet long, $\frac{1}{6}$–$\frac{1}{3}$ inch broad, linear, acuminate, dilated at the base, channelled above, glabrous with scabrous margins, green, coriaceous. Panicle 2–$3\frac{1}{2}$ feet long, oblong, copiously-branched, with ascending branches; lower bracts $\frac{1}{2}$–$1\frac{1}{2}$ foot long, with sheaths 1–$1\frac{1}{2}$ inch long, glabrous, and split on one side at the truncate apex; ultimate bracts $\frac{1}{10}$–$\frac{1}{5}$ inch long, subulate, scabrous, with sheaths $\frac{1}{12}$–$\frac{1}{6}$ inch long. Spikelets $\frac{1}{4}$–$\frac{1}{3}$ inch long, linear or linear-lanceolate, compressed, 7–14-glumed, pedicellate; pedicels $\frac{1}{12}$–$\frac{3}{4}$ inch long, ascending, triquetrous, with scabrous edges. Glumes empty except the uppermost two, distichous, imbricated, gradually increasing in size from $\frac{1}{16}$–$\frac{1}{10}$ inch long at the base to $\frac{1}{5}$–$\frac{1}{4}$ inch long at the apex of the spikelet, ovate-navicular, acute or subacute, keeled, glabrous, subcoriaceous, reddish-brown with pale brown sides or with the keel green and the sides reddish-brown; lower glumes 1–3, sometimes mucronate; uppermost glume completely hidden by the next glume below, $\frac{1}{5}$–$\frac{1}{4}$ inch long, linear-navicular, acute, without a keel, glabrous, pale brown, subcoriaceous, bearing a hermaphrodite flower. Stamens 3, protruded from the apex of the spikelet, longer than the style; filaments filiform, glabrous; anthers $\frac{1}{8}$–$\frac{1}{7}$ inch long, linear. Hypogynous bristles 6, $\frac{1}{5}$–$\frac{1}{4}$ inch long, barbed. Style $\frac{1}{4}$–$\frac{1}{3}$ inch long, divided one-third way down into 3 filiform papillose branches, protruded from the apex of the spikelet. Flower of second uppermost glume male, with 6 barbed bristles and 3 stamens bearing rudimentary anthers.

Habitat.—Bourbon, Boivin and Goudot; Mauritius, H. H. Johnston.

The name of this new species is published with the permission of Mr. C. B. Clarke, to whom I am indebted for the diagnosis in Latin. The description, in English, has been made by me from my Mauritius specimens, which are in flower, but not in fruit.

Mr. C. B. Clarke, in a letter, dated Kew, 15th March 1895, writes, with reference to *C. costularioides:* "It has happened (and it is an accident that has frequently happened to me) that while I never saw the plant till you sent it me, I have since found it several times in old herbaria that have come to my hand, both from Bourbon and Mauritius; it is Boivin n. 998, Goudot n. 1833, both from Bourbon."

In Mauritius I observed this species growing in a forest swamp, 1920 feet above sea-level, at the Mare aux Vacoas, on 28th September 1888; and in a forest, 940 feet above sea-level, at Le Grand Fond, Flacq, on 17th June 1890.

Fimbristylis obtusifolia, Kunth (*fide* C. B. Clarke).—Ile de la Passe, 26th October 1888; Ile aux Fouquets, 2nd September 1889; Ile Marianne, 3rd September 1889; Ile Vakois, 5th September 1889. See Trans. Bot. Soc. Edin., vol. xx. p. 360.

Fimbristylis complanata, Link (*fide* C. B. Clarke).—Marshy river-side, 60 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 5th December 1887. Stems 1–3 feet long, tufted, erect.

Eleocharis ochreata, Nees (*fide* C. B. Clarke).—Stream 1500 feet above sea-level, La Grande Rivière Sud Est, Mauritius, 6th June 1888; Forest swamp, 1920 feet above sea-level, near the Mare aux Vacoas, Mauritius, 28th September 1888; Clefts of rocks above water in the bed of a river, 740 feet above sea-level, Cascade Diamamouve, La Grande Rivière Sud Est, Mauritius, 19th November 1889.

Mr. C. B. Clarke, in a note on my herbarium specimens of *E. ochreata*, writes: "This Mauritius material belongs to the var. *humilis*, Boeck., or approaches that var."

CLADIUM ANCEPS, Hook. fil. (*fide* C. B. Clarke).—Swamp, 1910 feet above sea-level, Mare aux Vacoas, Mauritius, 28th September 1888. The species is also a native of Madagascar.

Mr. C. B. Clarke, in a note (dated 10th December 1894) on my herbarium specimen of *C. anceps*, Hook. fil., writes: "There are two very different plants in the Mauritius, viz. *Cladium anceps*, Hook. fil., and *Cladium iridifolium*, Baker pro parte."

PASPALUM CONJUGATUM, Berg.—Forest, 1880 feet above sea-level, Curepipe, Mauritius, 15th March 1888. This species is also a native of Central and Tropical America, West Indies, Tropical Asia, and Tropical Africa.

* SETARIA VERTICILLATA, P. Beauv.—Roadside, 1880 feet above sea-level, Curepipe, Mauritius, 9th July 1888; and roadside, 1070 feet above sea-level, Plaines Wilhelms, Mauritius, 3rd September 1888. A native of Europe, now widely dispersed.

ISCHÆMUM KOLEOSTACHYS, Hackel (*fide* E. Hackel).—River-side, 50 feet above sea-level, La Grande Rivière Nord Ouest, Mauritius, 8th September 1887. This species is also native in Bourbon, from which island it is recorded by Boivin.

ISCHÆMUM PILOSUM, Hackel.—Swamp, 1910 feet above sea-level, Mare aux Vacoas, Mauritius, 28th September 1888. This species is also a native of India and Madagascar.

ROTTBOELLIA COMPRESSA, Linn. fil. var. FASCICULATA, Hackel (*fide* E. Hackel).—Abandoned sugar-cane field, 1870 feet above sea-level, Curepipe, Mauritius, 17th April 1889. Common. I was informed by Mr. M. Noël, on 16th January 1890, that this grass was introduced into

Mauritius, from France, as a forage plant, by Mr. Denis de Boucherville, then proprietor of Minissi Estate at Moka, Mauritius.

Andropogon Ischæmum, Linn.—Forest, 1880 feet above sea-level, Curepipe, Mauritius, 4th June 1888. This species is also a native of Europe, Asia, Africa, and Australia.

* Aira capillaris, Host.—Roadside, 1850 feet above sea-level, Curepipe, Mauritius, 21st November 1888. A native of Europe.

† Avena sativa, Linn.—Road, 1820 feet above sea-level, Curepipe, Mauritius, 16th October 1888.

The grain of the common cultivated oat is imported into Mauritius for feeding horses; and on the turf roadways, among the sugar-cane plantations, at Curepipe, plants of this species are occasionally found in flower and ripe fruit.

A. sativa is recorded as cultivated in the plantations, in Mauritius, in Bojer, Hort. Maur., p. 367.

Lepturus repens, R. Br. (*fide* E. Hackel).—Ile Maria-anne, 3rd September 1889; Ile Vakois, 5th September 1889; Ile de la Passe, 18th March 1890. See Trans. Bot. Soc. Edin., vol. xx. p. 373.

The following orders are not included in Baker's "Flora of Mauritius and the Seychelles."

Except where otherwise noted, the specimens have been identified by Mr. C. H. Wright, Assistant in the Herbarium, Royal Gardens, Kew:—

Nitella acuminata, A. Braun (*fide* H. & J. Groves).—Stream 1840 feet above sea-level, Curepipe, Mauritius, 25th February 1889.

Rhizogonium spiniforme, Bruch.—Trunk of a tree in a damp forest, 2050 feet above sea-level, Montagne du Pouce, Mauritius, 7th July 1887; and trunk of a dead tree in a forest, 1860 feet above sea-level, Curepipe, Mauritius, 28th August 1889.

Webera albicans, Schimper.—Wet rocks in a shady ravine, 360 feet above sea-level, Chamarel, Mauritius, 21st January 1890.

Macromitrium recurvum, Mitt. MSS. in Herb. Kew. —Trunk of a tree in a damp forest, 2050 feet above sea-level, Montagne du Pouce, Mauritius, 7th July 1887.

Hypopterygium tamarisci, Brid.—Rock at a stream-side, 1740 feet above sea-level, Curepipe, Mauritius, 27th August 1888.

Hypnum regulare, C. Müll.—Rock in a stream, 1800 feet above sea-level, Curepipe, Mauritius, 27th August 1888.

Raphidostegium Duisabonum, Schimper (*fide* G. Massee).—Trunk of a living tree in a swamp, 1910 feet above sea-level, Mare aux Vacoas, Mauritius, 13th June 1888.

Mastigobryum decrescens, Lehm. et Ldbg.—Trunk of a dead tree in a forest, 1860 feet above sea-level, Curepipe, Mauritius, 28th August 1889.

Cladonia coccifera, Schaer.—Trunk of a dead tree in a forest, 1890 feet above sea-level, Mare aux Vacoas, Mauritius, 13th June 1888.

Cladonia squamosa, Hoffm.—Rock in a forest, 900 feet above sea-level, Le Grand Fond, Flacq, Mauritius, 17th June 1890.

Ramalina calicaris, Fries.—Recorded by me from Round Island in Trans. Bot. Soc. Edin., vol. xx. (1894) p. 263.

Ramalina homalea, Ach. (*fide* G. Massee).—Ile Marianne, 3rd September 1889; Ile Vakois, 5th September 1889. See Trans. Bot. Soc. Edin., vol. xx. p. 373.

Ramalina usneoides, Fries (*fide* G. Massee).—Ile Marianne, 3rd September 1889. See Trans. Bot. Soc. Edin., vol. xx. p. 373.

Lepraria flava, Ach.—Living trunk of *Casuarina equisetifolia*, Forst., 45 feet above sea-level, Souillac, Mauritius, 14th January 1890; Ile Marianne, 19th March 1890. Plant greenish-yellow. See Trans. Bot. Soc. Edin., vol. xx. p. 373.

Parmelia conspersa, Ach.—Round Island, 27th November 1889. See Trans. Bot. Soc. Edin., vol. xx. (1894) p. 263.

Physcia picta, Nyl.—Round Island, 27th November 1889. See Trans. Bot. Soc. Edin., vol. xx. (1894) p. 263.

Stictina tomentosa, Nyl.—Trunks of living trees in a forest, 1860 feet above sea-level, Curepipe, Mauritius, 29th May 1888. Thallus crisp, dark green above, brown beneath, with copious grey spots and grey at the margin. Apothecia saucer-shaped, reddish-brown.

Sticta damæcornis, Ach.—Trunk of a tree in a damp forest, 2050 feet above sea-level, Montagne du Pouce, Mauritius, 7th July 1887. Thallus green above, whitish beneath. Apothecia black above, brown beneath.

Lecidea leucoplaca, Fries.—Ile Vakois, 5th September 1889. See Trans. Bot. Soc. Edin., vol. xx. p. 363.

Lecanora sphinctrina, Mont.—Trunk of a tree in a damp forest, 2050 feet above sea-level, Montagne du Pouce, Mauritius, 7th July 1887. Thallus green above, white beneath. Apothecia brown.

Lecanora subfusca, Ach.—Round Island, 27th November 1889. See Trans. Bot. Soc. Edin., vol. xx. (1894) p. 263.

Agaricus alveolus, Lasch. (*fide* M. C. Cooke).—Trunk of a living tree in a shady ravine, 360 feet above sea-level, Chamarel, Mauritius, 21st January 1890. Plant whitish on both surfaces.

Polyporus sanguineus, Meyer (*fide* J. G. Baker).—Round Island, 28th November 1889, and Ile Vakois, 18th March 1890. Plant red on both surfaces. See Trans. Bot. Soc. Edin., vol. xx. (1894) p. 264.

Dacrymyces chrysospermus, Berk. et Curt. (*fide* M. C. Cooke).—Dead branch of a tree in a shady ravine, 360 feet above sea-level, Chamarel, Mauritius, 21st January 1890. Plant thick, coarsely corrugated, orange-coloured, with the consistency of a jelly-fish.

Caulerpa plumaris, C. A. Agardh.—Ile Marianne, 19th March 1890. See Trans. Bot. Soc. Edin., vol. xx. p. 373.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF FEBRUARY 1895. By ROBERT LINDSAY, Curator.

During the past month of February all out-door vegetation has been completely retarded in consequence of the prolonged hard frost which prevailed during the entire month. It has been by far the most inclement February that we have experienced, and has not been exceeded in severity by any February of which we have any record. Not a single plant came into flower during the month on the rock-garden, a circumstance altogether unprecedented. The snowdrop did not come into flower till the 1st of March, while last year it came into flower on the 16th of January. Many plants have sustained great injury from the prolonged frost, the full extent of which will not be known till later on in the season. Among the worst injured are the following:—*Arundo conspicua; Baccharis patagonica; Bambusa Simoni, B. Mitis*, and *B. Fortunei aurea; Berberis dulcis, B. trifoliolata; Ceanothus azureus, C. dentatus; Cistus populifolius, C. formosus, C. lusitanicus; Corokia Cotoneaster; Cupressus macrocarpa; Dacrydium Franklinii; Erica ciliaris, E. australis, E. mediterranea; Edwardsia microphylla; Helianthemum amabile* and vars.; *Gynerium argenteum; Garrya MacFadyena; Iberis corifolia fl. pl.; Lithospermum prostratum; Olearia ilicifolia, O. Gunniana; Pieris formosa; Pinus insignis; Polygonum vaccinifolium; Raphiolepis ovata; Phillyrea angustifolia, P. latifolia; Phlomis fruticosa; Veronica anomala, V. Andersonii, V. cupressoides, V. epacridea, V. chathamica, V. Cataractæ, V. Bidwillii, V. Kirkii, V. Lewisii, V. parviflora, V. Traversii; Senecio Buchanani, S. Greyii, S. compactus;* wallflower, stock, etc.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF FEBRUARY 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	30·222	35·6	30·5	35·6	33·3	E.	St.	10	E.	0·235
2	29·989	36·4	32·9	34·0	33·9	N.E	Nim.	10	N.E.	0·050
3	30·144	37·2	34·0	35·9	35·0	E.	St.	9	E.	0·010
4	30·224	38·2	34·6	36·6	34·9	N.E.	St.	9	N.E.	0·000
5	30·131	38·2	31 0	33·0	30·2	N.	...	0	...	0·050
6	29·627	34·8	25·8	26·1	25·2	N.	Cir. St.	5	N.	0·000
7	29·773	29·9	20·1	22·1	20·7	S.E.	Cir. St.	10	S.E.	0·000
8	29·945	25·3	12·9	14·9	13·0	W.	Cir.	9	W.	0·000
9	30·029	28·9	13·0	16·6	16·2	W.	Fog	5	...	0·000
10	29·874	32·0	11·8	13·3	13·3	W.	Fog	5	...	0·000
11	29·747	29·7	12·8	16·0	16 0	W.	Cir.	1	N.W.	0·000
12	29·868	33·1	15·6	23·8	22·0	W.	...	0	...	0·000
13	30·042	37·9	16·1	22·3	21·9	W.	Fog	5	...	0·000
14	30·248	34·2	21·7	25·9	24·0	E.	...	0	...	0·000
15	30·428	30·7	24·1	30·2	27·7	S.E.	Cir. Cum.	4	S.E.	0·000
16	30·580	36·6	21·8	32·1	31·0	S.E.	Fog	5	...	0·000
17	30·521	41·1	30·6	33·1	32·0	E.	St.	8	E.	0·000
18	30·337	36·4	27·0	28·2	27·5	W.	Cir.	3	N.	0·000
19	30·298	36·2	18·8	20·1	19·9	W.	Fog	5	...	0·000
20	30·331	40·9	19·1	23·8	23·8	W.	Fog	5	...	0·000
21	30·295	36·9	23·4	36·6	34·4	W.	...	0	...	0·000
22	30·297	47 0	29·6	35·0	33·3	W.	...	0	...	0·000
23	30·166	41·9	35·0	39·2	38·0	S.W.	St.	10	S.W.	0·040
24	29·728	47·4	35·8	35·8	35·2	N.E.	Nim.	10	N.E.	0·030
25	30·017	41·5	30 0	34·2	32·7	W.	Cir.	1	N.	0·000
26	29·622	42·2	30 3	40·8	39·8	W.	Cir. St.	10	N.W.	0·000
27	29·780	45·8	33·9	34·9	32·4	W.	St.	7	N.	0·000
28	29·735	41·1	29·7	40·8	39·1	W.	Cir.	1	N.W.	0·045

Barometer.—Highest, 30·580 inches, on the 16th. Lowest, 29·622 inches, on the 26th. Monthly Range, 0·958 inch. Mean, 30·071 inches, being 0·312 inch above the average for February for four preceding years.

Protected S. R. Thermometers,—Highest, 47°·4, on the 23rd. Lowest, 11°·8, on the 10th. Monthly Range, 35°·6. Mean of all the Highest, 37°·0. Mean of all the Lowest, 25°·1. Mean Daily Range, 11°·9. Mean Temperature of Month, 31°·0, being 8°·3 below the average for February for four preceding years. Frost occurred on 22 days.

Hygrometer.—Mean of Dry Bulb, 29°·3. Mean of Wet Bulb, 28°·1. Temperature of Dew-point, 23°·9. Mean Humidity, 79 %.

Radiation Thermometers.—Highest in Sun, 97°·9, on the 23rd. Lowest on Grass, 9°·0, on the 10th. Frost occurred on Grass on 28 days.

Sunshine.—Total recorded for month, 75 hours 25 minutes, being 28·4 % of the possible amount. The sunniest day was the 21st, with 8 hours 15 minutes, being 82·8 % of the possible amount. None was recorded on 4 days.

Rainfall.—Rain or Snow fell on 7 days. Total Fall, 0·460 inch, being 2·334 inches below the average for February for four preceding years. Greatest Fall in 24 hours, 0·235 inch, on the 1st.

A. D. RICHARDSON, *Observer*.

III. ON PLANTS IN THE PLANT HOUSES. BY R. L. HARROW.

A general activity of growth in the majority of plants in the plant houses seems now to have set in. This is naturally further developed in those houses devoted to tropical plants, where the many-hued colours of the young foliage is very attractive. About forty species have, since the last meeting, in February, come into flower. Among the most interesting of which are the following:—

Paulo-Wilhelmia speciosa, Hochst. A plant belonging to the order Acanthaceæ, and a native of Abyssinia. It has loose stems of a herbaceous character, swollen at the nodes, growing about three feet in height and bearing opposite cordate leaves, with irregular serrations. The inflorescences are in panicles, bearing pretty mauve blue flowers; the lobes of the corolla arranged so as to give the appearance of a single lip. Plants were raised at Kew from seed obtained from a dried specimen collected in an expedition to the Cross River, Cameroon, by Vice-Consul H. H. Johnston. A figure and description by Mr. N. E. Brown appeared in the "Gardeners' Chronicle" of 1889, p. 749. The genus was founded by Hochstetter, and dedicated to Frederich Paul Wilhelm, Duke of Wurtemburg, in 1840.

Rhododendron argenteum, Hook. f. This beautiful species is a native of the Sikkim Himalayas, and is well figured in Hooker's "Rhododendrons of the Sikkim Himalayas," where it is stated to grow on Sinchul at an elevation of from 8000 to 9000 feet. The tree-like habit of the plant is well known, and the large leaves with silvery under surface are characteristic. The large individual flowers are pink in bud, changing as the flower expands to pure white, with a deep purple blotch at the base.

Philageria Veitchii, Mast. This plant is an interesting one on account of its being a hybrid between two genera, viz. *Lapageria* and *Philesia*, two plants of widely differing habit, and the hybrid exhibits many intermediate characters. The stems are wiry, most resembling that of *Lapageria*, but the foliage is most like that of the pollen-parent *Philesia*. The solitary flowers are of a waxy texture, and bright rose-coloured. It was raised by Messrs. Veitch, of Chelsea, in compliment to whom it was specifically named by Dr. Masters in the "Gardeners' Chronicle" of 1872, p. 358.

Burchellia capensis, R. Br. This plant is the only representative of this genus, which was named in compliment to W. Burchell, a botanical traveller; and is a native of South Africa, introduced about the early part of the century. It is of a compact shrub-like habit, the terminal inflorescences being made up of generally six flowers. The corolla is inflated and of a scarlet colour, with the club-shaped stigmas protruding from the mouths.

Of others that have flowered the following may be mentioned, viz.:—*Vanda tricolor*, L.,—a native of Java, introduced by Messrs. Veitch in 1846, with axillary spikes of large scented flowers; and *V. tricolor*, L., var. *suavis*, Rchb. fil.,—with longer racemes bearing more flowers; *Trichopilia sanguinolenta*, Rchb.,—native of Ecuador, with a richly striated lip, and flattened pseudobulbs; *Mitriostigma axillare*, Hochst.,—a small spreading shrub, with highly perfumed white flowers, belonging to the order Rubiaceæ, a native of South Africa; and *Kopsia fruticosa*, A. DC.,—an apocynaceous East Indian plant.

MEETING OF THE SOCIETY,

Thursday, April 11, 1895.

Symington Grieve, Esq., Vice-President, in the Chair.

The Chairman made intimation of the death of Charles Eyre Parker, Torquay, and of Dr. A. G. More, Dublin, Non-Resident Fellows of the Society.

Dr. W. G. Smith exhibited and commented upon a section of stem of horse chestnut, showing large callus-development.

Mr. J. H. Burrage exhibited specimens of *Pandanus tenuifolius*, Balf. fil., an endemic Rodriguez plant, which had been killed in the Palm House of the Royal Botanic Garden, through the attack of *Melanconiun Pandani*, and he described the phases of the life history of the fungus, which has previously been reported from the Botanic Gardens at Breslau, Berlin, Paris, Kew, and Glasnevin.

Mr. Symington Grieve exhibited twigs of mistleto, in fruit, from his garden.

The following plants in bloom were exhibited from the Royal Botanic Garden:—*Philageria Veitchii, Trichopilia sanguinolenta, Vanda tricolor suavis.*

The following papers were read:—

Notes on the Morphology of some British Leguminosæ.—II. Meliotus officinalis. By James A. Terras, B.Sc.

Seeds.—Ellipsoidal, laterally compressed, embryo pleurorhizal, radicle extending from one end to about two-thirds of the length of the seed, and projecting strongly, especially at the apex.

Issued November 1895.

The whole seed is yellow or light yellow-brown in colour, with a smooth but not shining surface.

The small, point-like, hilum scar is situated in the hollow formed by the projection of the apex of the radicle, while on the end of the seed, beyond the hilum scar, is a small patch darker brown in colour than the rest of the seed.

Size, 2·75 mm. long × 2 mm. broad, including the radicle, × 1·5 mm. thick; or, according to Hartz, 2·2 × 1·5 × 1 mm.

GERMINATION.—During the earlier stages of germination the rapid elongation of the hypocotyl carries the young growing root out of the seed in a downward direction, forcing it into the soil, and when the root itself has reached a length of about 4–5 mm., the hypocotyl is at least twice as long, and the seed still below the surface of the soil. At about this time, however, the formation of the first root hairs may be observed taking place near the point of junction of the root and hypocotyl. These soon attach themselves to particles of soil, and so anchor that particular part of the compound radicle that any further progress made by the root in the soil must be due to its own elongation. The hypocotyl, however, still continues to grow, and, as its lower end is now fixed, this increase in length has the effect of withdrawing the cotyledons from the seed-coat, which is retained below the surface by the weight of the superincumbent soil, while the liberation of the cotyledons is facilitated by the presence of the mucilaginous endosperm.

In a normal germination, the first part of the embryo to appear above the surface of the soil is the bent upper part of the hypocotyl, followed at once by the bases of the cotyledons. As soon as these last are free from the soil a backward curvature of the hypocotyl takes place, the still closed cotyledons are swung round in a vertical plane till the erect position is reached, then each curves outwards laterally till it reaches its permanent horizontal position.

COTYLEDONS.—The petiole is rather short, and the lamina is attached to its apex by a short slightly swollen joint. The lamina is, in general, expanded almost horizontally, and may even droop somewhat at its apex, while the petiole, on the other hand, is nearly, if not quite erect, and diverges but slightly from the line of the future plumular stem.

The lamina is equilateral, somewhat fleshy, and of an elongated elliptical outline. Both surfaces are quite glabrous, and pale green in colour, though the lower is of a distinctly paler tint than the upper.

A midrib is distinctly visible on the lower surface, being represented by a median longitudinal line, but no ridge, while on the upper its position is indicated by a slight groove at the base.

The petiole is generally about one-third or one-half the length of the lamina, and is rather slender, with a slight longitudinal groove on the upper face, which, however, disappears just below the joint by which the lamina is attached. The lower face is cylindrical, but not keeled.

At its base the petiole expands laterally to form a small distinct vagina, which half surrounds the stem, but scarcely, if at all, unites with that of the opposite cotyledon, consequently no tube is formed round the plumule, the protection of which is, however, assured by the upright petioles themselves.

The cotyledons are not persistent, but after the first three or four plumular leaves are fully formed the lamina falls off at the joint, leaving the yellow withered petiole still attached to the stem.

The hypocotyl is considerably elongated, and the two cotyledons are borne at a height of about an inch from the ground.

Plumule.—The first leaf arises in a plane at right angles to that in which the cotyledons lie, and in most cases, before it has fully expanded, the internode bearing it has elongated to such an extent as to raise the first node clear of the cotyledonary petioles.

This internode is in colour pale green, splashed with minute red spots; it is always glabrous, quite smooth, and in many seedlings reaches a considerable height.

The first leaf itself is composed of a simple unbranched lamina, borne at the apex of a long slender petiole, to which it is attached by means of a short joint, and may be expanded either horizontally or obliquely upwards.

The petiole is generally long enough to raise the lamina of the leaf clear of at least the lower portion of the surrounding vegetation, and in any case to a considerable height above the terminal bud. It is provided with a slight groove on the upper face, and is smoothly cylindrical but not keeled below. At the base it expands laterally into a short but comparatively broad membranous vagina, which scarcely half surrounds the stem bearing on its upper free margin two long, linear, somewhat spreading stipules, each of which is crowned at its apex by a tuft of short delicate hairs, and bears on its inner side (that opposite the petiole) a short triangular tooth which projects from it almost at right angles.

The lamina is composed of a single terminal leaflet of nearly orbicular outline, with an apical triangular sinus, from the base of which arises, in typical cases, an extremely short, blunt, spine-like process, which is, however, not unfrequently absent. The margin of the leaflet is more or less distinctly undulate on at least the upper half of its extent, and the marginal projections correspond with the terminations of the lateral veins. A distinct midrib runs up the median plane of the leaflet, and terminates in the short triangular apical projection after having given rise to three or four pairs of slender lateral branches, which, after again branching once or twice, terminate as above stated in the margin of the leaflet.

Before the second leaf reaches its full development, the internode bearing it has undergone a considerable elongation, sufficient, at least, to raise it half an inch or so clear of the vaginal sheath of the first leaf by which it has been protected. It is placed almost opposite the first, but somewhat approximated to it on the left-hand side, and is trifoliate, all three leaflets being attached to the petiole by short cylindrical joints, one at the apex and the other two laterally opposite each other at about an eighth of an inch behind the terminal one.

The petiole is considerably elongated, and in transverse section may be described as rather broadly triangular, the apex projecting strongly downwards, while a deep groove runs along the upper face from the base, where it expands into the vaginal sheath, to the point at which the two lateral leaflets arise, beyond which the petiole is narrower and the groove very much smaller. At its lower end the petiole is attached to the stem by a broadly sheathing vagina, the upper margin of which is prolonged into two long subulate somewhat spreading stipules, behind each of which is found a short triangular tooth with a sharp accuminate apex curved distinctly downwards, and somewhat resembling a minute recurved rose prickle. Other tooth-like projections appear occasionally on the vaginal margin, generally in descending series below this main one, but, unlike it, they are not of constant occurrence.

Of the three leaflets constituting the lamina, the terminal one is slightly larger than the other two, but this difference is not so well marked here as in the adult form, the leaflet being but slightly broader than the other, and not very much longer. The apical sinus, with its basal point, is generally more highly developed in this second than in the first leaf, and especially so in the terminal leaflet, but even there not so highly as in the adult leaves. In the same way the serration of the margin here is intermediate between that seen in the first leaf and that occurring in those formed later. The first three leaves may, in fact, be considered as embryonic structures, gradually increasing in complexity as they pass upward. The fourth leaf, on the other hand, differs but slightly if at all from that succeeding it, and must therefore be looked upon as the first adult leaf borne by the plant.

The earlier leaves show, as regards their position on the axis, a gradual transition from the opposite arrangement, exemplified in the cotyledons, to the $\frac{1}{3}$ spiral ascending from right to left, which is characteristic of the higher parts of the primary axis. As the stem increases in height the lower leaves fall off, leaving the vaginæ each with its pair of stipules still attached to the axis.

Branching.—The cotyledons and all the succeeding leaves on the primary axis bear in their axils branch buds, and these with the exception of the cotyledonary buds develop at once into branches during the first year. These branches bear leaves similar in all respects to those borne on the main stem, and arranged, like them, in a $\frac{1}{3}$ spiral rising from right to left, and consequently homodromous.

Secondary branches arise in the axils of the leaves borne on the primary branches, and these in their turn bear similar leaves, but, as a rule, tertiary branches are not formed though they occasionally develop in particularly strong plants.

Every leaf which bears a branch in its axil, whether on the main stem or the primary branches, bears also a small accessory bud placed directly below the axillary branch and completely enclosed by the vagina, which persisting after the leaf has fallen off, protects it from external injury. This accessory bud, however, does not develop under normal conditions, but enters on active growth only when the axillary bud of the same leaf is seriously injured or destroyed. No flowers appear on the primary axis or its branches during the first year of the plant's existence.

During the late summer and early autumn of the first year, the subterranean parts of the plant, but especially the hypocotyl, become considerably enlarged owing to the storage in them of reserve materials; during the same period the cotyledonary node is drawn below the surface of the soil, and the buds in the axils of the cotyledons have increased considerably in size. These buds, if examined towards the end of autumn, will be seen to consist of a number of scales, each composed of the vagina and stipules of a leaf, the petiole and lamina of which are either absent or only developed in the most rudimentary manner.

These leaf organs, which are in general colourless and membranous, are placed alternately to right and left of the bud, and in strong plants one or more secondary buds may be observed in the axils of the lower scale leaves. These exactly resemble the primary buds, and may in their turn bear tertiary buds in the axils of their lower scales.

During late autumn the whole of the aërial branching system of the plant dies down to the level of the ground, leaving only the subterranean hypocotyl and root system, with the above-mentioned cotyledonary buds, to persist during the winter.

During the following spring these various buds elongate into shoots, which rise into the air and bear leaves arranged in a $\frac{1}{3}$ spiral. In the axil of each leaf is to be found an axillary bud with a smaller accessory one, placed vertically below it, but in the region toward the base of the shoot; comparatively few of the former ever elongate, while the latter never do so under normal circumstances, but replace the axillary branches if these should chance to be injured. In the upper parts of the shoot, however, the axillary buds develop into racemose unilateral inflorescences, while in autumn, after the termination of the flowering period, their accessory buds frequently elongate into leafy branches, the leaves of which, themselves in most cases much smaller than those borne on the main axis, bear inflorescences in their axils, or only the leaves towards the apex of the branch do so while the lower bear leafy branches. The accessory buds themselves occasionally elongate into inflorescences without the intervention of leafy branches, but in either case the result is the same, namely, the production of a second autumnal flowering period. Those of the axillary buds arising towards the base of the shoot which elongate, form branches which behave in the same way as the shoot itself.

Notes from the Royal Botanic Garden, Edinburgh.

1. Report on Vegetation during the month of March 1895. By Robert Lindsay, Curator.

During March vegetation made considerable progress, but the severity of the previous months has been such as to render the season a very late one. Trees and shrubs are late in developing their leaf buds. Hardly any perceptible change was noticed at the end of the month, many being still in their winter condition. The extent of injury done to various shrubs by frost during the protracted winter is now more apparent, and is even greater than was anticipated. Herbaceous plants are late in flowering, the earlier kinds continued in bloom for a much shorter time than usual. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following twenty-three came into flower during March:—*Eranthis hiemalis* on 1st March; *Galanthus nivalis*, 1st; *G. plicatus*, 4th; *Corylus Avellana*, 7th;

Leucojum vernum, 10th; *Scilla praecox*, 11th; *Dondia Epipactis*, 11th; *Bulbocodium vernum*, 13th; *Tussilago fragrans*, 15th; *Crocus susianus*, 15th; *Nordmannia cordifolia*, 16th; *Crocus vernus*, 17th; *Scilla sibirica*, 18th; *Symplocarpus fœtidus*, 24th; *Iris reticulata*, 25th; *Daphne Mezereum*, 25th; *Rhododendron atrovirens*, 26th; *Arabis albida*, 27th; *Narcissus pumilus*, 27th; *Orobus vernus*, 28th; *Scilla bifolia*, 30th; *S. bifolia alba*, 30th; *Rhododendron Nobleanum*, 31st.

On the rock-garden 44 species and varieties came into flower during the month, as against 75 for March last year. Amongst the most interesting were:—*Andromeda floribunda*, *Anemone Hepatica*, *A. angulosa*, *Bulbocodium vernum*, *Colchicum crociflorum*, *Chionodoxa Luciliæ*, *Crocus biflorus*, *Daphne Blagayana*, *D. Mezereum*, *Erica herbacea*, *Draba Mawcana*, *Galanthus Elwesii*, *G. Imperati*, *Iris reticulata*, *Narcissus minimus*, *Saxifraga Burseriana*, *S. imbricata*, *S. juniperifolia*, *S. oppositifolia pyrenaica*, *S. sancta*, *Scilla sibirica*.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF MARCH 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·414	47·2	36·8	40·0	38·1	W.	...	0	...	0·010
2	29·696	46·4	30·8	33·7	30·1	N.	Cir. St.	5	N.	0·050
3	29·604	37·2	27·2	30·8	27·7	N.	...	0	...	0·000
4	29·902	38·0	30·1	37·6	33·7	N.	Cir.	2	...	0·035
5	29·794	41·8	32·1	37·2	35·8	W.	Cir.	5	N.	0·015
6	29·517	45 7	37·0	41·7	39·8	S.W.	St.	10	S.W.	0·050
7	29·620	44 7	36·8	40·1	39·1	W.	St.	9	W.	0·000
8	29·519	47·5	34·2	40·1	36·9	S.E.	Cir.	6	S.	0·080
9	29·504	42·0	36·7	37·8	37·4	W.	St.	9	S.	0·000
10	29·309	42·1	37·1	37·7	36·9	N.E.	Nim.	10	N.E.	0·370
11	29·393	38·1	35·4	36·0	35·4	N.E.	Nim.	10	N.E.	0·025
12	29·680	36·9	33·0	35 0	33·2	N.E.	Nim.	10	N.E.	0·000
13	29·938	38·2	30·0	34 8	34·5	W.	Fog	5	...	0·000
14	30·015	46·2	34·3	46·0	43·8	S.W.	Cir.	6	W.	0·000
15	30·078	50·7	45·7	48·0	46·0	W.	Cir. St.	10	W.	0·000
16	30·133	52·9	44·8	48·1	45·0	S.W.	Cir.	6	W.	0·000
17	30·122	54·7	40 9	46·0	44·0	W.	St.	3	W.	0·000
18	30·042	54·7	33·4	37·1	37·1	W.	St.	10	W.	0·060
19	29·765	49·7	37·1	43·7	41·1	W.	St.	10	W.	0·035
20	29·740	48·8	39·8	43·8	41·7	W.	St.	9	N.	0·150
21	29·646	49·7	39·2	49·7	48·2	W.	Cir.	6	W.	0·000
22	29·755	55·1	43·7	46·3	42·9	S.W.	Cir. St.	10	N.W.	0·015
23	29·524	53·1	45·1	48·1	45·7	S.W.	St.	10	S.W.	0·065
24	28·818	53·0	48·0	48·3	45·1	W.	Cir. St.	10	W.	0·040
25	28·848	50·1	37·0	43·7	40·9	S.W.	St.	10	S.W.	0·030
26	28·999	46·0	33·7	40·7	38·9	W.	Cir.	5	N.W.	0·020
27	29·107	48·6	34·6	38·8	37·5	N.E.	Cir. St.	10	S.W.	0·650
28	28 592	41·5	37·0	37·9	37·5	N.E.	Nim.	10	N.E.	0·165
29	28·927	40·4	36·9	40·4	38 5	N.W.	Nim.	10	N.W.	0·320
30	29·313	42·0	37·3	40·2	38·4	N.E.	Nim.	10	N.E.	0·050
31	29·452	44·0	38·0	39·0	38·0	S.W.	Nim.	10	N.W.	0·060

Barometer.—Highest, 30·133 inches, on the 16th. Lowest, 28·592 inches, on the 28th. Monthly Range, 1·541 inch. Mean, 29·541 inches, being 0·280 inch below the average for March for four preceding years.

Protected S. R. Thermometers.—Highest, 55°·1, on the 21st. Lowest, 27°·2, on the 3rd. Monthly Range, 27°·9. Mean of all the Highest, 46°·0. Mean of all the Lowest, 36°·9. Mean Daily Range, 9°·1. Mean Temperature of Month, 41°·4, being 1°·4 above the average for March for four preceding years. Frost occurred on 4 days.

Hygrometer.—Mean of Dry Bulb, 40°·9. Mean of Wet Bulb, 39°·0. Temperature of Dew-point, 36°·6. Mean Humidity, 84°·3 %.

Radiation Thermometers.—Highest in Sun, 101°·3, on the 17th. Lowest on Grass, 21°·0, on the 3rd. Frost occurred on Grass on 12 days.

Sunshine.—Total recorded for month, 58 hours 15 minutes, being 16 % of the possible amount. The sunniest day was the 17th, with 7 hours 50 minutes, being 67·3 % of the possible amount. None was recorded on 8 days.

Rainfall.—Rain or Snow fell on 21 days. Total Fall, 2·295 inches, being 0·723 inch above the average for March for four preceding years. Greatest Fall in 24 hours, 0·650 inch, on the 27th.

A. D. RICHARDSON, *Observer*.

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

During the past month of March a large number of plants in the houses of the Royal Botanic Garden have come into flower; the houses in consequence have assumed a much brighter appearance. Rhododendrons, both species and hybrid varieties, and azaleas have flowered freely. Among ferns and foliage plants, the many colours of the young leaves are a very pleasing character. Since the last meeting of the Society, about 120 species have flowered, this being 80 more than was recorded for the preceding month., A few of the most interesting are as follows:—

Crotalaria longirostrata, Hook. and Arn. This free-flowering leguminous plant is a native of Mexico, and has of recent years been introduced to cultivation in this country. The slender stems growing to a height of 4 feet or more, with numerous short shoots with alternate trifoliolate leaves, bear inflorescences at the ends of the side shoots, composed of bright yellow flowers. A figure prepared from a plant flowered at Kew may be seen in "Botanical Magazine," t. 7306.

Rudgea macrophylla, Benth. This plant, which belongs to the order Rubiaceæ, is a native of Brazil, and was introduced through the late Mr. Arthur Henderson of the Pine Apple Nursery. It is a stiff growing plant, usually with a crown of large, sessile, obovate, oblong leaves, and the terminal inflorescence is a dense head of many pure white flowers.

Cystacanthus turgida, Nicholson. This plant is an evergreen perennial, of a shrub-like habit, with glabrous stems and foliage. The panicled inflorescences are terminal, the flowers arising in the axils of purplish coloured bracts. The white flowers are inflated at the mouth, and covered with reddish coloured lines. The throat is yellow, and bears numerous erect white hairs upon the lower surface. It belongs to the order Acanthaceæ, and was introduced from Cochin China in 1869. A figure may be seen in the "Botanical Magazine," t. 6043, under the name of *Meninia turgida*.

Psychotria jasminiflora, Hook. f. This is a handsome Brazilian shrub, of the order Rubiaceæ, placed by Linden, by whom it was introduced under the generic name of *Gloneria*. In habit it is compact, and clothed with light green foliage, which upon the under surface is covered with a white tomentum. The terminal panicles of pure white flowers resemble somewhat the common jasmine, but the corolla tube and lobes bear numerous white hairs, the stamens protruding beyond the corolla.

Melia Azedarach, Linn. In its native habitat this plant reaches a height of 40 feet, and is of economic and medicinal value. It has several common names, as Bead Tree, Pride of India, etc. The terminal and axillary inflorescences are branched, and the flowers in bud are lilac, changing to white as they expand. The segments of the bipinnate foliage is deeply serrated.

Others worthy of note are:—*Streptosolen Jamesoni*, Miers.,—a native of Columbia, introduced in 1847, is a handsome plant, with corymbose panicles of orange-coloured flowers; *Begonia goëgoënsis*, Veitch,—introduced from Sumatra by Messrs. Veitch in 1882, is a very ornamental foliage plant, with pinkish small flowers; *Oncidium Crœsus*, Rchb. f.,—with small pseudobulbs, and slender spikes of flowers having a large golden yellow lip, is a Tropical American species, introduced in 1872; *Tecoma Smithii*, Hort.,—this plant is an Australian hybrid between *Tecoma capensis* and *Tecoma stans*, var. *velutina*, and although a climber is for horticultural purposes grown on a dwarfed system, and produces large terminal heads of yellow flowers.

MEETING OF THE SOCIETY,

Thursday, May 9, 1895.

SYMINGTON GRIEVE, Vice-President, in the Chair.

The desirability of altering the hour of some of the meetings of the Society, to suit the convenience of country members, having been brought before the Council, the question was submitted to the members at this meeting for consideration and discussion. Ultimately it was resolved, on the motion of Professor BAYLEY BALFOUR, seconded by Mr. SYMINGTON GRIEVE, to refer the matter back to the Council, with an instruction to obtain a direct expression of opinion from the whole Society by post card or otherwise.

Mr. TAGG exhibited from the Museum of the Royal Botanic Garden specimens of pine weevil (*Hylobius abietis*) upon spruce, received from Mr. GUNN, Strathpeffer, and taken from a young plantation at Fornabrock, which it had greatly destroyed.

Mr. ROBERT TURNBULL commented upon hybrids in flower between the swede turnip and the green kail, which had been grown in the Royal Botanic Garden from the plants exhibited by him to the Society at the meeting in January.

Professor BAYLEY BALFOUR exhibited a monstrous flower of *Cypripedium*, in which the right labellar staminode had developed as a perfect stamen with filament and two-lobed anther, whilst the two normally perfect stamens were also developed to form distinct filaments bearing anthers.

Issued November 1895.

Mr. CAMPBELL sent for exhibition from his garden at Ledaig, Argyllshire, blooms of the following plants:—*Orchis mascula*, *Trollius europæus*, *Lychnis diurna*, *Potentilla alba*, *Pyrus japonica alba*, *Azalea pontica*, *Erica mediterranea*, *Escallonia macrantha*, *Narcissus poeticus*, and *Phlox setacea*.

A collection of alpine plants in flower from the Royal Botanic Garden was exhibited, and also the following plants in flower:—*Petrea volubilis*, *Clavija Ernstii*, *Ruellia formosa*, *Begonia* "President Carnot," *Masdevallia ignea*, *M. amabilis*, and *Mesembryanthemum pugioniforme*.

Mr. CUTHBERT DAY exhibited some barley corns, which, after being steeped for the usual time before malting, were frozen hard for fourteen days and then carefully thawed, and when placed subsequently in condition suitable for germination had sprouted.

A collection of dried plants from South Australia, sent by Mr. KILGOUR, Portobello, was exhibited.

The following papers were read:—

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF APRIL 1895. By ROBERT LINDSAY, Curator.

During the month of April vegetation generally made fairly good progress, particularly during the latter portion of the month. The continuance of cold winds, together with a succession of frosty nights during the early part of the month, prevented any very rapid progress from being made, consequently the season is still very late. There was no very marked change in the leafage of deciduous trees till the 20th of the month, after which time the foliage began to develop rapidly, in marked contrast to their condition at the same date last year, when the hawthorn, for instance, was not only in full leaf, but in flower also, as early as the 29th of April. Fruit trees and bushes, such as pear, apple, cherry, currant, and gooseberry, look very promising, being well set with flower buds, and, the season being so late, they are more likely to escape injury from late frost, and thus bear good crops of fruit.

On the rock-garden 133 species of alpine and herbaceous plants came into flower during the month, as against 153 for April of last year. Among the more interesting were :—*Anemone nemorosa*, var. *Robinsoniana*, *A. Pulsatilla*, var. *bracteata*, *Androsace Laggeri*, *Arnebia echioides*, *Aretia Vitaliana*, *Aubrietia Hendersoni*, *Bryanthu serectus*, *Corydalis angustifolia*, *C. nobilis*, *C. Scouleri*, *Dentaria pentaphylla*, *Dielytra formosa*, *Doronicum caucasicum*, *Erythronium giganteum*, *Helonias bullata*, *Iberis petræa*, *Lathyrus vernus*, *L. cyaneus*, *Menziesia cœrulea*, *M. empetriformis*, *Narcissus calathinus*, *N. cyclamineus*, *N. juncifolius*, *Podophyllum Emodi*, *Primula ciliata purpurata* seedlings, *Ranunculus amplexicaulis*, *Rhododendron ciliatum*, *R. Grievei*, *Sanguinaria canadensis*, *Saxifraga imbricata*, *S. oppositifolia*, *S. retusa bryoides*, *Thlaspi alpestre*, *Soldanella alpina*, *S. montana*, *Trillium erectum*, *T. grandiflorum*, *Xanthorrhiza apiifolia*, *Synthyris reniformis*, etc.

Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following sixteen came into flower during April, viz.:—*Tussilago nivea*, on 3rd April; *T. alba*, 5th; *Scilla bifolia taurica*, 5th; *Mandragora officinalis*, 6th; *Erythronium Dens-canis*, 8th; *Corydalis solida*, 9th; *Draba aizoides*, 10th; *Narcissus Pseudo-Narcissus*, 10th; *Hyoscyamus Scopolia*, 11th; *Adonis vernalis*, 11th; *Ribes sanguineum*, 13th; *Sisyrinchium grandiflorum*, 18th; *S. grandiflorum album*, 15th; *Symphytum caucasicum*, 16th; *Aubrietia grandiflora*, 16th; *Omphalodes verna*, 22nd; and *Fritillaria imperialis*, on 5th May: thus completing the list which was completed last year on the 25th of March.

[*Continued on next page.*

REGISTER OF SPRING-FLOWERING PLANTS, SHOWING DATES OF FLOWERING, AT THE ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE YEARS 1894 AND 1895.

No.	Names of Plants.	First Flowers opened. 1894.	1895.
1	Adonis vernalis, ...	March 24	April 11
2	Arabis albida, ...	February 20	March 27
3	Aubrietia grandiflora, . . .	March 16	April 16
4	Bulbocodium vernum, . . .	January 12	March 13
5	Corydalis solida, . . .	March 22	April 9
6	Corylus Avellana, . .	February 8	March 7
7	Crocus susianus, ...	,, 6	,, 15
8	,, vernus, ...	,, 12	,, 17
9	Daphne Mezereum, . . .	,, 19	,, 25
10	Dondia Epipactis, ...	Dec. 28 (1893)	,, 11
11	Draba aizoides, ...	March 14	April 10
12	Eranthis hyemalis, . . .	January 19	March 1
13	Erythronium Dens-canis, . .	March 14	April 8
14	Fritillaria imperialis, . . .	,, 25	May 5
15	Galanthus nivalis, . . .	January 16	March 1
16	,, plicatus, ...	,, 22	,, 4
17	Hyoscyamus Scopolia, . . .	March 22	April 11
18	Iris reticulata, ...	February 19	March 25
19	Leucojum vernum, . . .	January 18	,, 10
20	Mandragora officinalis, . . .	February 26	April 6
21	Narcissus Pseudo-Narcissus, .	March 20	,, 10
22	,, pumilus, . . .	,, 6	March 27
23	Nordmannia cordifolia, . . .	February 14	,, 16
24	Omphalodes verna, . . .	March 13	April 22
25	Orobus vernus, ...	,, 6	March 28
26	Rhododendron atrovirens, . .	January 24	,, 26
27	,, Nobleanum, .	February 3	,, 31
28	Ribes sanguineum, . .	March 19	April 13
29	Scilla bifolia, ...	February 5	March 30
30	,, ,, alba, ...	March 6	,, 30
31	,, præcox, ...	January 22	,, 11
32	,, sibirica, ...	,, 22	,, 18
33	,, taurica, ...	March 6	April 5
34	Sisyrinchium grandiflorum, . .	,, 18	,, 18
35	,, ,, album,	,, 12	,, 15
36	Symphytum caucasicum, . .	,, 22	,, 16
37	Symplocarpus fœtidus, . . .	February 13	March 24
38	Tussilago alba, . . .	March 2	April 5
39	,, fragrans, . . .	Dec. 25 (1893)	March 15
40	,, nivea, ...	February 19	April 3

II. Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of April 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours.		Hygrometer.		Direction of Wind.	Clouds.			Rainfall. (Inches.)
		Max.	Min.	Dry.	Wet.		Kind.	Amount	Direction.	
		°	°	°	°					
1	29·730	46·4	38·0	41·0	39·8	N.E.	Cir. St.	6	N.E.	0·020
2	30·059	42·8	39·0	41·0	39·0	N.E.	St.	10	N.E.	0·000
3	29·836	46·6	37·3	45·6	42·0	S.W.	Cir.	5	N.E.	0·085
4	30·090	48·3	31·0	34·2	31·8	N.W.	St.	8	N.W.	0·000
5	29·961	48·4	31·0	40·4	36·3	W.	Cir. St.	10	W.	0·020
6	28·979	49·4	40·1	49·2	47·0	S.W.	St.	9	W.	0·065
7	29·342	52·2	28·8	40·2	35·0	N.W.	...	0	...	0·000
8	29·596	46·8	30·2	37·5	34·8	Var.	Cir. Cum.	9	W.	0·035
9	29·494	51·8	37·2	50·0	45·0	S.W.	...	0	...	0·015
10	29·500	56·2	48·9	53·2	48·5	W.	...	0	...	0·000
11	30·048	55·2	42·2	49·8	44·8	W.	Cum.	5	W.	0·085
12	30·271	54·2	36·2	44·8	41·2	W.	Cir.	8	N.	0·000
13	30·256	53·6	40·8	43·0	41·7	N.	St.	10	N.	0·000
14	30·324	46·2	29·6	42·8	38·1	N.E.	...	0	...	0·000
15	30·256	49·1	36·7	39·9	38·2	E.	St.	10	E.	0·000
16	30·047	47·1	37·1	40·0	39·0	E.	St.	10	E.	0·000
17	29·799	46·2	38·3	39·1	38·1	S.E.	St.	10	S.E.	0·010
18	29·591	42·0	38·9	40·8	40·4	E.	St.	10	E.	0·000
19	29·569	50·9	38·3	50·7	48·0	W.	St.	8	W.	0·000
20	29·830	59·2	40·1	50·7	47·3	E.	St.	9	S.	0·000
21	29·606	59·5	50·8	55·9	50·6	S.W.	Cir. St.	8	S.W.	0·000
22	29·663	59·9	45·0	58·0	51·1	S.W.	Cum.	5	S.W.	0·010
23	29·309	59·8	50·8	54·8	50·8	S.W.	Cir.	5	S.	0·000
24	29·488	62·0	47·1	51·9	47·9	S.W.	Cir. St.	10	S.W.	0·160
25	29·453	58·0	45·6	51·4	47·9	S.W.	Cir.	2	W.	0·330
26	29·281	55·7	44·7	45·9	45·1	Var.	Nim.	10	N.	0·215
27	29·634	46·1	43·0	45·9	45·1	N.E.	St.	10	N.E.	0·000
28	29·985	48·9	44·7	48·9	46·0	S.	St.	10	S.	0·000
29	29·982	55·5	38·0	50·9	46·4	S.W.	Cir. St.	8	S.W.	0·015
30	30·040	58·7	44·7	50·7	44·8	W.	Cum.	2	W.	0·030

Barometer.—Highest, 30·324 inches, on the 14th. Lowest, 28·979 inches, on the 6th. Monthly Range, 1·345 inch. Mean 29·767 inches, being 0·181 inch below the average for April for four preceding years.

Protected S. R. Thermometers.—Highest, 62°·0, on the 23rd. Lowest, 28°·8, on the 7th. Monthly Range, 33°·2. Mean of all the Highest, 51°·9. Mean of all the Lowest, 39°·8 Mean Daily Range, 12°·1. Mean Temperature of Month, 45°·8, being 0°·9 above the average for April for four preceding years. Frost occurred on 5 days.

Hygrometer.—Mean of Dry Bulb, 46°·3. Mean of Wet Bulb, 43°·0. Temperature of Dew-point, 39°·3. Mean Humidity, 76·2%.

Radiation Thermometers.—Highest in Sun, 113°·2, on the 23rd. Lowest on Grass, 19°·9, on the 7th. Frost occurred on Grass on 9 days.

Sunshine.—Total recorded for month, 119 hours 45 minutes, being 28·3% of the possible amount. The sunniest day was the 14th, with 11 hours 20 minutes, being 80·8% of the possible amount. None was recorded on 3 days.

Rainfall.—Rain fell on 14 days. Total Fall, 1·085 inch, being 0·046 inch below the average for April for four preceding years. Greatest Fall in 24 hours, 0·330 inch, on the 25th.

A. D. RICHARDSON, *Observer.*

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

The plants in the houses of the Royal Botanic Garden have during the month of April made considerable growth in the fine weather experienced. Flowering and foliage plants have generally a more bright appearance with the developing new foliage. The new houses are rapidly assuming a more established and furnished appearance. Additions have been made to the collections of orchids, cacti, and stove plants, which will increase their interest largely. The raising of seed received from home and colonial gardens is always a work of some importance in a Botanic Garden, and of those which have germinated may be mentioned *Roridula Gorgonias.*, Planch, received through the Royal Gardens, Kew, during the early spring months. Some years ago seed of *Roridula dentata*, L., germinated in the Botanic Garden, and fine plants were raised, but they unfortunately died, and no one else in the country has raised the genus. It may be hoped better success will attend our effort on this occasion. Rather more than one hundred species have flowered since the last meeting of the Society; the following being considered worthy of mention:—

Drosophyllum lusitanicum, Link. The only species of this genus of Droseraceæ, is a native of Portugal, Spain, and Marocco. It is a small-growing plant about a foot high, with a woody stem. The linear leaves, characteristically recircinate in bud, vary in length, and bear numerous stalked glands, and others almost sessile, and less observable. These glands are apparent upon the pedicel and persistent calyx. The inflorescence is terminal, and bears a large showy yellow petalled flower which is short-lived, opening during the morning and closing before night.

Petrea volubilis, Linn. A native of Tropical America, this plant belongs to the order Verbenaceæ, and is in habit a twining shrub, with opposite coriaceous leaves. The inflorescence is a short raceme of violet-coloured flowers. The epicalyx is persistent, and is said to enlarge as the fruit grows. The corolla is deciduous, and possesses a short tube. A figure may be seen in the "Botanical Magazine," t. 628.

Clavija Ernstii, Hook. f., inhabits the tropical parts of South America, and is straight-stemmed with large coriaceous glabrous entire leaves, in a crown at top. The flowers are in drooping racemes, appearing upon the old wood.

Ruellia formosa, Andr. A Brazilian species introduced to cultivation in 1808, now seldom seen in our gardens. It is of a small spreading habit, with herbaceous stems, and light green opposite ovate leaves, densely covered with hairs. The inflorescences, 2–4 flowered, are axillary, rising well above the foliage. The corolla is bright scarlet, the tube being more than an inch long.

Many others are still flowering, among which are *Cypripedium Chamberlainianum*,—a New Guinea species imported a few years since by Messrs. Sander & Co. *Begonia* "President Carnot," Hort., — one of the best evergreen hybrids yet raised, with bold foliage and large clusters of carmine flowers. The parents are said to be *B. olbia*, Kerchove, and *B. rubra*, Bl. It was raised by M. Crozy. *Masdevallia ignea*, Rchb.,—a species from New Grenada; *M. amabilis*, Rchb.,—from the Andes of Peru; *Miltonia Warszewiczii*, Rchb., — introduced to European gardens about 1868, has a remarkable lip of a reddish-brown colour, margined with white; *Mesembryanthemum pugioniforme*, Linn.,—one of the finest of the genus, with large flowers of a brilliant yellow colour; *Saintpaulia ionantha*, H. Wendl.,—a Central African plant, collected on the Usambura Mountains, is small and low-growing, with violet-coloured flowers, and belongs to the order Gesneraceæ; *Euadenia eminens*, Hook., f.,—a capparidaceous plant.

MEETING OF THE SOCIETY.

Thursday, June 13, 1895.

Rev. David Paul, Vice-President, in the Chair.

Intimation of the death of Hugh Francis Clarke Cleghorn, British Honorary Fellow of the Society, was made by the Chairman.

Mr. James Grieve exhibited from Pilrig Nurseries a fine series of hybrid violas and pansies.

A collection of alpine and herbaceous plants from the Royal Botanic Garden was exhibited; also the following plants:—*Alberta magna*, *Orthosiphon stamineus*, *Fagelia bituminosa*, *Disa Langleyensis* ×, *D. tripetaloides*, *D. racemosa*, and *Selenipedium nitidissimum*

The following papers were read:—

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Vegetation during the Month of May 1895. By Robert Lindsay, Curator.

The weather of the past month of May has been warm and dry, and if not all that could have been desired, has been very favourable to vegetation generally, which has made very rapid progress. The foliage of all the ordinary deciduous trees and shrubs is now in perfect condition, being most luxuriant and healthy. Ornamental and fruit trees have flowered very profusely; among the finest in blossom were the single and double cherry, pear, apple, horse chestnut, laburnum, and pavia. No frost having occurred when the trees were in blossom, a heavy fruit crop may safely be anticipated.

Issued November 1895.

The rock-garden was very attractive during the month, many more plants having come into bloom than we usually find in May. No less than 346 species and varieties came into flower, as against 227 for May of last year. Among the most interesting were:—*Anemone alpina*, *A. sulphurea*, *A. narcissiflora*, *A. polyanthes*, *Androsace villosa*, *A. lactea*, *Anthyllis montana rubra*, *Aquilegia cœrulea*, *A. Wittmanniana*, *A. glandulosa*, *Arctostaphylos californica*, *Aster alpinus speciosus*, *Aubrietia Campbellii*, *A. Leichtlinii*, *Campanula Allionii*, *Cassiope fastigiata*, *Cornus canadensis*, *Cypripedium calceolus*, *Cytisus Ardoini*, *C. decumbens*, *C. purpureus*, *Daphne Cneorum*, *Dianthus glacialis*, *Dielytra spectabilis*, *Doronicum grandiflorum*, *Dryas octopetala*, *Erica australis*, *Erodium Manescavi*, *Gentiana verna*, *Geum montanum*, *Gnaphalium dioicum roseum*, *Gypsophila cerastioides*, *Homogyne sylvestris*, *Horminum pyrenaicum*, *Hippocrepis helvetica*, *Hyacinthus amethystinus*, *Heuchera sanguinea*, *Lithospermum Gastoni*, *Morina betonicoides*, *Meconopsis simplicifolia*, *Melittis Melissophyllum*, *Mertensia sibirica*, *Myosotis alpestris*, *Narcissus poeticus grandiflorus*, *Phlox canadensis*, *P. nivalis*, *P. setacea* vars., *P. stolonifera*, *Primula cortusoides*, *Polemonium humile*, *Potentilla lupinoides*, *Pentstemon Menziesii*, *Papaver pyrenaica*, *Rhododendron lepidotum*, *Rodgersia podophylla*, *Ranunculus montanus*, *R. uniflorus*, *R. speciosus*, *Saponaria ocymoides*, *Saxifraga corsicana*, *S. Cotyledon*, *S. longiflora*, *S. muscoides atropurpurea*, *S. Wallacei*, *Silene acaulis alba*, *S. odontopetala*, *Solbolewskia clavata*, *Veronica satureœfolia*, *V. saxatilis alba*, *Vinca herbacea*, *Wulfenia carinthiaca*, etc.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF MAY 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·900	58·1	46·8	49·8	44·7	W.	Cum.	5	W.	0·000
2	30·445	54·8	39·0	49·9	45·0	S.W.	Cir. St.	10	S.W.	0·000
3	30·529	57·9	40·0	52·8	46·9	N.E.	Cir.	3	...	0·000
4	30·505	59·7	41·3	45·1	42·8	N.E.	Cir.	4	...	0·000
5	30·393	54·1	39·0	52·9	48·1	E.	...	0	...	0·000
6	30·468	62·0	44·0	48·8	47·2	E.	St.	5	E.	0·000
7	30·433	55·7	43·0	52·2	49·1	N.E.	...	0	...	0·000
8	30·161	59·0	41·7	52·2	49·0	N.E.	...	0	...	0·000
9	29·949	65·5	43·9	48·7	47·5	E.	St.	3	E.	0·010
10	29·984	66·6	48·2	61·3	53·2	S.W.	Cir.	3	N.	0·000
11	30·093	65·1	40·8	57·2	49·8	S.E.	Cir.	3	E.	0·000
12	30·127	63·8	42·4	49·1	48·6	E.	St.	10	E.	0·090
13	30·155	60·4	49·0	60·0	56·0	W.	Cum.	8	W.	0·000
14	30·147	67·9	50·8	55·6	53·0	W.	St.	10	W.	0·110
15	29·923	60·7	48·0	55·8	50·3	N.W.	Cir. St.	10	N.W.	0·000
16	29·894	64·9	40·2	46·3	39·9	N.E.	Cum.	5	N.E.	0·000
17	29·757	52·8	39·1	41·7	37·0	N.	St.	10	N.	0·195
18	29·744	47·0	40·6	47·1	45·0	W.	St.	10	N.E.	0·000
19	29·791	55·7	42·6	46·8	43·1	N.	St.	10	N.	0·010
20	29·734	53·7	40·2	44·0	40·8	W	Nim.	10	N.	0·005
21	29·723	51·7	43·1	46·4	46·0	S.E.	St.	10	S.E.	0·050
22	29·852	52·9	46·1	46·8	46·2	N.E.	Nim.	10	N.E.	0·030
23	29·872	55·7	42·7	53·4	50·1	Calm	Cir.	5	S.E.	0·025
24	29·865	58·8	44·4	46·8	46·8	E.	Fog	8	...	0·095
25	29·934	54·8	44·0	45·7	45·2	E.	St.	10	E.	0·380
26	29·076	60·1	42·1	60·0	53·6	W.	...	0	...	0·000
27	30·249	64·5	46·6	62·2	56·0	Var.	Cum.	1	S.W.	0·000
28	30·174	69·8	44·9	62·1	55·2	S.W.	...	0	...	0·000
29	30·022	70·9	47·1	66·1	56·7	W.	Cir.	5	W.	0·000
30	29·841	71·2	51·1	56·3	53·2	S.E.	...	0	...	0·000
31	29·587	74·2	50·6	56·9	54·0	S.E.	Cir.	9	S.	0·000

Barometer.—Highest, 30·529 inches, on the 3rd. Lowest, 29·587 inches, on the 31st. Monthly Range, 0·942 inch. Mean, 30·043 inches, being 0·198 inch above the average for May for four preceding years.

Protected S. R. Thermometers.—Highest, 74°·2, on the 30th. Lowest, 39°·0, on the 2nd and 5th. Monthly Range, 35°·2. Mean of all the Highest, 60°·3. Mean of all the Lowest, 44°·0. Mean Daily Range, 16°·3. Mean Temperature of Month, 52°·1, being 2°·6 above the average for May for four preceding years.

Hygrometer.—Mean of Dry Bulb, 52°·3. Mean of Wet Bulb, 48°·4. Temperature of Dew-point, 44°·5. Mean Humidity, 74°·8 %.

Radiation Thermometers.—Highest in Sun, 126°·0, on the 28th. Lowest on Grass, 28°·0, on the 8th and 11th. Frost occurred on Grass on 7 days.

Sunshine.—Total recorded for month, 186 hours 25 minutes, being 37·1 % of the possible amount. The sunniest day was the 8th, with 11 hours 45 minutes, being 74·7 % of the possible amount. None was recorded on 2 days.

Rainfall.—Rain fell on 11 days. Total fall, 1·000 inch, being 1·171 inch below the average for May for four preceding years. Greatest fall in 24 hours, 0·380 inch, on the 25th.

A. D. RICHARDSON, *Observer.*

III. ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

About two hundred and twenty plants have flowered since the last meeting of this Society, rather more than two hundred of these being species. This exceeds the number recorded for the month of May 1894 by nearly a hundred species. Of these a large number are new to the collections, to which they have recently been added. Of those most worthy of note the following may be mentioned :—

Cœlogyne Dayana, Rchb. A species from North Borneo, introduced by Messrs. Veitch, and flowered by them at their nursery at Chelsea in 1884. The pseudobulbs are long, with large deep green leaves. The inflorescences are produced with the young growth, the pendulous racemes varying in length with the strength of the plant, but sometimes more than two feet long. The sepals and petals are dull yellow, the lip dark brown streaked with white. It is stated to grow in the hot districts on the branches of trees near the coast.

Alberta magna, E. Mey. This is an erect bush-like rubiaceous plant from South Africa. The opposite ovate foliage is coriaceous, the inflorescences terminal panicles of bright crimson flowers; the tube of the corolla being about an inch long. Two of the lobes of the calyx enlarge after flowering, and assume a scarlet colour. The plant has been in cultivation for several years, but was recorded at Kew last year as having flowered for the first time in this country.

Orthosiphon stamineus, Benth. This is an old introduction to our gardens, but is seldom met with in cultivation. It is a native of Malaya, India, and other tropical countries. Of a herbaceous habit, it grows a foot or more high, and bears ovate deeply-toothed leaves, and crowded terminal racemes of lilac-coloured flowers. The corolla is bilabiate, and has long conspicuous filaments and style projecting about two inches beyond the mouth of the corolla. The plant belongs to the natural order Labiatæ.

Adenocalymna nitidum, Mart. This climbing plant, of the order Bignoniaceæ, is a native of Brazil, introduced in 1848. It is a sturdy-growing plant, with glabrous stems and foliage; the leaves being trifoliate, or with two elliptic leaflets and a tendril; the inflorescences are in terminal or axillary racemes of bright yellow flowers with a trumpet-shaped corolla. The calyx bears large glands upon the surface. When in full flower it has a handsome appearance. A good figure may be seen in "Paxton's Flower Garden," t. 2.

Fagelia bituminosa, DC. Belongs to the order Leguminoseæ, and is of a twining or trailing habit, the slender stems and trifoliate leaves being densely clothed with clammy hairs. The axillary inflorescences bear generally four yellow flowers, the keel tipped with dark brown blotches. It is the *Glycine bituminosa* figured in the Bot. Reg., 261.

Others are:—*Oncidium Harrisonianum*, Lindl.,—discovered on the Organ Mountains, Brazil, in 1832, a small-growing species, with slender panicled inflorescences of bright yellow, blotched with red flowers; *Disa Langleyensis* ×, Hort.,—a hybrid raised by Messrs. Veitch & Son, Chelsea, between *D. tripetaloides* and *D. racemosa*, possessing strong spikes of flowers tinged with a lilac tint; *Selenipedium nitidissimum*, Hort.,—raised by Norman Cookson, Esq., Oakwood, Wylam-on-Tyne, the foliage is strong, and the spike bears generally from three to four flowers of large size, greenish-yellow in colour, the petals lengthened, and shaded with dark brown striations; *Masdevallia caudata*, var. *Shuttleworthii*, Rchb., and *M. caudata xanthocorys*, Rchb.,—both pretty varieties, from New Grenada; *Solanum pensile*, Sendtn.,—a native of Demerara, with large pendant racemes of dark purple flowers; *Columnea Schiedeana*, Schlecht.,—the corollas of which are covered with glandular hairs, the stems and foliage being also covered with numerous purplish hairs.

MEETING OF THE SOCIETY,

Thursday, July 11, 1895.

SYMINGTON GRIEVE, Vice-President, in the Chair.

RALPH STOCKMAN, M.D., was elected Resident Fellow of the Society.

The following plants were exhibited from the Royal Botanic Garden:—*Streptocarpus Saundersii, Tussacia pulchella, Ureocharis Clibrani, Nertera depressa, Lambertia formosa, Combretum purpureum, Platytheca galioides, Crinum augustum, Cypripedium Parishii, Aristolochia tricaudata.*

The following papers were read:—

OBITUARY NOTICE OF HUGH FRANCIS CLARKE CLEGHORN, M.D., LL.D., F.R.S.E., F.L.S. By ANDREW TAYLOR.

Dr. Cleghorn joined this Society in 1837. The first of several medical students who have left our table to demonstrate the richer yields of descriptive Indian botany, he also opened a new career to the professional botanist. He was born in Madras in 1820, but returning to Fife in infancy, the love of nature beset the boy. He studied medicine in Edinburgh, as he himself from our chair recommended the future travelling botanist to do, mainly as a profitable life-opening in which he could also follow his future studies. In 1841 our young M.D. sailed for Madras, joining the Medical Establishment of the H.E.I.C.S. in the subsequent year, aged twenty-two.

How the six years were spent ere Cleghorn left India in 1848 on sick-leave may be judged from the following extracts from a paper "On the Hedge Plants of India," contributed to our "Transactions" in 1850:—"Since my admission on the Madras Establishment in 1842, I have traversed a considerable portion of that Presidency in the execution of duty, including the Southern Division, the territory of Mysore, with parts of Canara and the Southern Mahratta country. Along the line of march, and in the course of botanical rambles, I made rough camp notes as to the vegetation and general appearance of the country." The traverse embraced the area of a European kingdom, and included the arid sands of Madras, the undulating plateau of the Mysore, the primeval forests of Coorg and Malabar, the woodless plains of the Carnatic, where European furniture cracks and warps, and the Malabar ghauts, where in the south-west monsoon the lancet, in pocket, coats with rust. How did the author of this paper so quickly acquire his power in describing Indian botany? A reply is found in the obituary of Dr. Wight, F.R.S., also a Fellow of our Society, contributed by Cleghorn in 1872. The veteran botanist, who began his official career in 1826, had to learn solely by self-instruction the gorgeous flora of the East, and displayed an ardour, the wonder of civilians. Near Cape Comorin he had collected 2000 species; but what to do with them? They would be downright ruin to him to transport, as he already required, when on march, six carts to carry his books and kit. After eleven hours on his legs, during another traverse, he felt little fatigued, and only ceased march when every sheet of paper was filled, so that he could dry no more plants. As the fruit of all this travel, and mindful of future Indian classification tyros, he essayed the publication of "Illustrations of Indian Botany" and the "Icones," describing 2101 Indian plants. Wight learned lithography with a view to this project; undertook publishing at his own risk, and kept a staff of native collectors, draughtsmen, and painters to perfect their execution. Cleghorn issued an index to the "Icones," published by the Madras Government. At the instance of this new botanical master, Cleghorn carried tracings with him on his journeys of Roxburgh's Coromandel plants, and of the same author's unpublished drawings, then housed at the Calcutta Gardens, systematically arranged in portfolios. He learned from him too so to arrange his time that the busy day of a departmental surgeon always afforded leisure for the study of at least one plant.

When Cleghorn came to Madras, in 1842, Wight had for some years been allocated to a special office, under the Custom's Department. This, in the near future, developed into the Special Department of the Government of India having cognisance of Agriculture, Revenue, and Commerce, which includes the Forest Department. In truth, the former garrison surgeon was then busy at the Government Experimental Cotton Farm at Coimbatore. The paper already quoted, on hedge plants, so modestly designated as rough botanical notes, abounds in sympathy with the depressed ryot; trusting that by better hedgerows, increasing cultivation, and diminished periodic famines, and by persuasion, patience, and perseverance, the upraising of the downtrodden cultivator of the soil might become to the dominant western race the brightest triumph of peace.

Cleghorn's special life-work even now stood right to the front, though not by this track. Dr. Gibson, better known as "Daddy Gibson," first appointed Conservator of Forests in 1846, with the view of keeping up the supply of teak for the Bombay Dockyard, is quoted by him in the paper. Before leaving for Europe, in shattered health, Cleghorn made representations on the national injury caused by denuding hill slopes of their forest coverings, as well as by the injurious native system of kumri cultivation. In 1848, when he sailed home, suffering shipwreck on the voyage, Colonel, now General Michael, C.S.I., entered on his duties as Conservator of the Anamala Teak Forests, in the Madras Presidency, where he continued till forced to retire, in 1856, through ill-health, brought on by indefatigable exertions. Our invalid, though uncertain of returning to India, had a committee appointed by the British Association, at its Edinburgh meeting, in 1850, to draw up a report on the probable effects, in an economical and physical point of view, of the destruction of tropical forests. The members were Professor Forbes Royle, Captain R. Baird Smith, Lieutenant-General R. Strachey, and Dr. Cleghorn as convener, who drew up the report.

This, presented in the following year at Ipswich, coupled with Colonel Michael's now assured work in Madras, according to Sir George Birdwood, induced the Court of Directors H.E.I.C. to inaugurate, in systematic fashion, a regular Forest Department over the Madras Presidency, and also over all the Peninsula.

Dr. Cleghorn, two years after returning to India, submitted a report to the Government of Madras in 1856, with proposals, which were sanctioned by the Government of India in November of that year. He was appointed Conservator of Forests for the Presidency on 19th December. Holding this position for five years, he gained a crowning success in the prohibition by the Government, in 1860, of kumri cultivation in the forests by the natives. The people loved and trusted him, for his kindly ways as well as his medical services. Those at the head of affairs in Madras knew how the good of the people lay near his heart, and placed confidence in his calm judgment. So resulted the successful carrying out of such a drastic measure in Indian rural economy.

From this time onwards Dr. Cleghorn sent frequent communications to this Society, no doubt incited thereto by his correspondent, Professor J. H. Balfour. In our "Transactions," up till 1861, we may trace his early progress in Forest Conservancy. All things came under notice in those great traverses of Southern India, from the Indian gutta tree, to the growth of yams and mangoes, invaluable to the natives in famine times, to gigantic cabbages in Orissa. The vegetable oils of Southern India, as well as Sir F. Abel's best means of preventing timber fires, and, above all, the preservation of teak forests, which alone occupied two-thirds of his time, were brought under notice, and a manual of Indian Botany was in course of preparation. The climates and soils of different localities were given patient study, so far as suitable for the growth of the new industries of tea and cinchona. Clements Markham returned from South America to India with the young plants which were to create a revolution in medicine and planting in 1859, the year Dr. Cleghorn came home in ill health, a circumstance depriving the latter of inspecting the placing of the seedlings in their proper soil.

Dr. Cleghorn was a member of Council, and made several communications and presentations to the Society during his temporary sojourn in Scotland from 1860 to 1861. He also published at this time his book on "The Forests and Gardens of South India," a work which, Sir D. Brandis says, had much influence with the now Imperial Government in its adoption of great measures for Forest Conservancy. In October 1861 he wrote to Professor Balfour of perils from inundation at Alexandria on his return voyage, this time accompanied by a bride, Mabel, a daughter of the late Charles Cowan, formerly M.P. for Edinburgh, and a cinchona glass case given him at Kew. At our first meeting in 1863, Professor Balfour announced receipt of another letter, dated 2nd December 1861, announcing transference of cinchona plants, after safe arrival at Madras, to Nilgiris to be planted, but that the other newcomers were on their way to the Punjaub to examine the forests there. So, in consequence of this order of the Governor-General in Council, the honeymoon spread over three years on the slopes of the Himalayas. In this home stay Francis Appavoo, native surgeon, was made an Associate at Cleghorn's instigation. His assistant dresser, when district surgeon, also assistant to Cleghorn when teaching Materia Medica and Botany in the Madras Medical College, he had followed his master, in 1859, into the Forest Conservancy Office. His death is touchingly noticed in the opening address by Sir Douglas Maclagan to our session 1863–64.

The magnificent Deodar forests, the gorgeous vegetation of the valleys, and the natives eager for medical advice, furnish several papers to our "Transactions" from this Himalayan pilgrimage. They are to be found in volume viii., including a "Detailed List of the Principal Plants of the Sutlej Valley;" "Notes of an Excursion from Simla to the Valleys of Giri, Pabur, and Tonse;" and "Supplementary Notes upon the Vegetation of the Sutlej Valley." This last, read 13th July 1865, was followed by a like paper by Dr. Brandis, now ten years in the Indian Forest Service. Professor Balfour remarked on the presence that evening of Drs. Wight, Brandis, Cleghorn, and John Kirk, then of Zambesi fame. Brandis, first Inspector-General of Indian

Forests, had associated Cleghorn with him in his duties in 1864. He was now in Europe, partly for health, but also to inaugurate the initial stages of this new departure in Indian administration by obtaining European candidates for its service, trained in the Imperial Forest systems of France and Germany. Whilst Brandis remained for a year on furlough, Cleghorn returned to be sole chief of the department. On retiring to Madras in April 1867, the temporary Inspector-General received the thanks of the Government of India for his long and successful labours in the cause of Forest Conservancy in India. In a previous resolution from the same quarter, he had been designated in 1865 as the founder of the movement. Thus, when Cleghorn retired from active work in India in 1870, the small seed had grown into a mighty tree. By "persuasion, patience, and perseverance" there had been secured a reserved forest area of 46,000 square miles, a net revenue of £300,000, and a capitalised value of the great forests, else doomed to destruction. At an expense, something like £190,000 per annum, a staff of some hundreds of officers now actively engage in reducing droughts and famines to a minimum—indeed, in keeping all India, within the solstitial line, from becoming an inhospitable desert like Northern Afghanistan.

Dr. Cleghorn's remaining years in Britain as in India, were spent in constant travel. With the hours of day and week systematically apportioned equally to public and private duties, his weeks were as systematically devoted to business visits to St. Andrews, Cupar, and Edinburgh, varied by periodic journeys to the India Office in London, in pursuance of his duties as confidential adviser to the Government in the selection of candidates for the Indian Forest Service. He loved his young men. Years after 1870—when a class of seven forest aspirants, then driven into Edinburgh by the Franco-Prussian war, studied petrology with me—he would stop on the street to tell of recent Indian intelligence regarding them, one having shot a tiger, or another trapped an elephant. A splendid group of men has resulted from his twenty years' selection. May I instance Professor Fisher, of Cooper's Hill, who has just issued, as vol. iv. of Dr. Schlich's Manual, a valued treatise on Forest Protection. So too, as examiner in Botany to medical aspirants, or in Forestry, for the Highland and Agricultural Society's Diploma, Dr. Cleghorn's kindly manner put spirit into the disheartened candidate. A power of specific individualisation, which extended alike to men and trees, constituted a main element in his successful career.

The visitor to the ancestral home at Stravithie, rebuilt after his final return from India, could not fail being struck with the sympathy, arising from intimate personal knowledge, manifested to fishermen or cottagers of Boarhills, the neighbouring hamlet. He would mark, too, the enthusiasm glancing from the doctor's eye as he pruned with bill-hook some excrescence on a favourite pine, for he knew every tree in his woods. Mrs. Cleghorn died several years before himself, yet the doctor continued steady work. County meetings, scientific councils, examination boards, and an enormous heap of correspondence filled up the busy hours. The Edinburgh Forestry Exhibition, of which he was a chief promoter, was perhaps the greatest break in this systematic routine. The spare lithe form of the doctor fleeting about its halls, was well-known to the general visitor. Only those acquainted with the inner workings became aware of the time spent on almost every committee; of his editing foreign catalogues, involving an immense study of specific floras and herbarium specimens, borrowed from our institutions; of his taking a house in the neighbourhood so as to be close to the, as yet, hazardous undertaking; of his hospitality to savans and Indian forest officers. What looked at first to be a financial failure, turned out a magnificent success even in this age of steel. Dr. Cleghorn was an old hand at exhibition work, serving his novitiate, under Dr. Forbes Royle, in the Mother of all British ones in 1851, classifying the exhibits of the Indian section. Hence the perfect arrangement of this new one at Murrayfield, the Indian court of which was magnificent: and the special catalogue of which, a pamphlet of 116 pages, is of permanent value. Sir George Birdwood, C.S.I., thus concludes his editorial preface: "It is a happy omen that the first International Exhibition should have been held in the stately capital of Scotland, where scientific forestry throughout the British Empire received its earliest impulse, and that the Exhibition should be so much indebted for its prosperous issue to the co-operation of Colonel Michael, the pioneer of practical forestry, and of Cleghorn, the father of scientific forestry in India." Though chill October saw this gorgeous exhibition of woods and woodmen dispersed, its permanent results at least have been—the Parliamentary Forestry Commission, the Indian Forest School at Cooper's Hill, lectureships at Edinburgh and Durham Universities, together with the Hugh Cleghorn Memorial Library in the Edinburgh Museum of Science and Art.

Dr. Cleghorn busied himself in the administration of our Society, once occupying the presidential chair, obtaining valuable papers from influential correspondents, as well as devoting infinite time and trouble in editing the "Transactions." Living at Stravithie, he arranged his weeks so as to be present either at the monthly Council or general meeting. He was elected one of our British Honorary Fellows in 1890, an honour reserved to six botanists of our own blood and kin.

Two years ago Cleghorn resigned connection with the India Office. As he said to the writer, "I dropped the service before it could drop me." Yet days of activity, as of old, sweetened by the company of his nephew's little children, seemed before him; so we thought, shaking hands with him, tall, erect, and bustling, on an Edinburgh street last November. It was not so to be, for on the 16th May 1895 he was summoned, at Stravithie, to the activities of immortal youth in Christ, in his seventy-fifth earthly year.

CHRONOLOGY.

Born in Madras, 9th August 1820, where his father was Adminstrator-General in the Supreme Court.—Graduated as M.D. in 1841.—Joined Madras General Hospital, 1842.—Returned to Great Britain in 1848.—Juror on Indian Products, Great Exhibition, 1851.—Author of Report of Brit. Asso. Report on Tropical Forests. Ipswich, 1851.—Joined Linnean Society, 1851.—Chair of Botany and Materia Medica, Madras Medical College, 1852.—Requested by Lord Harris, Governor of Madras, to organise a Forest Department for the Presidency, 1855.—Joint-Conservator of Forests for India with Sir D. Brandis, 1861.—Elected Fellow of the Royal Society of Edinburgh, 1863.—Inspector-General of Forests, 1867.—Retired from Indian life, 1869.—President of

Botanical Society, 1868–69.—Made LL.D. of St. Andrews University.—Conducted Summer Session of Prof. Walker Arnott's Botanical Class, University of Glasgow, during his last illness, 1868.—President of Royal Scottish Arboricultural Soc., 1872–74, 1883–86.—International Forestry Exhibition, 1884.—Presentation of Testimonial (money part given by Dr. Cleghorn to form a Forestry Library) and Portrait, 1888.—British Honorary Fellow Botanical Society, 1890.

BOTANICAL PUBLICATIONS.

On the Hedge Plants of India, and the conditions which adapt them for special purposes and particular localities.—Trans. Bot. Soc. Edin., vol. iv. Read 1850.

Report of the Committee appointed to investigate the Probable Effects, in an economic and physical point of view, of the Destruction of Tropical Forests.—British Asso. Reports, 1851.

Remarks on *Calysaccion longifolium*, Wight.—Pharm. Jour., 1851.

Note on the *Ægle Marmelos*.—Indian Annals, 1851.

Note on the Sand Binding Plants of the Madras Beach.—Hooker's Journ. of Bot., viii., 1856.

Note on the varieties of Chiretta used in the Hospitals of Southern India.—Indian Annals, iii., 1856.

Expedition to the Higher Ranges of the Anamalai Hills, Coimbatore, in 1858.—Trans. Royal Soc. Edin.

On the Pauchontee, or Indian Gutta Percha Tree, on the Western Coast, Madras Presidency.—Trans. Bot. Soc. Edin., vol. vi. p. 148.

Report on the Conservation of Forests in India.—Ibid. p. 237.

On Tea Culture in Southern India.—Trans. Bot. Soc. Edin., vol. vii. p. 30.

On Introduction of Cinchona Trees into Southern India.

On Timbers suited for Railway Sleepers in India.—Ibid. p. 55.

On a Species of *Dioscorea* (Yam) occurring in Southern India.

Notes upon the Coco-nut Tree and its uses.—Ibid. p. 155 (Two plates).

List of Plants growing in the Bangalore Garden, Mysore, drawn up by Mr. New, at the request of Dr. Cleghorn.—Ibid. p. 223.

Extracts from Letters written during the Voyage to Cairo, Sept. 28, 1861.—Ibid. p. 250.

Extracts from Indian Letters.—Ibid. p. 500.

Memorandum of Local Museums in Punjaub.—Ibid. p. 531.

Notice of the Chinchona Cultivation on the Neilgherry Hills.—Ibid. p. 585.

On some Economic Plants of India.—Trans. Bot. Soc. Edin., vol. viii. p. 63.

Principal Plants of the Sutlej Valley, with Hill, Botanical, and English Names; together with Approximate Elevations and Remarks.—Ibid. p. 77.

Notes of an Excursion from Simla to the Valleys of the Giri, Pabur, and Tonse Rivers, Tributaries of the Jumna.—Ibid. p. 306.

Supplementary Notes upon the Vegetation of the Sutlej Valley.—Trans. Bot. Soc. Edin., vol. viii. p. 309.

Notes on the Travancore Government Garden at Peermade.

On the Deodar Forests of Himalayas.—Brit. Asso. Reports, vol. xxxv. p. 865.

On the Distribution of the Principal Timber Trees of India.—Brit. Asso. Reports, vol. xxxv., 1868.

On the Supply of Wood-fuel to Indian Railways.—Trans. Bot. Soc. Edin., vol. ix. p. 56.

Communication: On the Cultivation of Sumach (*Rhus coriaria*) in the vicinity of Colli, near Palermo. By Professor Inzenga. Translated by Colonel H. Yule, C.B.—Ibid. p. 341.

Biographical Notice of the late Dr. Walker Arnott, Regius Professor of Botany in the University of Glasgow.—Ibid. p. 414.

Communicated Notes on Vegetable Morphology. By Colonel Collinson, R.E., Malta.—Ibid. 480.

Notes on the Flora of Malta and Sicily.—Trans. Bot. Soc. Edin., vol. x. p. 28.

Obituary Notice of Professor C. F. P. von Martius, Munich, and Adalbert Schneizlein, Erlangen.—Ibid. p. 30.

Notes on the Botany and Agriculture of Malta and Sicily.—Ibid. p. 106.

Obituary Notices of the late Dr. William Seller, and of Prof. Bertoloni, of Bologna.—Ibid. p. 202.

On the Parasites which affect the Government Timber Plantations of Southern India.—Ibid. p. 245.

Opening Address as President.—Ibid. p. 261.

Communicated: Memorandum on Ipecacuanha. By Clements R. Markham, Esq.—Ibid. p. 391.

Obituary Notice of Dr. Robert Wight, F.R.S. (with portrait).—Trans. Bot. Soc. Edin., vol. xi. p. 363.

Obituary Notice of Dr. J. L. Stewart.—Trans. Bot. Soc. Edin., vol. xii. p. 31.

Obituary Notice of Deputy Surgeon-General W. Jameson, C.I.E.—Trans. Bot. Soc. Edin., vol. xiv. p. 288.

Introductory Remarks as Vice-President, Session XLVII.-XLVIII.

Communication of Note on *Rubus Idæus*, var. *Leesii*; and Notice of some Plants from Inverness-shire. By Dr. Mactier, St. Andrews. —Trans. Bot. Soc. Edin., vol. xvi. p. 15.

Obituary Notice of William Traill, M.D.—Trans. Bot. Soc. Edin., vol. xvii. p. 17.

Obituary Notice of Sir Walter Elliot.—Ibid. p. 342.

Obituary Notice of Dr. Boswell, of Balmuto.—Ibid. p 516.

TREATISES.

Forests and Gardens of South India.—London, 1861.

Arboriculture.—Last Ed. Ency. Brit. A. Black & Sons, London.

OBITUARY NOTICE OF DR. THOMAS ALEXANDER GOLDIE BALFOUR, M.D., F.R.C.P.E., F.R.S.E. By ANDREW TAYLOR.

The announcement that this loved physician had suddenly succumbed on 10th March, during the phenomenally severe weather of the early days of 1895, sent a wave of sorrow through Edinburgh circles—medical and general. The members of the Botanical Society, besides his patients and members of his private circle of friends, felt how one whose cheery presence, wit, and warm sympathy did so much to enliven social intercourse was now lost to them.

St. John's Hill, Pleasance, where the subject of this notice was born in 1825, was built by Hutton, the geologist. Really situated in the Queen's Park, and till those later years having all the surroundings of a mountain home, far from the crowded city's ceaseless roar, it was in the early decades of this century the home of a family of naturalists. The fame of John Hutton Balfour, the eldest, is European. If the exigencies of a crowded professional life prevented the youngest from climbing to like heights on the rung of the scientific ladder, the few papers by Thomas A. G. Balfour in our "Transactions" show what he might have done had he followed a strictly scientific career.

Though John Hutton Balfour removed to Dundas Street in 1834, his influence was paramount at St. John's Hill. The large section of garden ground, of the half acre now so well cultivated by the venerable survivor of a happy company of eleven, the Rev. Dr. William Balfour, specially set apart for the growth of wild plants by the future Queen's botanist, still remained. The herborisings first begun by the father in the King's Park had extended, under Professor Graham, into Sutherlandshire and like far off parts of Scotland, and the help of all the family group, male or female, was called in for the nurture of such new plant finds. Here, indeed, began our Botanical Society, which was formed some two years after, and it was the better of this private garden. Standing near the spot, and pointing to the jagged outlines of Salisbury Crags, the venerable pastor occupying Holyrood Free Manse exclaimed, "Who could not help being a naturalist in such surroundings?" So the boy Thomas Balfour caught the family enthusiasm, and became a botanist, though he did not appear as an attender of our meetings till late in life. Other surroundings of his home affected him. He became a zealous collector of insects, rare species of which used to abound in the neighbouring hill, and doubtless scrambles up its Cat's Nick, and like celebrated habitats, gave him that taste for minerals which stuck to him through life, the monument of which remains in his little work, "God's Jewels."

Dr. Thomas Balfour did not remove from the old paternal home to George Square till about five years after taking his degree of M.D., which he did in 1851, at the time twenty-eight years of age, thus more matured than brother graduates. Hutton's Chemical Laboratory, an outlying building to the family home, had not yet been taken down, so a taste for chemistry was incited, as shown by his graduation thesis on "Alcohol as an Etiological Agent," which was commended, and a prospective career as lecturer on Materia Medica. As it was, he spent three years of his student course with Messrs. Duncan, Flockhart, & Co., an experience which he found invaluable whilst writing out physician prescriptions. This came also to be of service when he succeeded Professor Fraser in 1874 as Curator of the Museum of the Royal College of Physicians. Here his knowledge of plants and minerals found ample scope. Till the end he was zealous in keeping up to date this great collection which the College purchased from Dr. Martius, of Erlangen, "a unique one in this country, being an almost complete collection of the 'Medicamina Simplicia' of the Materia Medica as it stood at the time of its purchase." The second brother, then the Rev. William Balfour, imbibing Dr. Chalmers', his preceptor's, enthusiasm, had devoted his life to working out Home Missions on the territorial principle, and the young doctor thus began that attendance on the forlorn inhabitants of Edinburgh's wynds and closes which was his life habit. Besides, the late Professor Pulteney Alison, his professor, became his *beau ideal* as a Christian physician. So it came about that busy medical practice outruled scientific tendencies, which asserted themselves, however, during immense practitional activity in the publication of a much esteemed little book, — "The Typical Character of Nature."

Dr. T. A. G. Balfour joined our Society in 1868. He became President, in succession to Sir Robert Christison, in session 1877–78, and continued to occupy the chair for the next term. He afterwards served the Society for many sessions, either as Vice-President or Councillor. A list of papers, the result of much patient labour in the laboratory of the Royal Botanic Garden, chiefly experiments on *Dionæa Muscipula* (Venus' Fly-Trap), is given at the close of this notice. They were highly valued by experts. But, beyond such contributions of work, his ready wit, urbanity, patience, and warmth of heart contributed much to the success of the meetings over which he presided.

Dr. Balfour contributed also many valuable professional papers both to the Medico-Chirurgical and Obstetrical Societies. He became a member of the Royal College of Physicians in 1867, rising to the Fellowship in 1869. He joined the ranks of the Royal Society of Edinburgh in 1870.

When death suddenly came to the busy worker—he had just entered his seventieth year—professors, reverend doctors of divinity, and over a hundred working men and women joined the funeral procession.

LIST OF DR. T. A. G. BALFOUR'S BOTANICAL PAPERS.

1. Observations on Mr. Darwin's Views of Climbing Plants.—Trans. Bot. Soc. Edin., vol. xii. p. 451–477.

2. Experiments on *Dionæa Muscipula* (Venus' Fly-trap).—Ibid. vol. xii. p. 334–369.

3. Presidential Remarks.—Ibid. vol. xiii. p. 165–171.

4. Note on the Effects of Soot on some Coniferæ.—Ibid. p. 343–351.

5. Presidential Address: On *Dionæa Muscipula* (Venus' Fly-trap).—Ibid. 353–389.

6. Presidential Address.—Ibid. vol. xiv. p. 49.

7. Obituary Notice of Dr. James Gilchrist, Dumfries.—Ibid. vol. xvii. p. 2.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF JUNE 1895. By ROBERT LINDSAY, Curator.

The past month of June has been remarkable for the great heat and drought which prevailed generally, and also for occasional frosts at night. As regards the Botanic Garden, vegetation did not suffer much from this abnormal weather, but throughout the country the results have been rather disastrous.

Hardy herbaceous plants have flowered very profusely during the month, and are fast ripening an abundant supply of seeds. Deciduous trees and shrubs generally, though scarcely up to the average in richness of blossom, have developed remarkably fine and luxuriant foliage. Insect pests are not very abundant, notwithstanding the drought. More plants came into flower in June this year than has happened since 1889. Nearly all variegated plants have developed richly coloured leaves.

On the rock-garden 402 species and varieties came into flower during the month, as against 288 for the corresponding month last year. Among the most effective in flower were:—*Arenaria graminifolia, Aster alpinus, A. alpinus albus, A. alpinus speciosus, A. Stracheyi, Astragalus Tragacantha, Anthyllis erinacea, Arnica montana, Aquilegia cærulea lutea, Campanula pulla, C. persicifolia grandiflora, C. "G. F. Wilson," Crambe cordifolia, Dianthus alpinus, D. cæsio-caricinus, D. neglectus roseus, D. superbus* and varieties, *Edraianthus Pumilio, Erica Mackaiana, Gillenia trifoliata, Galax aphylla, Helianthemum amabile fl. pl., Morina betonicoides, Mulgedium alpinum, Onosma taurica, Oxalis lasiandra, Oxytropis uralensis, Phlox carolina, Potentilla nitida atrorubens, P. lanuginosus, Robertia taraxacoides, Rhododendron ferrugineum album, Sphæralcea rivularis, Trifolium alpinum, Veronica satureæfolia*, etc.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JUNE 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·698	69·6	52·0	63·1	56·9	S.	Cum.	5	S.	0·125
2	29·891	70·2	52·0	53·8	52·0	E.	St.	8	E.	0·020
3	30·120	55·0	50·4	51·8	51·1	E	St.	10	E.	0·000
4	30·157	59·8	51·5	56·0	53·6	N.E.	Cir.	5	W.	0·050
5	30·388	63·0	52·0	58·1	52·2	N.E.	...	0	...	0·000
6	30·380	63·7	43·7	58·9	51·1	E.	...	0	...	0·000
7	30·293	68·2	45·8	60·5	54·2	N.E.	...	0	...	0·000
8	30·131	76·1	54·7	63·0	56·8	W.	Cir. St.	10	...	0·000
9	29·927	70·5	49·1	60·1	55·7	N.W.	St.	10	N.W.	0·000
10	29·869	70·7	51·4	60·0	50·7	W.	Cum.	1	W.	0·000
11	29·749	64·9	47·2	56·4	47·9	N.W.	Cum.	2	N.W.	0·075
12	29·942	59·7	40·1	52·3	45·8	W.	Cum.	5	N.	0·010
13	30·059	55·9	37·1	53·9	47·1	W.	Cir.	5	N.W.	0·060
14	30·088	61·9	44·2	53·4	46·0	N.W.	Cum.	8	N.W.	0·000
15	30·126	56·0	37·6	53·2	47·7	N.E.	Cir.	3	N.	0·000
16	29·973	64·5	40·1	58·0	49·3	W.	Cum.	3	W.	0·005
17	29·881	61·4	40·0	52·3	45·9	Var.	Cir. St.	10	...	0·275
18	29·554	57·8	45·7	50·8	48·8	E.	St.	8	S.	0·675
19	29·567	56·0	47·7	55·0	51·7	E.	Cum.	2	E.	0·465
20	29·849	58·0	44·5	57·1	51·6	W.	Cum.	1	W.	0·065
21	30·033	64·1	48·7	61·1	56·9	W.	Cir.	3	W.	0·050
22	30·143	64·0	49·0	55·7	51·1	S W.	Nim.	10	W.	0·000
23	30·205	71·1	57·8	63·9	59·1	N.W.	Cir. St.	8	N.W.	0·000
24	30·408	74·0	47·5	55·2	52·8	N.	Cir. St.	8	N.	0·000
25	30·315	62·1	51·0	57·9	54·3	N.	...	0	...	0·000
26	30·029	64·2	50·1	62·8	56·4	N.E.	Cir.	2	S.W.	0·000
27	29·810	77·7	59·1	63·9	57·6	S.W.	Cir. St.	5	W.	0·000
28	29·700	71·4	48·9	63·5	56·2	S.W.	Cir.	5	S.W.	0·215
29	29·532	64·2	51·1	61·4	57·4	Var.	{ Cir. / Cum. }	{ 2 / 2 }	S.W.	0·140
30	29·456	62·4	49·8	60·1	56·2	W.	Cum.	5	W	0·330

Barometer.—Highest, 30·408 inches, on the 24th. Lowest, 29·456 inches, on the 30th. Monthly Range, 0·952 inch. Mean, 29·976 inches, being 0·067 inch above the average for June for four preceding years.

Protected S. R. Thermometers.—Highest, 77°·7, on the 26th. Lowest, 37°·1, on the 13th. Monthly Range, 40°·6. Mean of all the Highest, 64°·6. Mean of all the Lowest, 48°·0. Mean Daily Range, 16°·6. Mean Temperature of Month, 56°·3, being 0°·7 above the average for June for four preceding years.

Hygrometer.—Mean of Dry Bulb, 57°·8. Mean of Wet Bulb, 52°·5. Temperature of Dew-point, 47°·7. Mean Humidity, 69·1 %.

Radiation Thermometers.—Highest in Sun, 131°·0, on the 9th. Lowest on Grass, 28°·8, on the 15th. Frost occurred on Grass on 6 days.

Sunshine.—Total recorded for month, 191 hours, being 36·6 % of the possible amount. The sunniest day was the 6th, with 13 hours, 30 minutes, being 78·3 % of the possible amount. No sunless days occurred during the month.

Rainfall.—Rain fell on 15 days. Total Fall, 2·560 inches, being 0·611 inch above the average for June for four preceding years. Greatest Fall in 24 hours, 0·675 inch, on the 18th.

A. D. RICHARDSON, *Observer.*

III. NOTES ON PLANTS IN PLANT HOUSES. By R. L. HARROW.

About 130 species of plants have flowered during June in the plant houses of the Royal Botanic Garden. Of these the majority have been natives of tropical countries, and the houses devoted to these plants have, in consequence, presented an attractive and interesting appearance.

This being, *par excellence*, the growing season of orchids, the least quantity of bloom is produced, and the plants which have flowered have been chiefly species of *Cypripedium*, *Stanhopea*, and *Cattleya*.

The creepers upon the roof of the Palm House annexe, and also in the corridor, include some showy species of *Allamanda*, *Clerodendron*, and *Solanum*, etc., and these are now becoming established and clothing the house.

The following are a few of the most worthy of plants flowered :—

Lambertia formosa, Sm. This plant is a native of Australia, and like many of the hard-wooded plants introduced to cultivation during the end of the last and beginning of the present century, is now rare in our gardens. The small number of species representing the genus are all natives of Australia; the natural order to which they belong being Proteaceæ. The species under notice is of a shrub-like habit, the branches springing from below the surface of the soil, and bearing linear leaves generally in whorls of three. The terminal involucres enclose seven flowers with a red corolla, the lobes of which are reflexed and hairy, the style protruding about an inch beyond the mouth of the corolla.

Urceocharis Clibrani, Hort. This bigeneric hybrid was raised by Messrs. Clibran, Altrincham, the parents being *Eucharis grandiflora*, Planch. and Linden, and *Urceolina pendula*, Herb. It resembles most the first-named in foliage and in the colour of its flowers, but differs in the flowers being produced in greater number on its inflorescences, and in its period of flowering. The umbels consist of six or more white flowers upon an erect peduncle rising well above the foliage.

Trichopilia Galeottiana, A. Rich., is a native of Mexico, discovered by Galeotti, an Italian explorer, in 1845, but was not introduced to European gardens until about 1859. It is a distinct orchid, with long pseudo-bulbs, and a single elliptic coriaceous leaf. The flowers spring from the base of the pseudo-bulbs, the sepals and petals are greenish-yellow in colour, the lip is large, light yellow at the edges, and darker yellow around the column.

Cypripedium Parishii, Rchb. This is a stout growing plant, with large coriaceous green leaves, the scape bearing from four to seven flowers, the petals of which are twisted, and bear along their margins patches of blackish hairs. It is said to have been first discovered by the Rev. C. Parish, in compliment to whom it is named, in 1859, but was not introduced to this country until 1868, when it was imported by Messrs. Low & Co.

Crinum augustum, Roxb., is a large plant, the bulb being from six to eight inches across at base. The peduncles bear umbels of flowers up to thirty or more, which, in bud, are bright red, the inner surface of the segments being lighter.

Oxypetalum cœruleum, Decne. A native of Brazil; is a slender growing plant with bright blue flowers and tomentose foliage; formerly known as *Tweedia cœrulea*.

Tussacia pulchella. Belongs to the order Gesneraceæ, and grows to about a foot in height. The axillary inflorescences bear flowers, the calyx of which is red, the corolla orange colour. The leaves are deciduous in winter.

Impatiens Hawkeri. A native of the Sunda Islands, and one of the most brilliant in cultivation, the flowers being dark purple-red and large. Introduced in 1886.

Solanum Wendlandii, Hook. f., the finest of the climbing species of this genius in cultivation.

Aristolochia tricaudata, Lem. A shrubby species, flowering from the older parts of the stems, the flowers being of a dark purple colour. A native of Mexico.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

VOLUME XX.

PART III.

EDINBURGH:
PRINTED FOR THE BOTANICAL SOCIETY BY
MORRISON AND GIBB LIMITED.
MDCCCXCVI.

TRANSACTIONS AND PROCEEDINGS

OF THE

BOTANICAL SOCIETY OF EDINBURGH.

SESSION LX.

MEETING OF THE SOCIETY,

Thursday, November 14, 1895.

Professor F. O. Bower, President, in the Chair.

The following Officers of the Society were elected for the Session 1895–96:—

PRESIDENT.

Andrew P. Aitken, M.A., D.Sc., F.R.S.E.

VICE-PRESIDENTS.

Patrick Neill Fraser.
Symington Grieve.
Professor F. O. Bower, Sc.D., F.R.SS. L. & E., F.L.S.
Colonel Fred. Bailey, R.E.

COUNCILLORS.

Sir Alexander Christison, Bart., M D.
William Craig, M.D., F.R.S.E., F.R.C.S.E.
T. Cuthbert Day.
Professor Cossar Ewart, M.D., F.R.SS. L. & E.
J. Rutherford Hill.
Commander F. M. Norman, R.N.
Robert A. Robertson, M.A., B.Sc. Edin.
Andrew Semple, M.B., F.R.C.S.E
Robert Turnbull, B.Sc.
William Watson, M.D.

Honorary Secretary—Professor Sir Douglas Maclagan, M.D., LL.D., P.R.S.E.
Honorary Curator—The Professor of Botany.
Foreign Secretary—Andrew P. Aitken, M.A., D.Sc., F.R.S.E
Treasurer—Richard Brown, C.A.
Assistant Secretary—James Adam Terras, B.Sc.
Artist—Francis M. Caird, M.B., C.M.
Auditor—Robert C. Millar, C.A.

Issued November 1896.

LOCAL SECRETARIES.

Aberdeen—Professor J. W. H. TRAIL, M.A., M.D., F.L.S.
Bathgate—ROBERT KIRK, M.B., C.M.
Beckenham, Kent—A. D. WEBSTER.
Berwick-on-Tweed—FRANCIS M. NORMAN, R.N.
Birmingham—GEORGE A. PANTON, F.R.S.E., 73 Westfield Road.
,, W. H. WILKINSON, F.L.S., F.R.M.S., Manor Hill, Sutton Coldfield.
Bridge of Allan—ALEXANDER PATERSON, M.D.
Bromley, Kent—D. T. PLAYFAIR, M.B., C.M.
Calcutta—GEORGE KING, M.D., F.R.S.. Botanic Garden.
,, DAVID PRAIN, M.D., F.R.S.E., F.L.S., Botanic Garden.
Cambridge—ARTHUR EVANS, M.A.
Chirnside—CHARLES STUART, M.D.
Croydon—A. BENNETT, F.L.S.
Dundee—Professor P. GEDDES, F.R.S.E.
,, W. G. SMITH, B.Sc., Ph.D.
Glasgow—Professor F. O. BOWER, Sc.D., F.R.S., F.L.S.
,, Professor J. CLELAND, M.D., F.R.S.
Kelso—Rev. DAVID PAUL, M.A., LL.D., Roxburgh Manse.
,, Rev. GEORGE GUNN, M.A., Stitchel Manse.
Kilbarchan—Rev. G. ALISON.
Leeds—Dr. JOHN H. WILSON, Yorkshire College.
Lincoln—GEORGE MAY LOWE, M.D., C.M.
London—WILLIAM CARRUTHERS, F.R.S., F.L.S.
,, E. M. HOLMES, F.L.S. F.R.H.S.
,, JOHN ARCHIBALD, M.D.. F.R.S.E.
Melbourne, Australia—Baron FERDINAND VON MUELLER, M.D., K.C.M.G.. F.R.S.
Melrose—W. B. BOYD, of Faldonside.
Nova Scotia—Professor GEORGE LAWSON, LL.D., Dalhousie.
Otago, New Zealand—Professor JAMES GOW BLACK, D.Sc., University.
Ottawa, Ontario—W. R. RIDDELL, B.Sc., B.A., Prov. Normal School.
Perth—Sir ROBERT PULLAR, F.R.S.E.
Philadelphia, U.S.A.—Professor JOHN M. MACFARLANE, D.Sc., F.R.S.E.
Saharunpore, India—J. F. DUTHIE, B.A., F.L.S.
Silloth—JOHN LEITCH, M.B., C.M.
St. Andrews—Professor M'INTOSH, M.D., LL.D., F.R.SS. L. & E.
,, ROBERT A. ROBERTSON, M.A., B.Sc.
Wellington, New Zealand—Sir JAMES HECTOR, M.D., K.C.M.G., F.R.SS. L. & E.
Wolverhampton—JOHN FRASER, M.A., M.D.

Dr. WILLIAM CRAIG exhibited specimens of *Fistulina hepatica* which had reappeared upon *Castanea vesca* in his garden at Bruntsfield Place. See Trans. Bot. Soc. Edin., vol. xix. p. 3.

Mr. CAMPBELL sent for exhibition blooms of *Cytisus fragrans, Potentilla alba, Myrtus communis, Escallonia macrantha,* and other plants from the open ground of his garden at Ledaig, Argyllshire.

From the Royal Botanic Garden were exhibited :—*Vanda Kimballiana*, *Cestrum aurantiacum*, *Ruellia macrantha*, *Tibouchina moricandiana* in flower, and *Vitis heterophylla humulifolia* (the blue-berried vine) in fruit.

The President (Professor F. O. Bower) delivered the following address :—

It is, I believe, usual for a retiring President to address the Society from this chair on some topic of current interest to botanists. On casting round for a subject for this evening, I have thought that I could not do better than turn your attention to the works of the celebrated botanist, Robert Brown, and consider them from the point of view of their bearing on the science as it is at the present day. You will all have been made aware, through the medium of the newspapers, of the main facts of Brown's life; for, in connection with the recent dedication of a bust to his memory in Montrose, his native town, by his kinswoman Miss Paton, the story of his life was eloquently told by Mr. Carruthers, and thus found its way afresh into the public prints. I shall therefore refer you to those sources of information, and devote our time this evening to the discussion of his life's work.

The botanists of his time were fully aware of his great merits; beyond the fact that Humboldt expressed his opinion in the often quoted epithet, that he was "facile botanicorum princeps," we have a substantial proof of appreciation in the two volumes of the Ray Society's publications, into which his papers were collected, and edited by J. J. Bennett—his successor in office at the British Museum. Such testimonials come to but few men of science; it is, however, in my opinion a still higher proof of the value of the work of this great man, that after the lapse of half a century his writings should hold the place that they still do. It is only the great buildings of a town which appear to tower above the rest in the distant view; and so in the growing distance of time it is only the great minds which maintain, or it may be increase their prominence above their more common-place contemporaries. Brown's reputation stands above that of his fellow-botanists like one of those landmarks, a church spire or a castle, which remain visible after the meaner buildings of the surrounding town have sunk in the distance.

Such landmarks are the guides of men; and I wish that our younger writers would hold them as such. In the classics it is customary before writing a composition of Latin prose, to read a few pages of Cicero, Livy, or Tacitus; before writing elegiacs, to read Ovid; before hexameters, Virgil; and by such exercises classical scholars induce, as far as may be, a feeling for the best style of composition. How many botanists, before they rashly hasten into print, consult those models which a writer like Brown provides for them? Instead of this they will post themselves up with the latest, often trivial details of their text, presented it may be in the formless inaugural dissertation of a man of little more experience than themselves; and will absorb almost unconsciously his heavy style, and ill-balanced estimate of the relative value of facts. I would earnestly advise any young writer to study the collected papers of Brown, as models of clearness (the very foundation of style) and of brevity, which is nowhere more truly the soul of wit than in scientific writing. Lastly, his transparent honesty of purpose should be a lesson to us all; he did not write to make or maintain a reputation, but he made a reputation because he had knowledge of value to his fellow-men to write down, and this he did with brevity and clearness.

A peculiar feature of his writings is how he leads his readers on from an apparently trivial point to the discussion of matters of the widest possible bearing, thus from the investigation of *Kingia*, he leads us to his far-reaching study and comparison of the ovules of phanerogams and gymnosperms. His examination of pollen grains and their contents leads to his description of the "Brownian movements." His investigations on the fecundation of orchids, leads to the recognition of the nucleus as a frequent, perhaps even constant feature in the vegetable cell. These are all object lessons in research; they show how the strong mind, pursuing a legitimate channel of observation, is not merely directed passively by it, but of its own motion widens and deepens the channel till it emerges into the vast sea of general interest.

And, before we consider some of Brown's writings in detail, we may pause to admire the catholicity of his taste. In these days of specialisation, when a man who knows Fungi is probably ignorant of Algæ, a man of Pteridophyta is probably weak in physiology, and a systematist may use the microscope only occasionally, and then with low powers; it is a useful corrective to note how large a field Brown covered. A specially expert collector, he, more than any man of his time, knew how to do justice to his collections when made. He had the true classificatory instinct, and it is fortunate that circumstances gave him an unusually wide field for its exercise. Starting, as so many great botanists have done, as a local collector in the district of his birth, his first contribution to the literature of the science was in the field of critical and topographical botany, in a paper on the plants of Forfarshire, his native county; in this paper is described, perhaps for the first time, *Eriophorum alpinum*, L., a plant now virtually extinct in Scotland. But, on the other hand, many of his most important writings were structural and physiological, and they covered the ground from the Gulf weed (*Sargassum*) and mosses to the angiosperms. Even fossils were not beyond his sphere of interest, and I can personally testify, from a detailed examination of the classical fossil known as "Brown's cone," how accurate and far-reaching were his observations in this most attractive, though specialised, region of our science. Specialism is doubtless an inevitable evil, which follows as a consequence of the advancement of our science; it was probably easier in Brown's day to avoid it; but I hope that the botanists of the present may continue to regard it as an evil, against which they must be on their guard; and not, as some are even beginning to do, glory in specialism, which is at best but a confession of human weakness.

After these general remarks we may turn to a more detailed consideration of some of Brown's memoirs. But I do not propose to discuss his larger contributions to systematic and geographical botany at any length. Over and above the very numerous additions which he made to the sum of known species, his writings developed in the most practical way the natural system of classification.

He did not construct, or even reconstruct, any system; but his works served as the most spontaneous illustration of what the principles of a natural system, then in its infancy, should be. As Sachs points out (History, p. 143), "he discovered that marks which are of great value for classification within the limits of certain groups of affinity, may possibly prove worthless in other divisions," a conclusion which one must examine in the light of the science of his time in order to fully estimate its value as a discovery. Some of his works were purely systematic, as, for instance, the "Prodromus Floræ Novæ Hollandiæ," which, though the original edition in England was withdrawn from circulation owing to Brown's sensitiveness to criticism on its Latinity, was repeatedly republished in Germany. But most of his descriptive works are interspersed with general observations, led up to by the study of the plants in question. I have already alluded to his papers on *Kingia* and on the Orchidaceæ as examples of this. It is great minds which thus are able to enlarge the area of what might at first appear a small subject, and by the touch of genius, the true philosopher's stone, convert what in other hands might be mere base metal to pure gold.

Probably the strongest and most general interest will at the present day be felt in those papers which in his miscellaneous works are collected under the heading of "Structural and Physiological Memoirs." In a short paper on the "Fructification of Mosses" Brown satisfactorily disposed of the erroneous idea of Beauvois, that the spores are of the nature of pollen and fertilise "seeds" embedded in the columella. A more careful mode of preparation, together with comparison with *Phascum*, which has no developed columella, were the foundation of Brown's argument.

The paper on "Seeds and Fruits" is chiefly remarkable for its concluding paragraph, which foreshadows so much of his important later work. He points out that the anomalous structures which he has been studying "especially demonstrate the necessity of carefully ascertaining the state of the unimpregnated ovarium; for while its structure remains unknown, that of the ripe fruit can never be thoroughly understood." This passage, published in 1818, strikes the key-note of several important researches. Obeying his own injunction, he examined the ovule of various angiosperms and gymnosperms in the young state, with the result that he was the first to distinguish the integuments from the nucleus (nucellus) of the ovule; he showed that the hilum represents the point of attachment, and recognised the micropyle as a canal leading to the apex of the nucleus; he noted the different relative positions of these parts in different types of ovule, and that the embryo is always attached at the point in the embryo-sac (amnion) nearest to the micropyle, while its root points towards the micropyle. He also recognised the true nature of the endosperm, perisperm, and arillus. In fact, though many of these parts had previously been the subject of less strict observation, Brown may be said to have laid out the broad lines of the morphology of the ovule, in a manner the permanence of which has been the sufficient proof of its excellence.

But the examination of the angiospermic ovule led him to that of the gymnosperms, and it was he who established on a comparative basis the view that what had previously passed as a female flower is really a naked ovule. It doubtless required Hofmeister's detailed and brilliant work to fully develop the importance of the comparison; nevertheless it was Brown who first showed the way. Moreover, his first communication on this subject in 1825 to the Linnæan Society, was followed by one read before the British Association in Edinburgh in 1834, in which he describes and figures the endosperm ("amnios or albumen"), the archegonia, the "funiculi or suspensors," and numerous embryos. In fact, though it remained for Hofmeister to perfect the comparisons and fill in the details, Brown was the pioneer in this most important line of research.

The pollen, also, from time to time occupied his attention. His paper "On the Organs and Mode of Fecundation in Orchideæ and Asclepiadeæ," contains many interesting observations. In a footnote (p. 514) we find a description of the division of the pollen-mother-cells of *Tradescantia* to form the tetrads, and of the maturing of the pollen grain. On p. 507, he confirms the observations of Amici and Brongniart relating to the formation of the pollen tube; he also observed, as Amici had done, that the tubes make their way to the micropyles of the ovules. He was, however, in doubt whether *all* the tubes originated from the pollen grains, or whether they were indirectly generated by them. He says (p. 539): "It is possible, therefore, that the mucous cords may be entirely derived from the pollen, not, however, by mere elongation of the original pollen tubes, but by an increase in their number, in a manner which I do not attempt to explain." No one was better aware than Brown of the incompleteness of this statement. He remarks (p. 538): "My observations on the *origin* of these tubes are not altogether satisfactory." One may express the wish that all writers would be equally candid at their own expense.

But the part of this remarkable paper which is the most generally known is that which connects Robert Brown's name, perhaps more than that of any other man, with the discovery of the nucleus of the cell. We will endeavour to place his contribution to the subject in its correct light.

He was by no means the first to see, and represent in drawing, the nucleus of the cell; the earliest notice of it of which we at present have record is by Fontana, in his work "Sur les Poisons et sur le Corps Animal," Florence, 1781 (vol. ii., pl. 1, figs. 7, 10). He examined the cells detached from the slimy skin of the eel, and described how, after partially drying, there appeared "a small body within, situated in different positions in each globule." In his fig. 10 he represents one of the cells on a larger scale, plainly showing the nucleus in a central position. Thus, probably, the earliest representation of the nucleus appears to have been in the animal, not in the vegetable cell, and to date a full half century before Brown's paper. Doubtless an exhaustive study of the publications from 1780 to 1830 would disclose other isolated observations of a like nature, and Brown himself refers to such by Meyer, Purkinje, and Brongniart (l.c. p. 514) in the vegetable cell. Certainly in the atlas to Meyer's "Phytotomia" (1830) several of the drawings indicate the nucleus more or less clearly. Without following out or enumerating such sporadic notes, it may be stated that up to 1830 no general importance was attached to the granules described or figured. It is to Brown that the credit is due of extending observations of the nucleus to cells of many different parts of the same plants, and to plants of various families, chiefly of Monocotyledons, but also in some cases of Dicotyledons. It is peculiarly interesting to us now that he observes its occurrence in the cells of the ovule, and in the pollen-mother-cells and tetrads. He thus approached at once the focal point of interest, viz. the relation of the nucleus to reproduction; but the demonstration of the part which it plays in this process did not come for nearly half a century after he wrote.

A noteworthy feature in the three pages of print into which he compressed his account of the nucleus or areola, is the caution displayed. It is a plain statement of facts of observation. He does not generalise on insufficient grounds; he does not even dwell on cases where the nucleus has not been seen, but he states where it has been seen. He does not state that it is a constant feature of the cell, but his attitude is distinctly that of expectancy that it will be found if properly sought for. His immediate followers, however, were not so reticent, and the varying size, position, and prominence of the nucleus, together with its elusive behaviour in division, greatly delayed further progress. These circumstances, doubtless, explain the position of Meyer, which we may place in antithesis to the truly scientific attitude of Brown. In his "Pflanzen-Physiologie" (1837, vol. i. p. 209) he remarks: "The occurrence of these nuclei within the cells does not seem to be constant at all times in the plant, and where they do occur, these structures are only to be recognised in a few cells. In the majority of cells they are absent. Perhaps the nucleus also is a sort of nourishment-reserve." And so was initiated the idea of a coming and going, a breaking up and reconstitution of the nucleus, while there naturally followed the view that free nuclear formation is a matter of common occurrence. This view largely dominated the expressions of Schleiden and his followers. It was not till forty years later that Strasburger (1879) summed up his evidence on the continuity of existence of the nucleus in the memorable sentence (Bot. Zeit., 1879, p. 278): "I am no longer able to quote any case of free nuclear formation preceding cell-division." This laid the foundation for connecting the nucleus with opinions on heredity. But, as above noted, the tendency of Brown's statement was such as to avoid the misconceptions which delayed the progress of the science, while his observation of the nucleus in the cells closely connected with reproduction, seems to indicate an opinion, or at least a surmise, of its importance in that process.

We may with advantage try to inquire what the verdict of so careful and reticent a theoriser as Brown would be, could we see the structures of hypothesis (not always built upon the most scientific principles, and apt at times to fall about the ears of their originators) which have arisen in recent years on the basis of observation of the nucleus. I have theorised myself on the subject in last year's address to you, and must not therefore be too outspoken; but I can confidently recommend the reading of Brown's three pages on the nucleus as a corrective against rash speculation.

Before leaving the consideration of this paper, I would direct your attention to another footnote (p. 513), in which he gives a minute account of the staminal hairs of *Tradescantia;* he there describes, as observed under a lens magnifying 300 to 400 times, the "circulation of very minute granular matter," and how the currents pass towards and from the nucleus. This is, I believe, the earliest description of the circulation of protoplasm, though a much more complete account of it is given by Meyer in his "Pflanzen-Physiologie" (1837). But he also dealt with more minute movements which he successfully distinguished from those of circulation. It was three years previous to the memoir we have been discussing (1827), that Brown had printed for private circulation his account of "the general existence of active molecules in organic and inorganic bodies;" these observations of what are now called "Brownian movements" were all made "with a simple microscope, and indeed with one and the same lens, the focal length of which is about $\frac{1}{32}$ of an inch." The investigation arose in connection with the pollen, and its mode of action in fertilisation; since the ideas which then prevailed are now entirely superseded, the chief interest of this paper will be in tracing how a skilful investigator attacked a difficult question with imperfect instruments, and arrived at a sound conclusion.

But it would be more than could be compressed into an address like this to remark on the many points of interest in Brown's works. I cannot do more than merely mention his masterly treatment of some most difficult families: the morphology of the flower of Orchidaceæ and Asclepiadaceæ, and their mode of fecundation occupied his attention, perhaps the attraction was the very difficulty which attended their study; while his treatise on that newly discovered wonder *Rafflesia*, in which he grouped together that extraordinarily aberrant form with *Hydnora*, *Brugmansia*, *Cytinus*, etc., and his constitution of the natural family Rafflesiaceæ, will always remain as one of his most notable works.

Enough will now have been said to revive your interest in this most extraordinary man. And while we feel a peculiar satisfaction in noting that he was a Scotchman by birth and education, and that his work commanded the respect and admiration of foreign as well as British Botanists, we may for our own advantage draw the moral: we mark as special features of his work his clear and concise style; his reticence, which prevented him from rash hypothesis, so subject to later demolition; lastly, his transparent honesty, which led him at times to indicate to the reader where the weak point or deficient observation lay. If only those who now write on kindred subjects, with perhaps a mere fraction of Robert Brown's ability, would follow him in these characteristics, how much fewer would be the obstacles which writers themselves unwittingly place in the way of the progress of their science. I should like to see the Structural and Physiological Memoirs of Robert Brown prescribed as a classic to be read by all aspirants to a degree of Bachelor of Science in Botany; such experience would bring untold advantages to style and accuracy of thought, at the same time the information actually so gained would be such as still maintains its value, for the writings of this most remarkable man, though often dealing with freshly broken ground of the science, have maintained their position as much as those of any writer; and it is this, combined with a native originality, which make his name respected to-day as highly as it was at the time of his death some forty years ago. Permanence of influence may be held as a title to high rank in the scientific world,—on this ground Robert Brown's place is among the highest.

On the motion of Dr. WILLIAM CRAIG the thanks of the Society were given to the President for his address.

The President made the following announcement regarding the Roll of the Society:—

During the past year the Society lost by death:—2 Honorary British Fellows—Charles Cardale Babington; Hugh Francis Clarke Cleghorn. 3 Resident Fellows—Thomas Alexander Goldie Balfour; Lady Henry Grosvenor; Henry E. Hole. 3 Non-Resident Fellows—Dr. Robert Brown, Ph.D.; A. G. More; Charles Eyre Parker. 1 Corresponding Member—Professor Fr. Schmitz.—Total, 9.

During the same period the Society received the following accessions:—1 Honorary British Fellow—George King. M.D. 5 Honorary Foreign Fellows—Ed. Bornet; Wilhelm Pfeffer; Charles S. Sargent; M. Treub; Hugo de Vries. 3 Resident Fellows—William Oliphant Gibb; R. Stewart Macdougall; Ralph Stockman, M.D. 7 Corresponding Members—Oscar Brefeld; Fred. Elving; A. Franchet; L. Guignard; E. Stahl; Henry Trimen; H. Vöchting.

The Roll of the Society stands at present thus:—

Honorary Fellows—		
Royal	3	
British	4	
Foreign	24	
	—	31
Resident Fellows		126
Non-Resident Fellows		139
Corresponding Members		51
Associates		24
Lady Associate		1
Lady Members		5
Total of Roll		377

The following papers were read:—

FUNGI OBSERVED IN GLEN URQUHART, INVERNESS-SHIRE. By REV. DR. DAVID PAUL, ROXBURGH.

The Cryptogamic Society of Scotland held their annual meeting for 1895 in Glen Urquhart, Inverness-shire, using the Drumnadrochit Hotel as their headquarters, under the

Presidency of Professor Trail of Aberdeen. The day of meeting was 16th September. Owing to the remoteness of the Glen the number of members present was small, consisting of the President, Dr. Stevenson, of Glamis, the Secretary; Professor King, of Glasgow, the Treasurer; with Dr. Paul, of Roxburgh, Dr. Watson, of Edinburgh, and Messrs. Polson and Crawford.

On Tuesday the 17th it rained nearly the whole day, and very little could be done in the way of exploration, but next day, Wednesday the 18th, was fine, and the whole party, under the guidance of Mr. Angus Grant, a local botanist, spent the day in the woods surrounding the Earl of Seafield's mansion-house. Fungi were tolerably abundant, more rain having fallen there than in the eastern and southern parts of the country. About a hundred different species of Hymenomycetes were noted, most of them being those that may be found in suitable woods anywhere in Scotland, and which need not be specially mentioned here. A full list, however, is set down at the end of the paper as a contribution to the geographical distribution of Fungi in Scotland, the locality having probably not before been specially examined. But some of the less common and rare Fungi found on the first day may be mentioned. Not far from the mansion-house rises a knoll covered with rocks on the top, and clothed with old Scotch firs everywhere but on the very summit, whose dark-green foliage forms a striking contrast to the lighter tints of the mixed woods around, and presents a conspicuous object as seen from the neighbourhood of the hotel. Many of the trees are magnificent specimens of the *Pinus silvestris.* On one side of this knoll a great number of specimens of *Cortinarius armillatus,* Fr., were found along with *Lactarius vietus,* Fr., in still greater abundance. One specimen of the rare *Trametes pini,* Fr., was discovered. Near the path leading from the house to this knoll a minute and beautiful Polyporus was detected on a fallen and decayed birch bough, which proved to be *Polyporus ciliatus,* Fr., and which, so far as is known, has not been found before in Britain. In another part of the grounds a fine Hydnum occurred, which has been identified as *Hydnum compactum,* Pers. These were the principal finds of the first day.

On the second day, Thursday the 19th, only two of the party remained to go out again with Mr. Grant, and they were moderately successful in their search. On the knoll already mentioned were found *Sparassis crispa*, Fr., and *Polyporus Schweinizii*, Fr., both rare Fungi. *Lactarius uvidus*, Fr., was also found. In a fir wood on another part of the property *Hydnum zonatum*, Batsch, was seen in considerable quantity, at one spot forming a nearly complete circle of 9 yards in diameter. It was not observed in any other place. *Ag. porrigens*, Pers., *Ag. pyrotrichus*, Holmsk., *Elaphomyces granulatus*, Fr., *Boletus pachypus*, Fr., *Cantharellus infundibuliformis*, Fr., *Craterellus cornucopioides*, Pers., and *Clavaria abietinus*, Pers., were also observed. As only a small part of the ground could be carefully gone over in the limited time at the disposal of the members, the results obtained seem to warrant the conclusion that the district, where it is wooded, would repay a more prolonged and minute search. A great deal has still to be done before we can be said to have much knowledge of the Hymenomycetes of Scotland, and the number of observers in this department of botany is so few that progress is but slow. The Society has mapped out the whole of Scotland into carefully defined districts with the view of gradually obtaining lists of the Fungi found in each, and hopes soon to publish a full list of Scotch Fungi as a guide for the tabulation of the different species. When this is done it may be expected that the finds of competent observers will so be chronicled as not to be lost sight of through being either not noted at all except on the margin of a private flora, or else recorded here and there in different publications. Greater interest may thus also be aroused in this sphere of Cryptogamic Botany, and the number of workers being by degrees increased the accuracy of their work will be increased also, and its permanence secured.

Fungi found in Glen Urquhart during the Annual Conference of the Cryptogamic Society of Scotland, 17th to 19th September 1895, inclusive:—

Agaricus mappa, Fr.
—— muscarius, L.
—— rubescens, Pers.
—— spissus, Fr.

Agaricus vaginatus, Bull; also *var.* fulvus, Schæff.
—— granulosus, Batsch.
—— melleus, Fl. Dan.

Agaricus equestris, L.
—— maximus, Fl. Wett.
—— resplendens, Fr.
—— albobrunneus, Pers.
—— rutilans, Schæff.
—— vaccinus. Pers.
—— terreus, Schæff.
—— saponaceus, Fr. (?).
—— virgatus, Fr.
—— sulphureus, Bull.
—— clavipes, Pers.
—— fragrans, Sow.
—— laccatus, Scop; also *var.* amethystinus.
—— radicatus, Rehl.
—— maculatus, A. and S.
—— butyraceus, Bull.
—— confluens, Pers.
—— tuberosus, Bull.
—— tenacellus, Pers.
—— dryophilus, Bull.
—— purus, Pers.
—— galericulatus, Scop.
—— polygrammus, Bull.
—— ammoniacus, Fr.
—— sanguinolentus, A. and S.
—— epipterygius, Scop.
—— muralis, Sow.
—— porrigens, Pers.
—— cervinus, Schæff.
—— rhodopolius, Fr.
—— prunulus, Scop.
—— pascuus, Pers.
—— variabilis, Pers.
—— squarrosus. Müll.
—— flammans, Fr.
—— mutabilis, Schæff.
—— hirsutus, Lasch.
—— rimosus, Bull.
—— geophyllus, Sow.
—— glutinosus, Lind.
—— arvensis, Scop.
—— hæmorrhoidarius, Kalchbi.
—— æruginosus, Curt.
—— capnoides, Fr.
—— epixanthus, Fr.
—— fascicularis, Huds.
—— pyrotrichus, Holmsk.
—— velutinus, Pers.
—— semilanceatus, Fr.
Coprinus atramentarius, Fr.
Cortinarius cærulescens, Fr.
—— elatior, Fr.
—— anomalus, Fr.
—— cinnamomeus, Fr.
—— torvus, Fr.
—— armillatus, Fr.
—— hemitrichus, Fr.
Gomphidius glutinosus, Fr.
Paxillus involutus, Fr.
—— atrotomentosus, Fr.
Hygrophorus cerasinus, Berk.
—— pratensis, Fr.
—— virgineus, Fr.
—— coccineus, Fr.
—— conicus, Fr.
—— chlorophanus, Fr.
Lactarius torminosus, Fr.
—— turpis, Fr.
Lactarius blennius, Fr.
—— uvidus, Fr.
—— piperatus, Fr.
—— deliciosus, Fr.
—— quietus, Fr.
—— vietus, Fr.
—— rufus, Fr.
—— glyciosmus, Fr.
—— volemus, Fr.
Russula nigricans, Fr.
—— adusta, Fr.
—— vesca, Fr,
—— fœtens. Fr.
—— fellea, Fr.
—— emetica, Fr.
—— fragilis, Fr.
—— alutacea, Fr.
—— vitellina, Fr.
Cantharellus cibarius, Fr.
—— aurantiacus, Fr.
—— infundibuliformis, Fr.
Nyctalis parasitica, Fr.
Marasmius peronatus, Fr.
—— androsaceus, Fr.
Boletus luteus, L.
—— flavus, With.
—— piperatus. Bull.
—— chrysenteron, Fr.
—— subtomentosus, L.
—— pachypus, Fr.
—— edulis, Bull.
—— luridus, Schæff.
—— versipellis. Fr.
—— scaber, Fr.
Polyporus Schweinizii, Fr
—— ciliatus, Fr.
—— perennis, Fr.
—— varius, Fr.
—— betulinus, Fr.
—— igniarius, Fr.
—— annosus, Fr.
—— radiatus, Fr.
—— versicolor, Fr.
Trametes pini, Fr.
Dædalea quercina, Pers.
Hydnum repandum, L.
—— rufescens. Pers.
—— zonatum, Batsch.
—— compactum, Pers.
Craterellus cornucopioides, Pers.
Sparassis crispa, Fr.
Clavaria rugosa, Bull.
—— abietina, Pers.
—— vermicularis, Scop.
Calocera viscosa, Fr.
Tremella albida, Huds.
—— mesenterica, Retz.
Lycoperdon gemmatum, Fr.
Scleroderma vulgare, Fr.
Leotia lubrica, Pers.
Geoglossum glabrum, Pers.
Spathularia flavida, Pers.
Peziza macropus, Pers.
—— scutellata. L.
Xylaria hypoxylon, Grev.
Bulgaria inquinans, Fr.
—— sarcoides, Fr.
Elaphomyces granulatus, Fr.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTHS OF JULY, AUGUST, SEPTEMBER, AND OCTOBER 1895. By ROBERT LINDSAY, Curator.

JULY.

The weather of July was, for the most part, cool and unsettled, with heavy falls of rain during the latter portion of the month. There was a marked absence of real summer warmth, consequently, most outdoor plants did not flower so freely as they usually do in July.

On the rock-garden 190 species and varieties of alpine and herbaceous plants came into flower during the month, as against 194 for the corresponding month last year. Amongst the most interesting were:—*Anemonopsis macrophylla, Aster ramulosus, Campanula Hendersoni, C. grandiflora alba, C. Waldsteiniana, Cassinia fulvida, Cistus algarvensis, Caltha leptosepala, Coronilla iberica, Cyananthus pedunculatus, Cyclamen europæum, Dianthus Atkinsonii, Fuchsia magellanica, Gentiana asclepiadea, Geranium Lamberti, G. polyanthes, Goniolimon speciosum, Haberlea rhodopensis robusta, Micromeria Piperella, Mimulus Jeffreyanus, Monarda didyma rosea, M. Kalmiana, Nardostachys Jatumansi, Parnassia nubicola, Phlomis setigera, Polygonum vaccinifolium, Phyteuma orbiculare, Sedum Aizoon, S. Maximowiczii, S. oppositifolium, Silene monachorum, S. quadridentata, Spiræa Bumalda, S. bullata, S. kamtschatica, Symphyandra pendula, Tropæolum polyphyllum, Tricyrtis macropoda, Veronica loganioides, V. pinguifolia, V. parviflora, V. rakaiensis, Viola Munbyana*, etc.

AUGUST.

August was a most inclement month, being wet and cold throughout, with frequent gales and thunderstorms, altogether a most unfavourable month for vegetation.

On the rock-garden 59 species and varieties of hardy plants came into flower, as against 94 during the previous August. Amongst the most interesting were:—*Alyssum argenteum, Campanula isophylla alba, Carlina subcaulescens, Centaurea alpina, Clematis Jackmanni, Geranium Endressi, G. Wallichianum, Dictamnus tauricus, Helianthus multi-*

florus, Gypsophila paniculata, Inula ensifolia, Linum flavum, Linaria alpina, Lilium tigrinum Fortunei, Potentilla subcaulescens, Sedum cyaneum, Scabiosa lucida, Veronica satureioides, V. longifolia subsessilis, etc.

SEPTEMBER.

September was an unusually fine and warm month, in marked contrast to the preceding months, the absence of rain and prevalence of bright sunshine were quite phenomenal. Herbaceous plants flowered extremely well, and were at their best during this month. Roses were also very fine, the blossoms being as good as those developed in July.

On the rock-garden 41 species and varieties came into flower, as against 30 during last September, a few of the most interesting were:—*Aster spectabilis, A. sikkimensis, A. Thomsoni, Achillea rupestris, Castanopsis chrysophylla, Coreopsis lanceolata, C. verticillata, Colchicum autumnale album fl. pl., Colchicum speciosum, Dianthus Seguieri, Hypericum patulum, Pardanthus chinensis, Scabiosa Parnassi, Thymus comosus.*

OCTOBER.

The month of October was remarkable for the very cold weather experienced. Frost set in early. From the 16th till the end of the month there was a succession of frosty nights. The cold experienced was almost as abnormal, for the time of year, as was the excessive warmth experienced at the end of September. All plants in flower, out of doors, were severely injured. The various asters or "Michaelmas daisies," rudbeckias, helianthus, Japanese anemone, and lilies were more or less destroyed for the season. Leaves of deciduous trees and shrubs began to fall early in the month, and by the end, most trees were stripped bare. Autumn tints were most effective on oak, beech, magnolia, pyrus, cratægus, liquidambar, and azalea, many kinds, however, shed their leaves quite green. Fruit is not very abundant on trees and shrubs generally. Hardy rhododendrons, azaleas, and andromedas are fairly well set with flower-buds this year.

On the rock-garden the following six plants came into flower, viz.:—*Campanula garganica, Helleborus niger grandiflorus, Morina longifolia, Stachys densiflora, Verbascum Chaixii, Veronica Bachofenii.*

II. (1) METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF JULY 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32° (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·536	68·9	47·8	56·9	54·8	E.	Cir. St.	10	S.	0·210
2	29·425	63·8	56·7	61·0	57·2	N.E.	Cir. St.	5	N.	0·430
3	29·824	66·2	53·6	57·8	56·1	W.	St.	10	N.	0·365
4	30·122	63·6	51·5	56·8	52·1	N.E.	Cir Cum. / Cum.	4 / 2	N.W.	0·000
5	30·153	61·4	47·2	58·9	54·6	N.W.	Cum.	2	N.W.	0·000
6	30·092	67·0	50·9	66·0	59·2	W.	Cum.	1	W.	0·000
7	30·005	74·2	54·0	66·5	59·4	S.W.	Cir.	2	S.W.	0·000
8	29·908	71·9	53·7	67·2	58·2	S.W.	Cir. St.	5	S.W.	0·000
9	29·791	71·8	50·9	61·1	53·1	S.W.	Cir. St.	6	S.W.	0·010
10	29·722	62·2	51·7	61·8	53·0	W.	Cum.	1	W.	0·000
11	29·678	66·0	51·1	56·9	52·2	W.	St.	10	W.	0·230
12	29·536	61·2	46·2	56·1	50·8	S.E.	St.	8	N.	0·000
13	29·684	63·8	44·7	56·9	51·3	W.	Cum.	8	W.	0·010
14	29·430	60·9	50·3	59·0	53·7	W.	Cir. / Cum.	2 / 2	N.W. / W.	0·010
15	29·693	60·1	54·1	65·7	51·1	W.	St.	5	W.	0·000
16	29·726	64·3	47·8	56·7	52·7	W.	St.	10	W.	0·095
17	29·659	61·2	50·7	61·2	55·8	W.	...	0	...	0·030
18	29·608	66·9	54·9	60·8	57·2	S.	St.	10	S.	0·370
19	29·314	67·9	52·9	54·9	54·9	E.	St.	10	E.	0·160
20	29·390	60·2	51·2	58·8	55·9	S.	Nim.	10	S.	0·285
21	29·332	61·2	52·0	52·3	51·7	N.	Nim.	10	N.	0·130
22	29·466	63·8	51·2	63·4	55·6	W.	Cir.	5	N.	0·000
23	29·677	66·6	45·9	57·9	53·6	W.	Cir. / Cum.	2 / 3	N. / W.	0·000
24	29·615	65·1	49·8	52·8	50·9	Calm	St.	10	S.	0·000
25	29·737	62·2	50·8	55·0	51·7	E.	Cir. St. / St.	2 / 8	E.	0·435
26	29·786	56·2	52·7	53·1	52·8	E.	Nim.	10	E.	1·335
27	29·565	53·5	51·2	51·9	51·9	N.	Nim.	10	N.	0·695
28	29·614	55·9	51·9	54·9	53·2	N.	St.	10	N.	0·100
29	29·771	59·1	52·1	53·9	52·7	N.E.	Nim.	10	N.E	0·000
30	29·921	65·3	46·8	58·8	54·9	W.	Cum.	5	W.	0·000
31	29·991	64·1	50·0	59·9	54·1	W.	St.	7	W.	0·000

Barometer.—Highest, 30·153 inches, on the 5th. Lowest, 29·314 inches, on the 19th. Monthly Range, 0·839 inch. Mean, 29·702 inches, being 0·086 inch below the average for July for five preceding years.

Protected S. R. Thermometers.—Highest, 74°·2, on the 6th. Lowest, 44°·7, on the 13th. Monthly Range, 29°·5. Mean of all the Highest, 63°·8. Mean of all the Lowest, 50°·8. Mean Daily Range, 13°·0. Mean Temperature of Month, 57°·3, being 0°·4 below the average for July for five preceding years.

Hygrometer.—Mean of Dry Bulb, 58°·5. Mean of Wet Bulb, 54°·1. Temperature of Dew-point, 50°·1. Mean Humidity, 73°·7 %.

Radiation Thermometers.—Highest in Sun, 126°·1, on the 5th. Lowest on Grass, 35°·0, on the 13th.

Sunshine.—Total recorded for month, 133 hours 15 minutes, being 25·5 % of the possible amount. The sunniest day was the 15th, with 11 hours 35 minutes, being 68 % of the possible amount. None was recorded on 5 days.

Rainfall.—Rain fell on 17 days. Total Fall, 4·900 inch, being 2·665 inches above the average for July for five preceding years. Greatest Fall in 24 hours, 1·335 inch, on the 26th.

(2) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of August 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	29·824	62·7	50·1	58·8	53·0	W.	St.	9	W.	0·110
2	29·449	61·6	53·1	57·2	55·1	N.E.	St.	10	N.	0·105
3	29·246	62·8	53·4	59·8	54·9	S.	Cir. Cum.	3 5	N. S.	0·425
4	29·218	62·5	52·4	53·3	52·3	N.W.	Nim.	10	N.W	0·135
5	29·303	59·0	53·4	55·8	54·9	S.W.	St.	10	S.W.	0·715
6	29·330	57·8	54·0	57·2	55·0	N.W.	St.	8	N.W.	0·085
7	29·555	65·2	54·1	59·2	56·3	S.W.	St.	7	S.W.	0·000
8	29·733	66·4	51·0	59·1	55·2	S.W.	St.	3	S.W.	0·010
9	29·484	67·9	52·9	55·6	55·0	N.E.	St.	10	N.E.	0·075
10	29·590	66·9	54·6	59·3	55·2	S.W.	Cir.	3	S.W.	0·265
11	29·317	66·4	56·9	63·8	60·8	E.	Cir.	8	S.	0·150
12	29·397	68·4	52·8	57·8	54·8	S.W.	St.	10	S.W.	0·020
13	29·550	62·9	53·1	56·9	55·0	S.W.	St.	10	S.W.	0·150
14	29·773	64·2	47·3	60·8	57·8	N.	Cir. Cum.	9	W.	0·000
15	30·105	66·9	48·9	59·2	57·1	S.W.	Cir.	9	S.W.	0·010
16	30·070	68·8	57·2	60·7	59·2	N.	St.	10	N.	0·010
17	30·059	68·8	58·0	65·6	62·1	N.E.	Cir.	8	S.W.	0·390
18	29·976	76·7	59·3	66·2	61·3	S.	Cir.	8	S.	0·020
19	29·882	74·7	59·1	63·6	59·8	S.W.	St.	9	S.W.	0·000
20	29·934	68·0	57·1	62·9	58·2	W.	Cir.	6	W.	0·090
21	29·852	71·0	54·2	58·9	57·7	S.W.	Nim.	10	S.W.	0·595
22	29·739	67·7	57·2	62·4	60·3	W.	St.	10	W.	0·075
23	29·642	69·7	51·1	60·7	56·8	S.W.	St.	8	S.W	0·150
24	29·763	62·9	51·1	56·8	53·8	W.	St.	2	W.	0·100
25	30·023	60·4	45·7	57·1	51·7	W.	St.	3	W.	0·100
26	29·774	60·2	51·0	55·0	54·0	W.	St.	10	W.	0·575
27	29·380	65·0	54·8	57·0	55·0	W.	Cir.	4	W.	0·070
28	29·848	63·2	51·8	57·5	53·0	W.	Cir. St.	10	W.	0·145
29	29·789	62·9	56·2	61·1	57·9	S.W.	Nim.	10	S.W.	0·035
30	29·656	67·1	55·8	58·5	55·1	W.	St.	8	W.	0·025
31	29·912	63·2	55·3	56·8	54·4	S.W.	Nim.	10	S.W.	0·000

Barometer.—Highest, 30·105 inches, on the 15th. Lowest, 29·218 inches, on the 4th. Monthly Range, 0·887 inch. Mean, 29·683 inches, being 0·028 inch below the average for August for five preceding years.

Protected S. R. Thermometers.—Highest, 76°·7, on the 17th. Lowest, 45°·7, on the 25th. Monthly Range, 31°·0. Mean of all the Highest, 65°·5. Mean of all the Lowest, 53°·6. Mean Daily Range, 11°·9. Mean Temperature of Month, 59°·5, being 1°·5 above the average for August for five preceding years.

Hygrometer.—Mean of Dry Bulb, 59°·2. Mean of Wet Bulb, 56°·2. Temperature of Dew-point, 53°·5. Mean Humidity. 81·5 %.

Radiation Thermometers.—Highest in Sun, 128°·8, on the 17th. Lowest on Grass, 39°·8, on the 15th.

Sunshine.—Total recorded for month, 92 hours 15 minutes, being 19·8 % of the possible amount. The sunniest day was the 8th, with 7 hours, being 44·9 % of the possible amount. None was recorded on 3 days.

Rainfall.—Rain fell on 27 days. Total Fall, 4·635 inches, being 1·032 inch above the average for August for five preceding years. Greatest Fall in 24 hours, 0·715 inch, on the 5th.

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer.*

(3) METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF SEPTEMBER 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours.		Hygrometer.		Direction of Wind.	Clouds.			Rainfall. (Inches.)
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·811	62·1	55·0	62·0	57·2	S.W.	Cir.	3	S.W.	0·000
2	29·759	69·2	48·2	60·0	56·9	N.W.	St.	3	N.W.	0·105
3	29·772	71·1	57·9	59·0	57·1	S.W.	St.	10	S.W.	0·000
4	29·852	66·9	55·5	56·9	53·8	S.W.	Cum.	9	S.W.	0·005
5	29·825	61·0	54·1	59·8	55·7	S.W.	Cum.	8	S.W.	0·000
6	29·999	61·6	44·9	56·8	56·8	S.W.	St.	8	S.W.	0·005
7	29·774	61·9	54·7	60·1	57·1	S.	St.	7	S.	0·000
8	30·153	65·1	56·4	59·1	54·9	S.W.	Cir.	8	S.W.	0·000
9	29·967	64·0	47·2	58·9	56·0	N.E.	Cir.	2	S.W.	0·060
10	29·572	65·9	58·7	65·4	59·0	W.	...	0	...	0·015
11	29·180	68·0	55·0	58·9	53·4	W.	Cir.	2	W.	0·000
12	29·716	61·0	52·2	57·1	52·7	W.	...	0	...	0·000
13	30·126	62·8	44·1	55·0	50·1	W.	...	0	...	0·000
14	30·135	64·6	46·2	57·3	53·7	W.	St.	10	W.	0·000
15	30·214	62·6	50·0	61·3	58·1	W.	Cir.	2	N.	0·000
16	30·104	64·3	48·3	60·0	55·7	S.W.	Cir.	2	N.W.	0·350
17	29·852	64·7	57·2	58·7	57·2	S.W.	Nim.	10	S.W.	0·030
18	29·633	64·1	58·1	63·9	60·1	S.W.	St.	10	S.W.	0·000
19	30·009	64·9	47·4	56·0	51·9	W.	...	0	...	0·000
20	30·311	65·0	43·8	50·2	47·1	W.	Cir.	2	W.	0·000
21	30·246	56·0	38·1	53·0	49·1	E.	...	0	...	0·000
22	30·219	64·4	43·1	54·9	51·8	Var.	...	0	...	0·000
23	30·106	65·9	41·5	58·0	53·7	S.W.	...	0	...	0·000
24	30·065	69·4	50·7	56·2	54·7	S.	Cir.	2	S.	0·105
25	30·062	65·2	50·3	57·9	57·1	Var.	Cir.	9	S.W.	0·000
26	30·124	70·2	57·5	65·0	60·8	W.	Cir.	8	W.	0·000
27	30·161	73·9	55·1	57·7	57·1	S.W.	Cir. / Fog	2 / 1	S.W. / ...	0·000
28	30·196	69·0	53·6	59·1	57·4	Var.	Fog	1	...	0·010
29	30·181	65·9	54·2	55·0	55·0	Calm	Fog	5	...	0·010
30	30·030	58·6	45·2	49·0	49·0	Calm	Fog	10	...	0·005

Barometer.—Highest, 30·311 inches, on the 20th. Lowest, 20·180 inches, on the 11th. Monthly Range, 1·131 inch. Mean, 29·972 inches, being 0·170 inch above the average for September for five preceding years.

Protected S. R. Thermometers.—Highest, 73°·9, on the 26th. Lowest, 38°·1, on the 21st. Monthly Range, 35°·8. Mean of all the Highest, 65°·0. Mean of all the Lowest, 50°·7. Mean Daily Range, 14°·3. Mean Temperature of Month, 57°·8, being 3°·3 above the average for September for five preceding years.

Hygrometer.—Mean of Dry Bulb, 58°·1. Mean of Wet Bulb, 55°·0. Temperature of Dew-point, 52°·2. Mean Humidity, 80·9 %.

Radiation Thermometers.—Highest in Sun, 123°·1, on the 1st. Lowest on Grass, 27°·4, on the 21st. Frost occurred on Grass on 3 days.

Sunshine.—Total recorded for month, 148 hours 50 minutes, being 38·9 % of the possible amount. The sunniest day was the 23rd, with 9 hours 20 minutes, being 76·7 % of the possible amount. None was recorded on 2 days.

Rainfall.—Rain fell on 11 days. Total Fall, 0·700 inch, being 1·329 inch below the average for September for five preceding years. Greatest Fall in 24 hours, 0·350 inch, on the 16th.

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer.*

(4) Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during the Month of October 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direction.	
		°	°	°	°					
1	29·639	65·1	46·3	51·9	51·9	S.E.	Fog	10	...	0·620
2	28·960	62·8	43·8	44·3	43·4	W.	St.	10	W.	0·060
3	29·063	50·3	38·5	43·9	41·0	S.	Nim.	10	S.	0·145
4	29·219	45·8	37·5	45·2	41·1	W.	...	0	...	0·000
5	29·366	52·9	40·8	52·9	48·8	W.	...	0	...	0·160
6	29·431	55·8	41·8	50·0	46·7	S.W.	...	0	...	0·040
7	29·408	54·7	40·2	45·9	43·0	S.W.	Cir.	2	S.W.	0·020
8	29·374	51·2	38·0	47·2	45·9	Calm	Cir.	3	S.W.	0·515
9	29·226	52·0	45·9	49·1	45·2	N.E.	Cir. St.	10	N.E.	0·000
10	29·634	51·9	44·0	47·0	42·0	N.W.	Cir.	1	N.W.	0·025
11	29·916	53·0	41·1	48·4	43·4	N.W.	Cir. Cum.	10	N.W.	0·010
12	29·678	56·7	47·9	56·7	54·2	W.	St.	10	W.	0·000
13	29·896	61·3	51·5	53·1	50·8	W.	St.	10	W.	0·380
14	29·809	55·4	50·9	51·0	51·0	W.	Nim.	10	W.	0·320
15	30·016	51·6	45·1	45·1	43·9	E.	Nim.	10	E.	0·400
16	30·198	45·2	34·1	42·0	39·3	W.	...	0	...	0·000
17	30·480	49·8	32·3	40·0	37·8	N.W.	Fog	1	...	0·000
18	30·428	54·3	29·8	36·0	35·8	N.W.	Fog	5	...	0·000
19	30·275	53·0	34·9	48·1	45·7	S.W.	Cir. St.	2	N.W.	0·070
20	30·224	53·9	43·6	44·6	42·6	N.E.	Nim.	10	N.E.	0·250
21	29·927	41·3	39·9	40·9	38·7	N.E.	St.	10	N.E.	0·000
22	29·967	41·9	37·1	39·5	36·1	N.	Cir. St.	3	N.	0·000
23	29·687	43·2	33·0	38·7	34·9	N.W.	...	0	...	0·000
24	29·343	43·9	30·5	35·2	33·2	W.	...	0	...	0·000
25	29·341	44·6	33·0	36·8	34·1	W.	Cir. St.	10	W.	0·160
26	29·612	45·2	30·1	38·3	36·1	N.	...	0	...	0·000
27	29·631	45·8	30·1	38·0	34·8	N.W.	Cir.	1	N.	0·000
28	29·585	44·6	28·2	34·0	32·2	W.	Cir.	2	N.W.	0·040
29	29·875	42·2	32·9	38·6	35·6	N.W.	Cir.	1	N.	0·000
30	29·829	45·8	31·5	41·1	38·7	S.W.	Cir. St.	10	W.	0·015
31	29·903	48·0	41·0	43·0	40·6	N.E.	Cir. St.	5	N.E.	0·000

Barometer.—Highest, 30·480 inches, on the 17th. Lowest, 28·960 inches, on the 2nd. Monthly Range, 1·520 inch. Mean, 29·708 inches, being same as the average for October for five preceding years.

Protected S. R. Thermometers.—Highest, 62°·8, on the 1st. Lowest, 28°·2, on the 28th. Monthly Range, 34°·6. Mean of all the Highest, 50°·4. Mean of all the Lowest, 38°·5. Mean Daily Range, 11°·9. Mean Temperature of Month, 44°·4, being 2°·5 below the average for October for five preceding years Frost occurred on 6 days.

Hygrometer.—Mean of Dry Bulb, 44°·1. Mean of Wet Bulb, 41°·6. Temperature of Dew-point, 38°·6. Mean Humidity, 81 %.

Radiation Thermometers.—Highest in Sun, 107°·7, on the 12th. Lowest on Grass, 14°·9, on the 28th. Frost occurred on Grass on 18 days.

Sunshine.—Total recorded for month, 107 hours 40 minutes, being 33·4 % of the possible amount. The sunniest day was the 4th, with 8 hours 55 minutes, being 79 % of the possible amount. None was recorded on 5 days.

Rainfall.—Rain fell on 17 days. Total Fall, 3·230 inches, being 0·635 inch above the average for October for five preceding years. Greatest Fall in 24 hours, 0·620 inch, on the 1st. First Snowfall for season on 25th.

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer*

III.—NOTES ON PLANTS IN THE PLANT HOUSES. By. R. L. HARROW.

Since the last meeting of the Society in July, a succession of plants in flower has been kept up, comparing well with that of previous years. The plants occupying the new houses erected in 1894 show the good effect of their better accommodation. Of the plants which have flowered during the months since July may be mentioned:—*Dipladenia insignis*, Hort., with racemes of rich purple flowers; *Bougainvillea glabra*, Choisy, in the corridor was for some weeks a mass of colour; *Æschynanthus obconicus*, C. B. Clarke, introduced recently by Messrs. Veitch, from Malacca, has a blood-red large calyx enveloping the corolla. Besides these Passifloras, Allamandas, Bignonias, and other genera, have been attractive in the stoves. Among Orchids the most noticeable in flower have been:—*Oncidium Lanceanum*, Lindl.; *O. varicosum*, Lindl., var. *Rogersii*, Hort.; *Odontoglossum citrosmum*, Lindl.; *Cattleya guttata Leopoldii*, Hort.; *Vanda Kimballiana*; *Rhynchostylis retusa*, var. *guttata*, Rchb. f.; and *Catasetum Christyanum*, Rchb. f. During the past year the collection of Orchids has been more than doubled in species, and several genera not hitherto included have been added, so that the exhibition of this interesting group of plants will be more attractive in the coming and succeeding years than it has been in the past, and we shall hope to be able to show at the meetings of this Society many interesting forms.

The reconstruction of another section of the plant houses has been completed since the Society last met, and satisfactory accommodation is now provided for the large group of Succulent Plants and for Economic Plants. These houses when opened to the public, as they will be in course of the spring, should prove to be not the least instructive and attractive of the range.

Of the plants flowered during October, the few following may be noted:—

Monodora grandiflora, Benth. One of the Anonaceæ, a native of tropical Africa. One plant in the Palm House is about 20 feet high, and this is its first recorded flowering here. The large coriaceous light-green leaves are shed and replaced by a new crop several times in the year. The solitary flowers are pendulous and axillary with an outer and inner series of petals of a greenish colour.

Bignonia magnifica, Bull. This is decidedly one of the most gorgeous coloured of these usually showy climbing plants. The flowers, produced in terminal panicles, having a rich purple coloured corolla, with a yellowish throat. This is the first time the species has been recorded as flowering with us, and only a few solitary flowers have this year expanded. Mr. W. Bull, of Chelsea, is credited with the introduction of this plant from Columbia in 1879.

Cattleya Schilleriana, Rchb. The flowers of this species are amongst the most pretty of this section of the genus, and are produced at variable times of the year, often twice within the year on one plant, upon short thickish pseudo-bulbs; the spikes bearing from two to five flowers. The crimson magenta lip is especially attractive. A native of Brazil, this species was first flowered in the gardens of Consul Schiller, of Hamburg, and is supposed by some to be a natural hybrid between *C. Aclandiæ* and *C. guttata*.

Aphelandra nitens, Hook. This Columbian species, which was introduced in 1867, is an erect small growing plant, with large glossy purplish green ovate foliage. The inflorescence is a terminal spike, the bright vermilion scarlet flowers appearing from among rather large lanceolate persistent bracts. Seeds of this plant soon lose their germinating power, and we have many times sown them when received from foreign gardens with no success. When sown as soon as ripe, the greater number will produce plants.

Others of note, and some of which we are able to exhibit, are :—*Vitis heterophylla*, Thunb., var. *humulifolia*, Hort., remarkable for its turquoise blue berries, borne in great abundance upon slender side shoots, a native of China and Japan; *Ruellia macrantha*, Mart.,—a Brazilian winter flowering species; *Cestrum aurantiacum*, Lindl.,—an old introduction from Guatemala, with showy yellow flowers; *Tibouchina moricandiana*, Baill., — a native of India and Malaya, and one of the brightest winter flowering plants we have, the large flowers being deep purple in colour. Should be planted out in a stove to develop its beauty in perfection.

MEETING OF THE SOCIETY.

Thursday, December 12, 1895.

Dr. A. P. Aitken, President, in the Chair.

Mr. Somerville Grieve was elected Resident Fellow of the Society.

The following specimens, in flower, from the Royal Botanic Garden were exhibited:—*Asystasia scandens*, *Luculia gratissima*, *Reinwardtia trigyna*, *Catasetum Christyanum*, *Corynostylis Hybanthus*, *Eucharis Sanderi*, *Aphelandra Chrysops*, *Ipomœa Horsfalli*, var. *Briggsii*.

The following Papers were read:—

Excursion of the Scottish Alpine Botanical Club to Tyndrum, in 1895. By William Craig, M.D., F.R.S.E., F.R.C.S.E., Secretary of the Club.

On Monday, 5th August 1895, seven members of the Scottish Alpine Botanical Club assembled at Tyndrum, where they were most comfortably accommodated in Stewart's Royal Hotel. In the evening they were joined by Professor Bower, of Glasgow, and Professor F. W. Oliver, of London. The Caledonian Railway very kindly provided the Club with a fine saloon all the way from Edinburgh to Tyndrum. On the following morning the Club were joined by Mr. A. Somerville, B.Sc., Glasgow.

Tuesday, 6th August.—The morning was fine and the forenoon was hot and sultry. The members of the Club took the morning train to Bridge of Orchy, on the West Highland line, which was reached about 10 A.M., and after a walk of two miles due north, we ascended Beinn an Dòthaidh, a mountain in Argyllshire, 3267 feet high. This is one of a chain of mountains which extends from near the Moor of Rannoch southwards, and terminates in Beinn Doireann, a mountain 3523 feet high. The object of the Club's visit to Tyndrum on this occasion was to explore these mountains. The rocks on Beinn an Dòthaidh were high and precipitous, and though they faced the north we found them most unproductive. Shortly after we reached the rocks the hill was enveloped in a thick mist, and in the afternoon the rain came down in torrents, which greatly interfered with the comfort of the members and with a proper examination of the rocks.

Amongst the plants collected may be mentioned :—*Saxifraga oppositifolia*, L.; *S. stellaris*, L.; *S. aizoides*, L.; *Drosera anglica*, Huds.; *Cornus suecica*, L.; *Vaccinium uliginosum*, L.; *V. Vitis-Idæa*, L.; *Arctostaphylos Uva-ursi*, Spreng; *Erica Tetralix*, L., white; *Gentiana campestris*, L., white; *Rhynchospora alba*, Vahl.; *Carex pauciflora*, Lightf.; *Hymenophyllum unilaterale*, Willd.; *Asplenium viride*, Huds. On *Carex rigida* was found the fungus *Ustilago caricis*, Pers.

The members were all thoroughly soaked before they reached Bridge of Orchy Station. They returned to Tyndrum by train, but none of the party suffered any bad effects from the rain.

Professors Bower and Oliver having only one day to spend, went to Beinn Laoigh, and gathered many interesting plants, but of course the mist and rain greatly interfered with a successful exploration of the mountain.

Wednesday, 7th August.—After an early breakfast the members of the Club left Tyndrum about 7 A.M. in a waggonette, and drove *via* Bridge of Orchy and Loch Tulla, as far as the wood of Crannach, a distance of 18 miles. There is a good driving road for the first 10 miles, but the latter part of the road is a mere track, and we could only go at a walking pace. The members divided—

one party botanising Crannach Wood, and the other party ascending Beinn Achallader.

Crannach Wood is part of the old Caledonian Forest, and it was thought that some good plants might be found in the wood, but it proved very unproductive.

Among the plants found in the wood may be mentioned:—*Soidago Virgaurea*, L.; *Vaccinium Vitis-Idæa*, L., in fruit; *Pyrola rotundifolia*, L.; *Trientalis europæa*, L.; *Euphrasia gracilis*, Fries.; *Listera cordata*, Br.; *Rhynchospora alba*, Vahl.; and *Carex pauciflora*, Lightf.

Rev. Dr. Paul, who was one of the members who botanised the wood, made a careful inspection of the Fungi, and says, "There are no very particular ones among them, nor are they very numerous, it being too early for them by a month; but it might be worth recording those that were observed, as the wood may not have been examined for Fungi before. It would be a good place for them later in the season." Dr. Paul has sent a list of those Fungi observed, and it is here recorded:—

1. Agaricus (amanita) vaginatus, Bull.
2. —— (Armillaria) melleus. Fl. Dan.
3. —— (Clitocybe) laccatus, Scop.
4. —— (Collybia) dryophilus, Bull.
5. —— (Mycena) galericulatus, Scop.
6. —— (——) haematopus, Pers.
7. —— (Nolanea) pascuus, Pers.
8. —— (Flammula) scambus, Fr.
9. —— (Stropharia) semiglobatus, Batsch.
10. —— (Psilocybe) semilanceatus, Fr.
11. —— (Panæolus) separatus, Linn.
12. Cortinarius elator. Fr.
13. —— cinamomeus, Fr.
14. Paxillus involutus, Fr.
15. Lactarius torminosus, Fr.
16. Russula ochroleuca, Fr.
17. Cantharellus cibarius, Fr.
18. Marasmius androsaceus, Fr.
19. Boletus luteus, Linn.
20. —— bovinus. Linn.
21. —— badius, Fr.
22. —— piperatus, Bull.
23. —— subtomentosus, Linn.
24. —— edulis. Bull.
25. —— scaber, Fr.
26. Polyporus varius, Fr.
27. —— betulinus, Fr.
28. —— versicolor, Fr.

Trametes pini, Fr., though carefully searched for among the old Scotch firs of the Caledonian Forest was not found.

The members who ascended Beinn Achallader were more successful. Beinn Achallader is a mountain 3399 feet high, partly in Argyllshire and partly in Perthshire. The rocks, however, are all in Argyllshire. The day was fine, and a good view was obtained from the summit. This hill is one of the chain of mountains referred to in the beginning of this paper, and lies north of Beinn an Dòthaidh and south-west of Beinn Creachan.

Among the plants collected may be mentioned:—*Coch-*

learia alpina, Wats.; *Silene acaulis*, L.; *Solidago Virgaurea*, L.; *Saussurea alpina*, DC.; *Vaccinium uliginosum*, L.; *Armeria vulgaris*, Willd.; *Trientalis europœa*, L.; *Gentiana campestris*, L., white; *Salix phylicifolia*, L.; (?) *S. Lapponum*, L.; *Juncus triglumis*, L.; *J. trifidus*, L.; *Luzula spicata*, DC.; *Carex binervis*, Sm.,—this specimen was submitted to Rev. Mr. Marshall, and he says, "It is the very dark-brown form frequently above 2000 feet"; and *Cryptogramme crispa*, Br.

After descending the mountain we rejoined our carriage at Beinn Achallader farmhouse, near the old castle of that name, and famous as the scene of a bloody battle between two clans about 200 years ago. After partaking of the kind hospitality of Mr. Stewart, the venerable farmer, we left for Tyndrum, which was reached after a very enjoyable drive.

Thursday, 8th August.—The day was again fine, but rather hot for mountaineering. We took the train to Crianlarich and ascended Cruach Ardran, a mountain visited by the Club in 1891. On that occasion we botanised the rocks on the right hand of the corrie going upwards, but only the base of these rocks, and afterwards went to the summit by the south ridge, and gathered some good plants near the summit, which is 3428 feet high. On this occasion we wished to examine the high rocks on the south of the corrie. We accordingly ascended to the summit of the south ridge and carefully examined the ridge, and then went into the rocks from above.

We found the rocks very productive, and collected amongst other plants:—*Cochlearia alpina*, Wats.; *Silene acaulis*, L.; *Cerastium alpinum*, L.; *C. latifolium*, Sm.; *Saxifraga oppositifolia*, L.; *S. nivalis*, L.; *S. stellaris*, L.; *S. aizoides*, L.; *S. hirta*, Haw.; *Solidago Virgaurea*, L.; *Saussurea alpina*, DC.; *Vaccinium uliginosum*, L., in fruit; *V. Vitis-Idœa*, L.; *Loiseleuria procumbens*, Desv.; *Rhinanthus Crista-galli*, L., at 2500 feet above sea-level; *Salix Lapponum*, L.; *Malaxis paludosa*, Sw., very large; *Listera cordata*, Br.; *Juncus triglumis*, L.; *J. trifidus*, L.; *Luzula spicata*, DC.; *Rhynchospora alba*, Vahl.; *Carex pauciflora*, Lightf.; *C. stricta*, Good.; *C. vaginata*, Tausch; *Poa Balfourii*, Parn.; *Hymenophyllum unilaterale*, Willd.; and *Woodsia hyperborea*, Br.

After a very pleasant and enjoyable day on the hill, we returned to Crianlarich in time to get the train to Tyndrum, which we reached in good time for dinner—all highly delighted with our day's excursion.

Friday, 9th August.—To-day the members of the Club remaining at Tyndrum were reduced to five. Dr. Stuart, botanised in the neighbourhood of the village; Mr. Gunn and Mr. Lindsay went to Beinn Laoigh; whilst Mr. Potts and I went to Lochan Bhe.

Dr. Stuart found several interesting plants, but none that the Club had not previously gathered in the same district. Unfortunately the day was wet and stormy, and a thick mist covered the hills to their very base. This greatly interfered with the success of the Beinn Laoigh party. They gathered, however, *Arabis petræa*, Lamk.; *Draba incana*, L.; *Cerastium alpinum*, L.; *Arenaria Cherleri*, Benth.; *Juncus triglumis*, L.; *J. castaneus*, L.; *Kobresia caricina*, Willd.; *Carex capillaris*, L.; *C. pulla*, Good.

In Lochan Bhe we gathered *Subularia aquatica*, L.; *Lobelia Dortmanna*, L.; *Utricularia minor*, L.; *Juncus bufonius*, L.; and *Isoetes lacustris*, L.

My principal object in going to Lochan Bhe was to gather specimens of a submerged plant which was first gathered by the Club in 1891, and again in 1894 I gathered the same plant; and as considerable doubt existed in the minds of several of the members regarding the species of this submerged plant, I was anxious to obtain good specimens both for drying and for growing, for the purpose of ascertaining the species.

Specimens of this plant were sent to Bennett, of Croyden, in 1891, who pronounced it *Scirpus fluitans*, L. Dr. John H. Wilson, after a microscopic examination of the plant, came to the same opinion. Notwithstanding these authorities, some of the members had doubts about its being *Scirpus fluitans*. It was very different from the typical form of that plant, and, moreover, after a careful search round the margin of the loch, no trace of *Scirpus fluitans* could be seen. On the present occasion I was able to make more careful observations regarding this plant. It grows in deep water from 2 to 5 feet deep—generally about 3 or 4 feet deep—and in many places covers the bottom of the loch to a considerable extent. It is an exceedingly pretty object when seen growing, or even when floating on the surface after being pulled. It appears never to reach the surface of the water, although sometimes 2 feet in length. I dredged it up from deep water with my alpinestock and its iron hook. It has grass-like leaves, and though many specimens were obtained, neither flower nor fruit could be found. I have come to the conclusion that it never flowers in deep water. It appears to be a plant which, instead of flowers, develops young plants, and is in fact viviparous. Specimens of the plant are now growing in the pond in the Royal Botanic Garden, and several members of the Club have also plants in cultivation in the hope of some of the specimens flowering, which would at once determine the species. Mr. Fryer, of Chatteris, a great grower of water plants, has also the plants growing, but is unable to determine it. Dried specimens of the plant have been submitted to Professor Balfour, Professor Bower, and others, but I fear until some one succeeds in flowering the plants, the doubts of some of the members will not be removed.

On the same day I gathered some curious specimens of *Juncus bufonius*, all growing under water, and all becoming viviparous, the more marked the farther from the shore, and consequently in deeper water. After finding these specimens of undoubted *Juncus bufonius*, I suggested the idea that it might be an abnormal form of that plant. But from the careful examination of specimens of the plant by Mr. Burrage, it appears to be a species of *Scirpus*. It is, however, to be hoped that the plant will flower in cultivation.

Saturday, 10th August.—This morning the meetings of the Club came to an end for the present, and all the members returned home. On reaching Tyndrum station we found that the Caledonian Railway officials had a fine saloon carriage provided for our special use, which brought us to Edinburgh, and thus ended a very pleasant meeting.

ON THE MALE FLOWER OF *Nepenthes bicalcarata*. By J. H. BURRAGE, B.A.

Notes from the Royal Botanic Garden, Edinburgh.

I. Report on Vegetation during the Month of November 1895. By Robert Lindsay, Curator.

The past month of November was dull and gloomy, but somewhat mild for the time of year. Very little frost occurred, but storms of wind and rain were frequent. Few plants are in flower out of doors, vegetation being now almost dormant. Only one plant came into flower on the rock-garden during November, viz.:—*Helleborus niger angustifolius*.

Among hardy shrubs in flower, *Jasminum nudiflorum* and laurustinus are the best, but stray flowers were observed on *Pyrus japonica*. Fruit is remarkably scarce on shrubs generally.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF NOVEMBER 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches)	Thermometers, protected, 4 feet above grass. S. R. Thermometers for preceding 24 hours. Max.	Min.	Hygrometer. Dry.	Wet.	Direction of Wind.	Clouds. Kind.	Amount.	Direction.	Rainfall. (Inches.)
		°	°	°	°					
1	30·438	47·1	31·6	35·0	33·8	W.	...	0	...	0·000
2	30·345	45·8	29·9	37·0	36·3	Var.	Fog.	5	...	0·000
3	29·950	46·9	34·9	37·9	37·9	S.W.	Fog.	8	...	0·005
4	29·708	41·9	37·3	37·8	37·7	E.	Cir.	4	E.	0·125
5	29·396	46·1	37·1	46·1	46·1	E.	Nim.	10	E.	0·090
6	28·760	52·0	45·6	49·0	47·0	W.	Nim.	10	W.	0·045
7	29·511	51·9	48·0	50·0	47·1	W.	Cir. St.	2	W.	0·045
8	29·722	53·3	44·9	45·7	44·5	W.	Cum.	1	W.	0·015
9	29·515	52·4	33·4	43·1	42 6	S.W.	Nim.	10	S.W.	0·090
10	29·159	49·6	35·4	48·2	46·2	S.	Nim.	10	S.	0·300
11	28·812	57·4	45·5	45·9	43·7	S.W.	St.	9	S.W.	0·130
12	28·726	48·9	37·0	41·0	39·1	S.W.	Cir.	2	S.W.	0·065
13	29·152	45·6	39·5	45·0	43·1	W.	Cir. St.	2	N.W.	0·175
14	29·319	49·3	41·4	44·2	43·0	S.W.	Nim.	10	S.W.	0·235
15	29 598	47·4	38·0	46·2	43 1	S.W.	Cir. St.	10	S.W.	0·320
16	29·226	56·1	38·9	38 9	37·8	S.W.	Nim.	10	S.W.	0·265
17	29·728	43·2	36·2	42·7	40·1	W.	St.	3	W.	0·025
18	30·155	47·0	34·1	35·2	35·0	W.	...	0	...	0·000
19	30·133	49 1	35·0	38·6	35·3	S.E.	Cir.	4	...	0·000
20	29·860	46·4	37·4	45·7	44·0	S.E.	St.	10	S.E.	0·045
21	29·911	50·0	46·3	48·7	47·2	S.E.	St.	10	S.E.	0·100
22	30·013	53·6	43·0	43·0	40·0	W.	St.	10	W.	0·045
23	30·081	46·7	36·4	38·7	35·7	N.	...	0	...	0·010
24	30·473	44·1	37·6	37·8	35·8	E.	...	0	...	0·000
25	30·478	42·8	37·8	41·9	39·1	E.	St.	10	E.	0·000
26	30·268	44·1	41·8	43·6	42·0	E.	St.	9	E.	0·000
27	29·959	45·0	42·1	43 1	40·9	S.E.	St.	10	S.E.	0·025
28	29·857	44·2	41·8	44 2	44·0	E.	Nim.	10	E.	0·125
29	29·645	46·4	44·1	46·1	45·2	E.	St.	10	E.	0·015
30	29·621	50·2	45·1	45·5	45·1	N.E.	St.	10	N.E.	0·010

Barometer.—Highest, 30·478 inches, on the 25th. Lowest, 28·726 inches, on the 12th. Monthly Range, 1·752 inch. Mean, 29·717 inches, being 0·048 inch below the average for November for five preceding years.

Protected S. R. Thermometers.—Highest, 57°·4, on the 10th. Lowest, 29°·9, on the 2nd. Monthly Range, 27°·5. Mean of all the Highest, 48°·1. Mean of all the Lowest, 39°·2. Mean Daily Range, 8°·9. Mean Temperature of Month, 43°·6, being 1°·9 above the average for November for five preceding years. Frost occurred on 2 days.

Hygrometer.—Mean of Dry Bulb, 42°·7. Mean of Wet Bulb, 41°·3. Temperature of Dew-point, 39°·6. Mean Humidity, 88·7 %.

Radiation Thermometers.—Highest in Sun, 91°·6, on the 10th. Lowest on Grass, 19°·5, on the 2nd. Frost occurred on Grass on 14 days.

Sunshine.—Total recorded for month, 40 hours 25 minutes, being 16·3 % of the possible amount. The sunniest day was the 11th, with 6 hours 10 minutes, being 72·5 % of the possible amount. None was recorded on 12 days.

Rainfall.—Rain fell on 23 days. Total Fall, 2·305 inches, being 0·297 inch above the average for November for five preceding years. Greatest Fall in 24 hours, 0·320 inch, on the 15th.

A. D. RICHARDSON, *Observer*.
W. H. WAITE, *Interim Observer*.

III. Notes on Plants in the Plant Houses. By R. L. Harrow.

Chrysanthemums, which are now grown so extensively, and are so popular, have given the best display of colour during the past month of November. Camellias are now fast coming into bloom, and bid fair this season to be most floriferous. The acacias are also well set with numerous flower heads, the earliest of which are already in bloom. In the Palm House tropical climbers such as *Ipomœa Horsfalliæ*, var. *Rheedii* and *Corynostylis Hybanthus*, Mart., are very fine.

Others worthy of note are :—

Asystasia scandens, Hook. This plant is a native of Sierra Leone, introduced about fifty years ago to our gardens, under the name of *Henfreya scandens*, Lindl. It is of a climbing habit, the stems reaching about six feet in height, and bears terminal racemes of pure white flowers, two inches across. The anthers, which lie in the mouth of the cream white corolla, are of a blackish purple, and very conspicuous. The plant is seldom seen in our gardens. A figure may be seen in Bot. Mag. t. 4449.

Ceratopetalum gummiferum, Sm. This saxifragaceous plant is a native of New South Wales, and in its native habitat attains the height of from 40 to 50 feet. It is interesting on account of its long period of flowering, a small plant here having now been in bloom for more than three months. The sepals are at first a creamy white, afterwards changing to a pinkish tinge. The petals are very small, divided into three linear pointed segments.

Eucharis Sanderii, Baker. Is a fine, large-flowered species, introduced in 1882 by Messrs. Sander from New Grenada.

Aphelandra Chrysops, Bull. This Brazilian species is a handsome plant, growing from a foot to eighteen inches in height, with a large terminal inflorescence of pale yellow flowers, protected by large yellow ovate bracts.

MEETING OF THE SOCIETY.

Thursday, January 9, 1896.

Dr. A. P. Aitken, President, in the Chair.

The Chairman announced that, after due consideration and reference of the matter to Members of the Society, the Council could not propose any change in the hour of meeting of the Society.

The Treasurer submitted the following Statement of Accounts for the Session 1894–95:—

Receipts.

Annual Subscriptions, 1894–95: 68 at 15s., £51, and 1 at 10s.	£51 10 0
Do., 1893–94, 1 at 15s.	0 15 0
Compositions for Life Membership	1 7 0
Transactions, etc., sold	4 1 0
Interest received	0 13 11
Subscriptions to Illustration Fund	4 17 0
Receipts	£63 3 11
Balance of Payments	2 14 10
	£65 18 9

Payments.

Printing Transactions, £40, 14s. 3d.; Billets, etc., £6, 13s. 10d.	£47 8 1
Rooms for Meetings, Tea, and Hire of Screens	6 8 6
Commission paid to Collector of Subscriptions	0 14 3
Stationery, Postages, Carriages, etc.	11 2 11
Fire Insurance on Books, etc.	0 5 0
	£65 18 9

Issued November 1896.

State of Funds.

Amount of Funds at close of Session 1893–94 . .				£64	13	3
Deduct—Decrease during Session 1894–95, as above .				2	14	10
Amount of Funds at close of Session 1894–95 . .				£61	18	5
Being:—Sum on Current Account with Union Bank	£5	7	7			
Sum in Deposit Receipt do.	60	0	0			
	£65	7	7			
Less due to Treasurer . .	3	9	2			
				£61	18	5

On the motion of Dr. William Craig, seconded by Professor Bayley Balfour, the report was adopted and the Treasurer thanked for his services.

Miss Madden exhibited dried plants from Queensland.

Mr. R. Stewart M'Dougall exhibited a piece of wood from a table riddled by *Anobium domesticum*, and described a number of allied species.

Mr. James Grieve exhibited a piece of stem of Holly, which he had budded forty years previously, showing scars from the budding.

From the Royal Botanic Garden were exhibited plants in flower of—*Cattleya labiata Percivaliana*, *Cypripedium venustum*, *C. Leeanum*, *C. Dautherii*, *Pleurothallis ornata*, *Masdevallia polysticta*, *Oncidium Cavendishianum*, *Epidendrum paniculatum*.

The following papers were read:—

The Germination of Barley, with Restricted Moisture. By T. Cuthbert Day.

I propose to deal in this paper with a subject which is of some interest to brewers and distillers, namely, the influence of moisture during the germinative period of barley. That moisture, irrespective of changes in temperature, has a stimulating action during germination, as well as at other periods of growth, is a well-known fact. The problem for brewers and others using malted grain to solve, is the amount of moisture required to produce the necessary changes at the usual temperature of growth, in order that the resulting malt may have those properties most suited to their wants. The determination of this degree of moisture is of considerable importance, since an inadequate supply prevents a sufficient metabolism of the constituents of the endosperm ; while with a too abundant quantity the internal changes are carried too far, and besides the waste of starch and other desirable substances, there are apt to be formed certain nitrogenous compounds of a soluble nature, which, though of service when in moderate quantity, become a source of trouble if they are unduly predominant. Practice has of course determined for different brewers the amount of moisture to be employed by them in producing a malt most suited to their requirements, still many of them work rather in the dark in this respect, and I thought an inquiry into the subject might be of some service in bringing to light a few points in connection with the influence of moisture on germinating barley.

With this object in view I have carried out a series of experiments on different barleys, with varying degrees of moisture, to determine the following points :—

1. The Quantity of Carbonic Anhydride exhaled.
2. The Dry Weight of the Embryo at the end of the Germinative Period.
3. The Ratio of the Weight of Carbonic Anhydride exhaled to the Increase in the Dry Weight of the Embryo.
4. The Amount of Moisture in the Endosperm and in the Embryo at the end of the Germinative Period.
5. The Activity of Growth as shown by the Daily Amount of Carbonic Anhydride exhaled. This point being made plain by the construction of curves.

I do not propose, in this paper, to touch the problem connected with the compounds produced by metabolism under varying conditions of moisture. I have done some work on this point, and shall reserve the results for a possible future communication, as a consideration of them now would take up a good deal too much time. I will merely state in this connection that the effect of increased moisture appears to increase in a considerable degree the amount of metabolism which takes place without altering to any great extent its character as is the case under the influence of increased temperature.

METHOD OF EXPERIMENT.

Experiments were performed with three kinds of barley, viz.:—Hungarian, Scotch Chevalier, both of them two-rowed barleys, and ordinary Smyrna, a six-rowed variety.

The degree of moisture for germination was determined by steeping in distilled water, at a temperature of 57° F., for 24, 48, 72, or 96 hours. In each experiment 100 corns were carefully selected to ensure uniformity as much as possible. These were weighed and then steeped for the desired period, changing the water several times. At the close of the time for steeping the water was drained off, the corns well washed three times with fresh water, and adhering moisture removed by gentle pressure in a clean cloth. The corns were then weighed again. The steep water and washings were collected and evaporated to dryness, and the weight of the substances removed from the barley was carefully determined. This weight added to the increase in weight of the corns during steep, gave the total quantity of moisture absorbed. In order to ascertain the absolute quantity of moisture present in the corns, a separate sample of the original barley was ground and dried in vacuo at 100° C., and the natural moisture determined in this way. The amount of natural or original moisture added to the quantity absorbed during steep gave the absolute quantity of moisture present in the corns to be experimented upon. The steeped corns, after being weighed as above, were introduced into a small flask like that in the figure. This flask was immersed in water up to the mark F in the figure, contained in a large vessel holding about 9 gallons, the temperature being always kept constant by means of a small gas flame regulated by a thermostat.

In Fig. 1, A represents the small flask of about 100 c.c. capacity. B is the entrance tube for the air supply, it is connected with an apparatus for removing carbonic anhydride from the air. C is a small U tube containing little glass beads and a few drops of water. The air in passing through this becomes exactly saturated with water vapour at 57° F., and in this state it cannot take any moisture from the germinating corn, neither can the corn extract any moisture from the air supplied to it. Under these conditions the quantity of moisture given to the barley during steeping is kept constant throughout the experiment. D is the exit tube for the air. It is furnished at E with a small side tube or trap which is intended to intercept any condensed moisture from the upper cold part of the tube and prevent it getting into the flask. The upper extremity of the tube F is connected with a tube and bulbs containing strong sulphuric acid for drying the air as it comes from the flask, and the dried air is then passed through potash bulbs, etc., which remove the carbonic anhydride coming from the barley. The carbonic anhydride absorption apparatus was weighed once a day to ascertain the quantity of the gas absorbed. Air was drawn through the apparatus very slowly and continuously from start to finish of an experiment, except just at the times when the weighings were performed, by a carefully designed aspirator in which the speed of the air current could be easily regulated. All parts of the apparatus were made as small as possible on account of the small quantity of barley operated upon, and the slowness of the aspiration. In order to save time four pieces of apparatus, identical in detail, were fitted up, the four flasks being all immersed in the same large vessel, which enabled me to conduct four experiments at the same time.

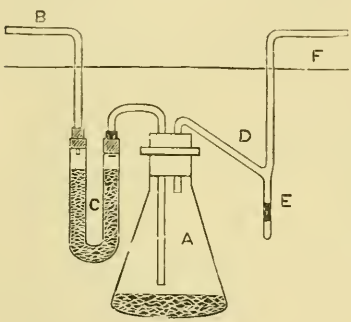
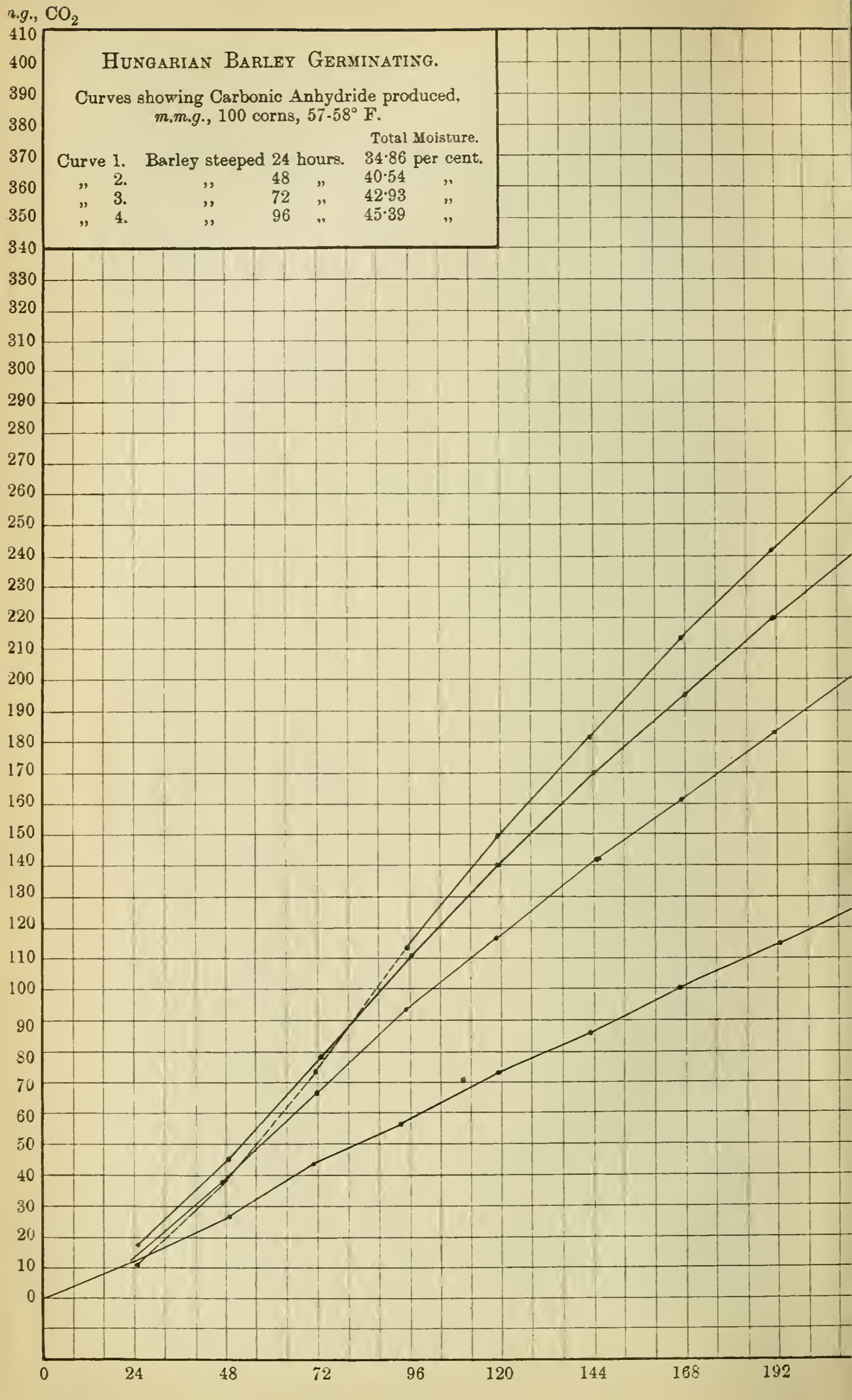


Fig. 1.

The germination of the barley was carried on in this apparatus, usually from 12 to 16 days. At the end of that time the barley was extracted from the flask and weighed. In every case it was found that the germinating corn had lost weight, and that the loss very nearly corresponded to the weight of carbon oxidised to carbonic anhydride and removed by the current of air passing through the apparatus. To be exact, the loss of weight suffered by the corn is always a little less than that accounted for by the carbon removed, this is due to the fact that a small amount of oxygen is absorbed and retained by the germinating barley, and is not again excreted in the form of carbonic anhydride. This small loss in weight of the germinated grain is a good indication that the experiment has been successfully carried out, and that the grain has neither gained nor lost in moisture since the start of the experiment. As a matter of fact, there is always a small increase in the amount of moisture in the grain, which is due to the process of respiration. If we take COH_2 to represent the formula of a carbo-hydrate, it is evident that if sufficient oxygen be supplied to convert the contained carbon into carbonic anhydride, we have OH_2, *i.e.* water, left. This water remains in contact with the seed.

Having weighed the 100 corns after germination as above, the next thing was to find the amount of moisture present in the embryos, and in the endosperms. In order to do this 20 corns were selected and weighed at once. The weighed corns were put into a watch glass and placed under a large bell glass containing a sponge saturated with water to keep the air moist. The corns were then dissected as quickly as possible with a small scalpel, and the embryos were placed in a weighed porcelain boat, the endosperms, with the husk, being placed in a similar weighed boat. Both the boats, except when necessary, were kept under the bell glass, so as to minimise the loss of moisture during the operation as much as possible. As soon as the dissection was complete the boats were weighed. A loss of moisture was always found to have taken place during dissection in spite of all precautions. This loss was always divided, and half given to the moisture subsequently found in the embryos and half to that found in the endosperms. To determine the quantity of moisture the boats were placed in a wide glass tube surrounded with boiling water,



m.g., CO_2
HUNGARIAN BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced, m.m.g., 100 corns, 57-58° F.
Total Moisture.
Curve 1. Barley steeped 24 hours. 34·86 per cent.
" 2. " 48 " 40·54 "
" 3. " 72 " 42·93 "
" 4. " 96 " 45·39 "
410 400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
0 24 48 72 96 120 144 168 192

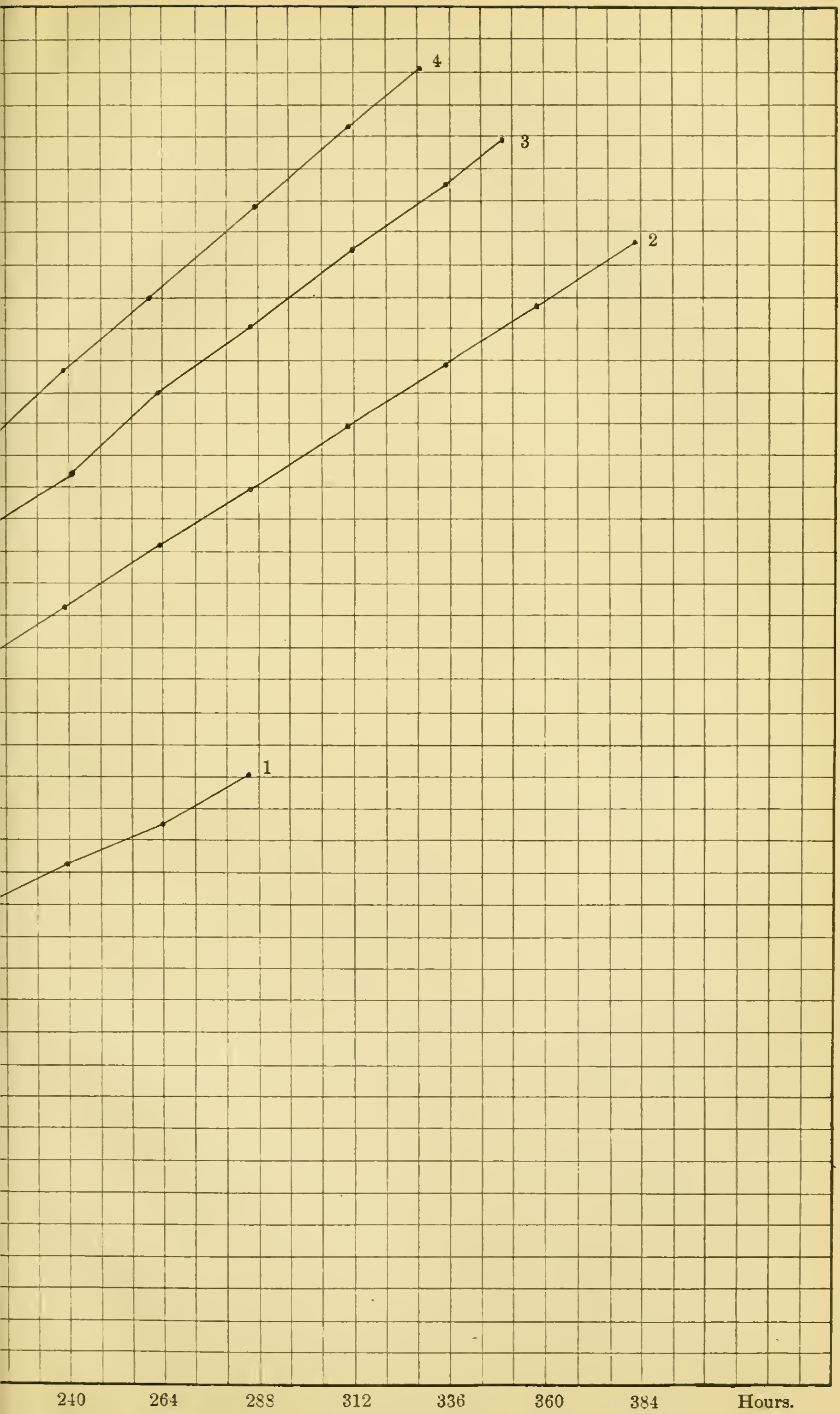
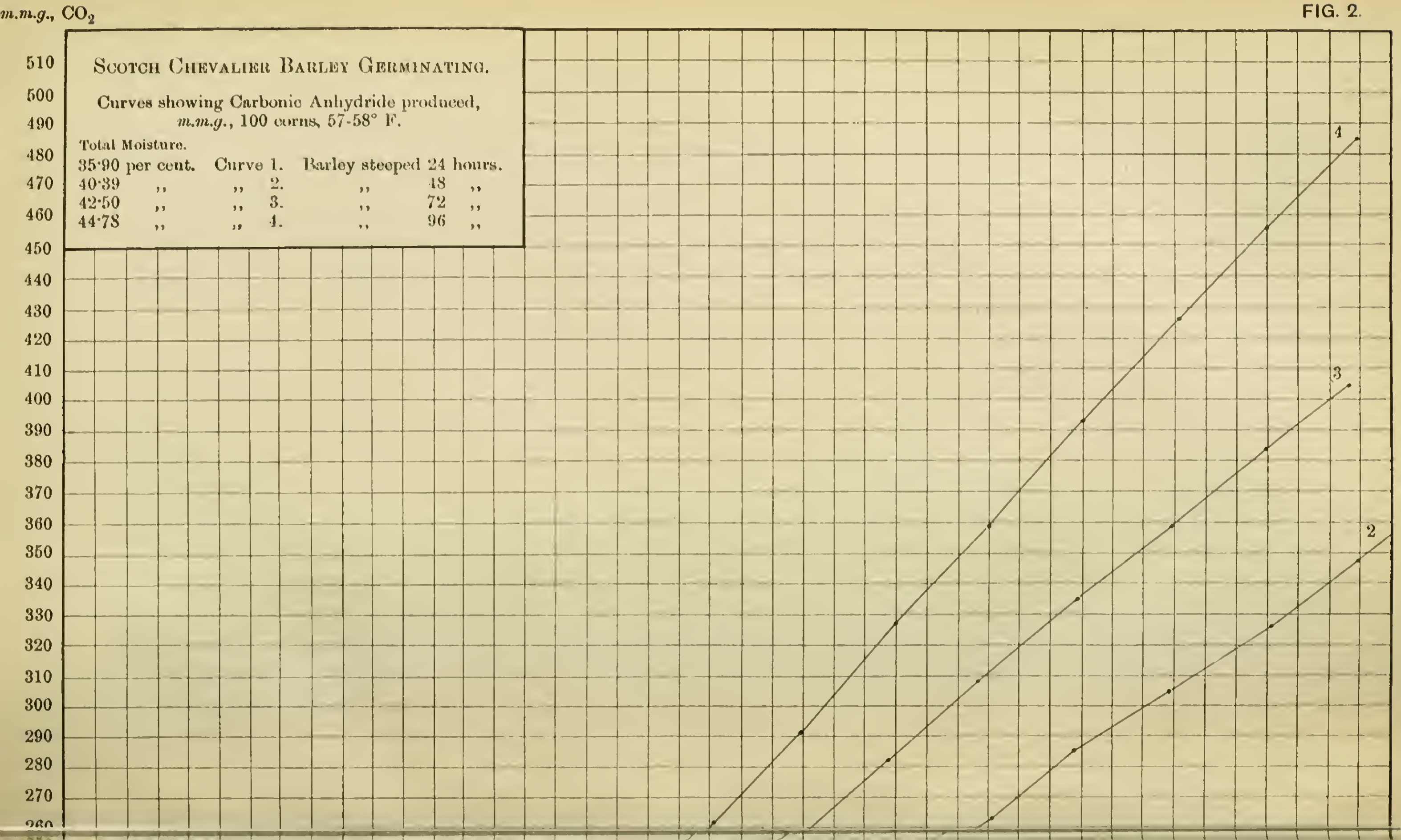
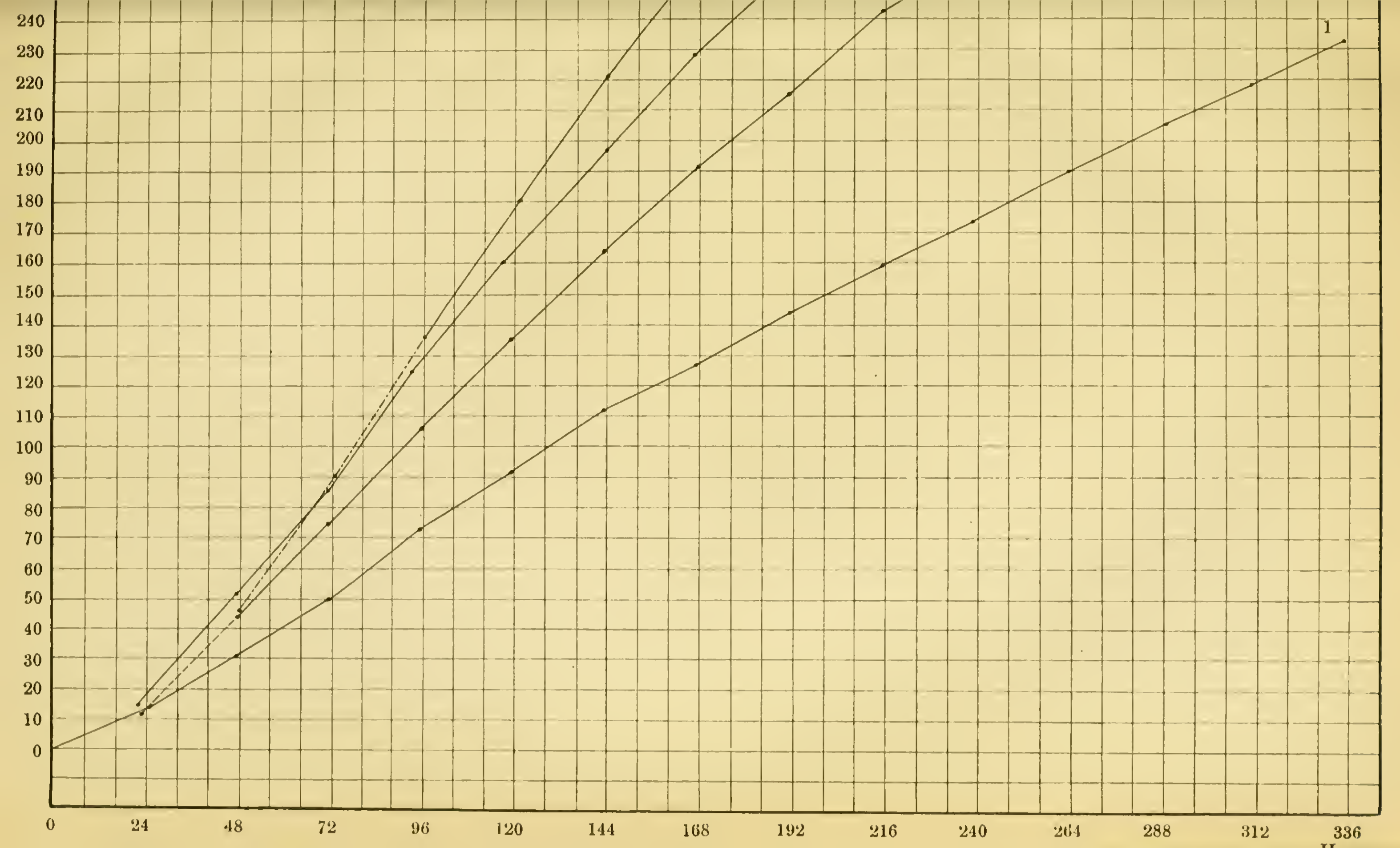
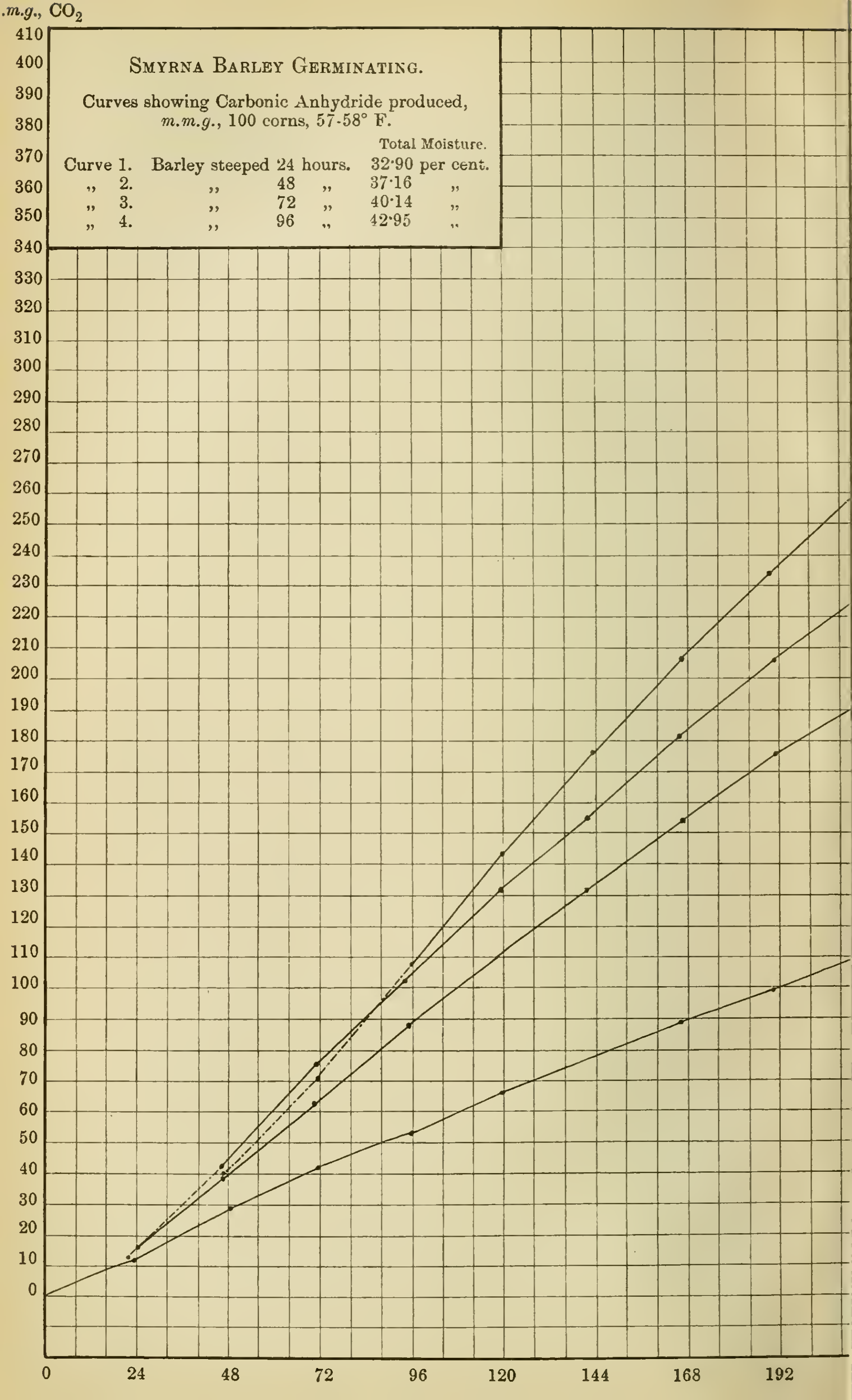


FIG. 1.

FIG. 2.


m.m.g., CO_2
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
Scotch Chevalier Barley Germinating.
Curves showing Carbonic Anhydride produced, m.m.g., 100 corns, 57-58° F.
Total Moisture.
35·90 per cent. Curve 1. Barley steeped 24 hours.
40·39 ,, ,, 2. ,, 48 ,,
42·50 ,, ,, 3. ,, 72 ,,
44·78 ,, ,, 4. ,, 96 ,,
4
3
2


1
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
24
48
72
96
120
144
168
192
216
240
264
288
312
336



.m.g., CO_2
SMYRNA BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced, m.m.g., 100 corns, 57-58° F.
Total Moisture.
Curve 1. Barley steeped 24 hours. 32·90 per cent.
„ 2. „ 48 „ 37·16 „
„ 3. „ 72 „ 40·14 „
„ 4. „ 96 „ 42·95 „
410 400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
0 24 48 72 96 120 144 168 192

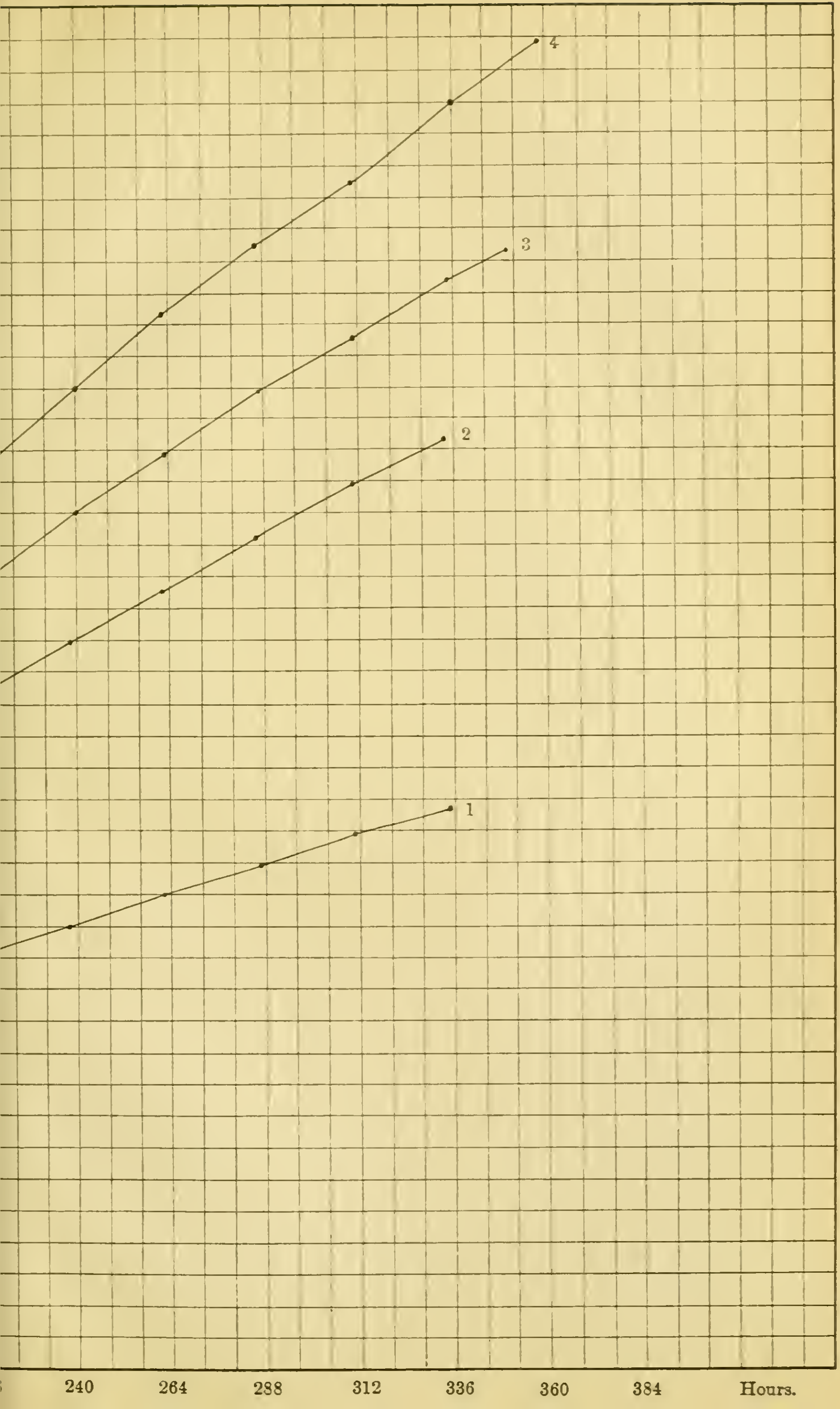
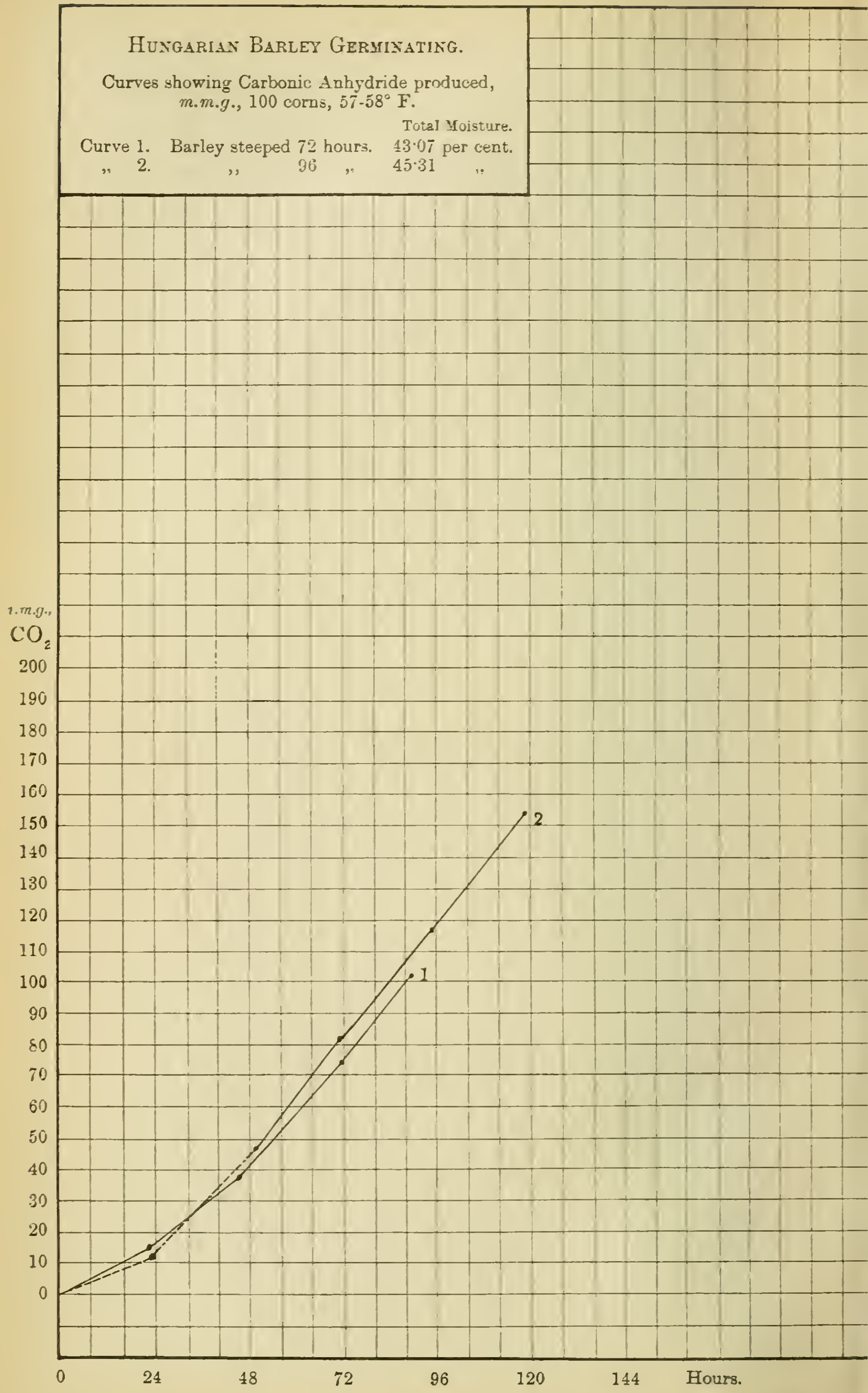
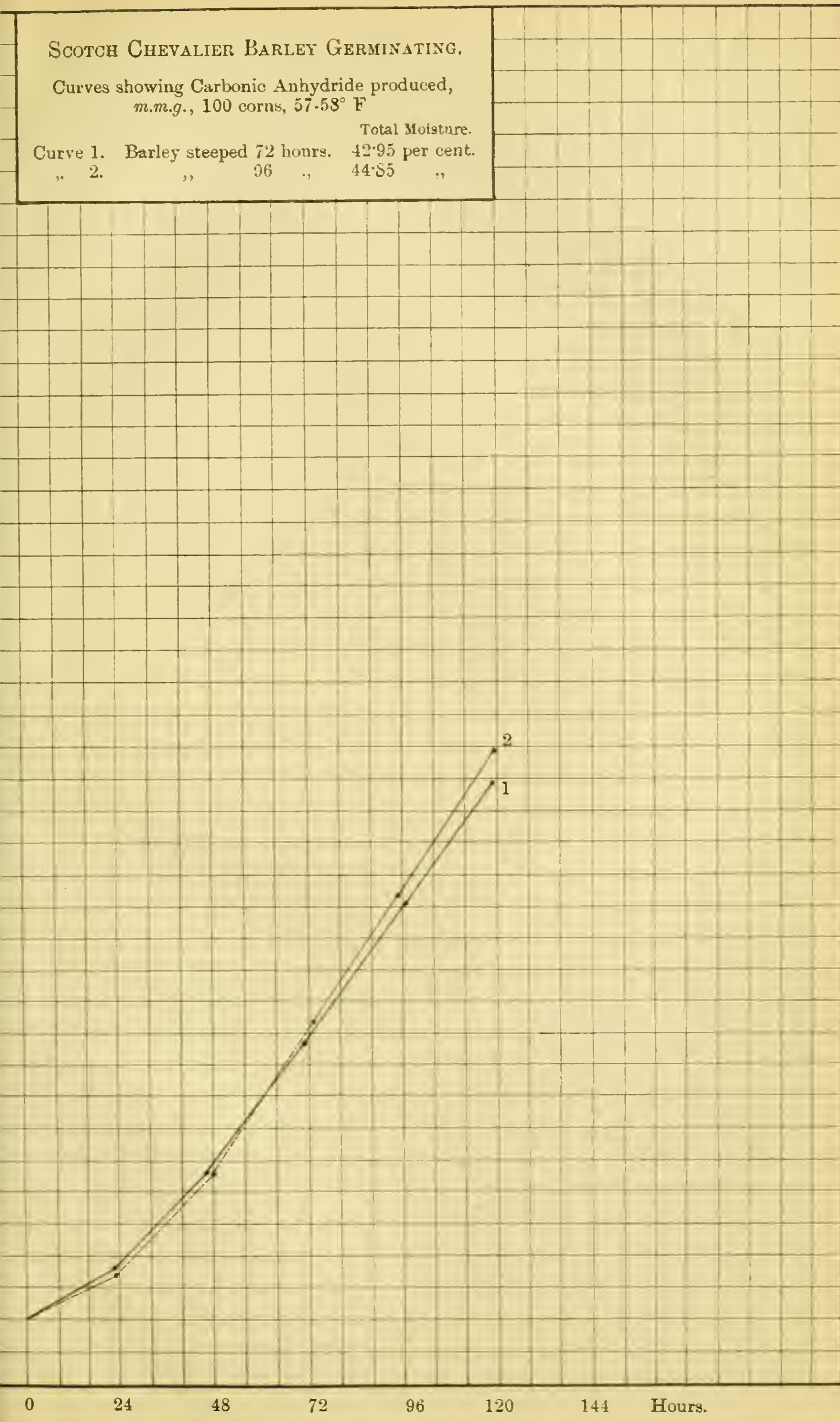


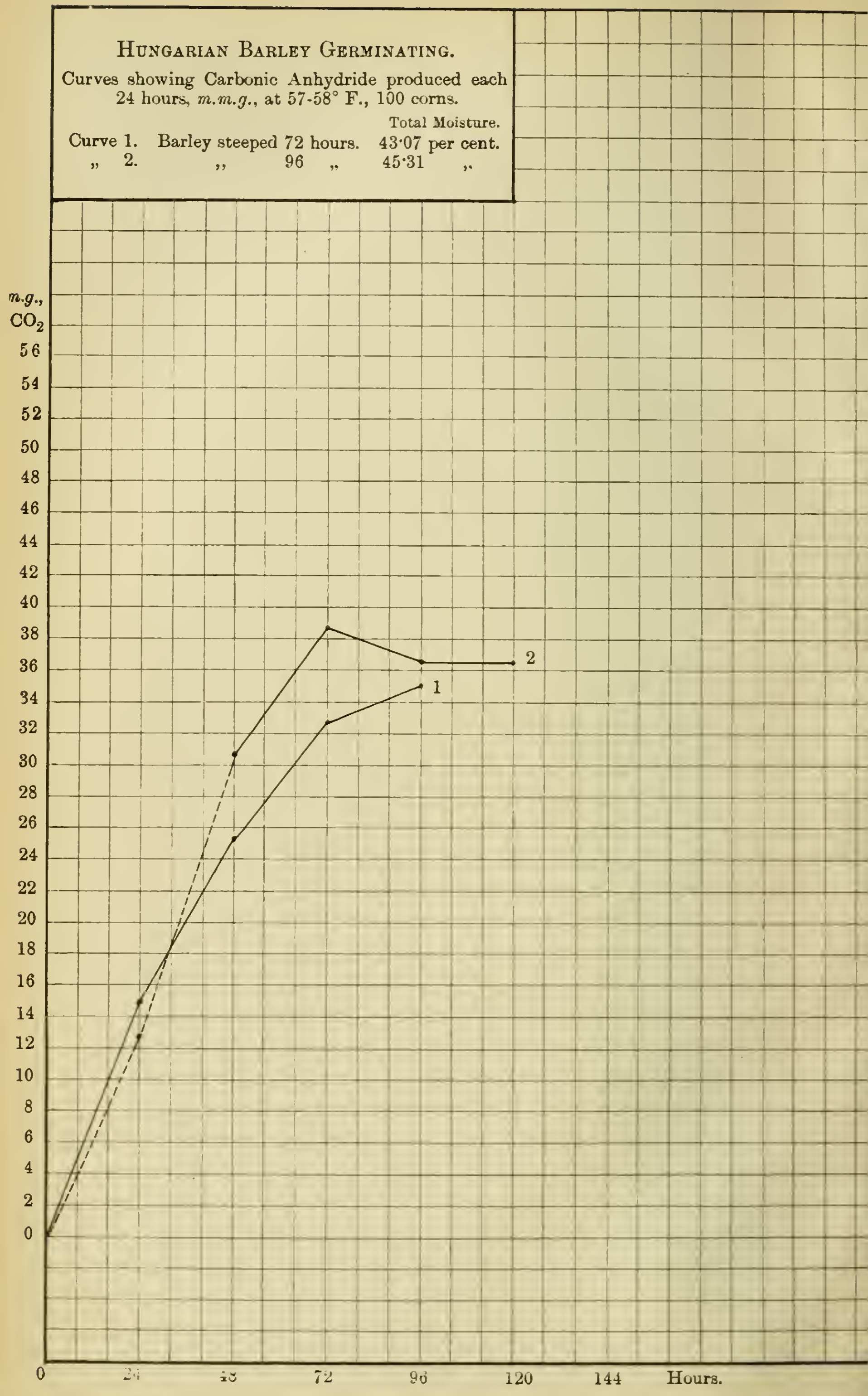
FIG. 3.


HUNGARIAN BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced, m.m.g., 100 corns, 57-58° F.
Total Moisture.
Curve 1. Barley steeped 72 hours. 43·07 per cent.
„ 2. „ 96 „ 45·31 „
m.m.g., CO2
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1
2
0
24
48
72
96
120
144
Hours.



SCOTCH CHEVALIER BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced,
m.m.g., 100 corns, 57-58° F
Total Moisture.
Curve 1. Barley steeped 72 hours. 42·95 per cent.
„ 2. „ 96 „ 44·85 „
2
1
0
24
48
72
96
120
144
Hours.

FIG. 4.



HUNGARIAN BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced each 24 hours, *m.m.g.*, at 57-58° F., 100 corns.
Total Moisture.
Curve 1. Barley steeped 72 hours. 43·07 per cent.
„ 2. „ 96 „ 45·31 „
m.g., CO_2
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
2
1
0
24
48
72
96
120
144
Hours.

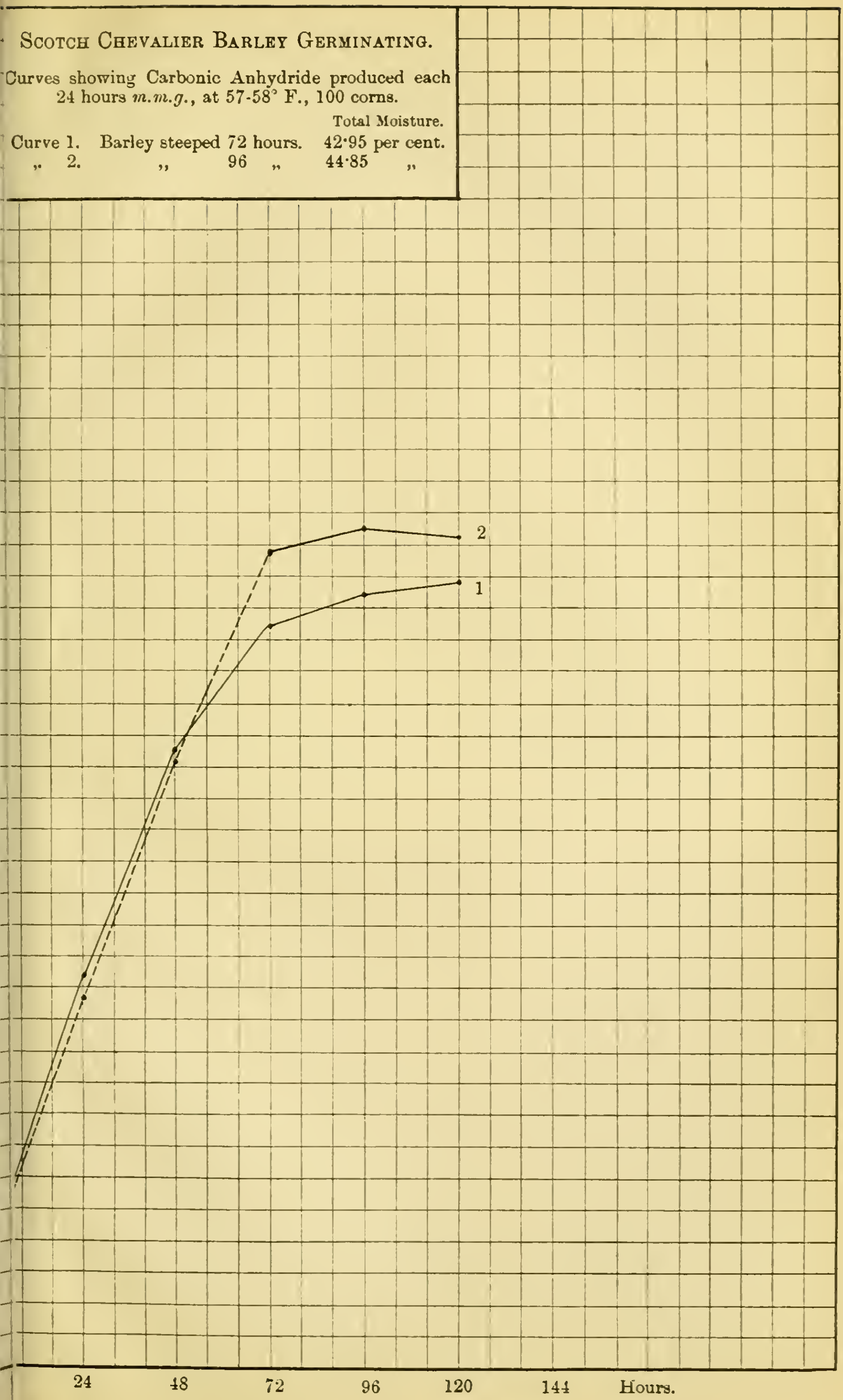
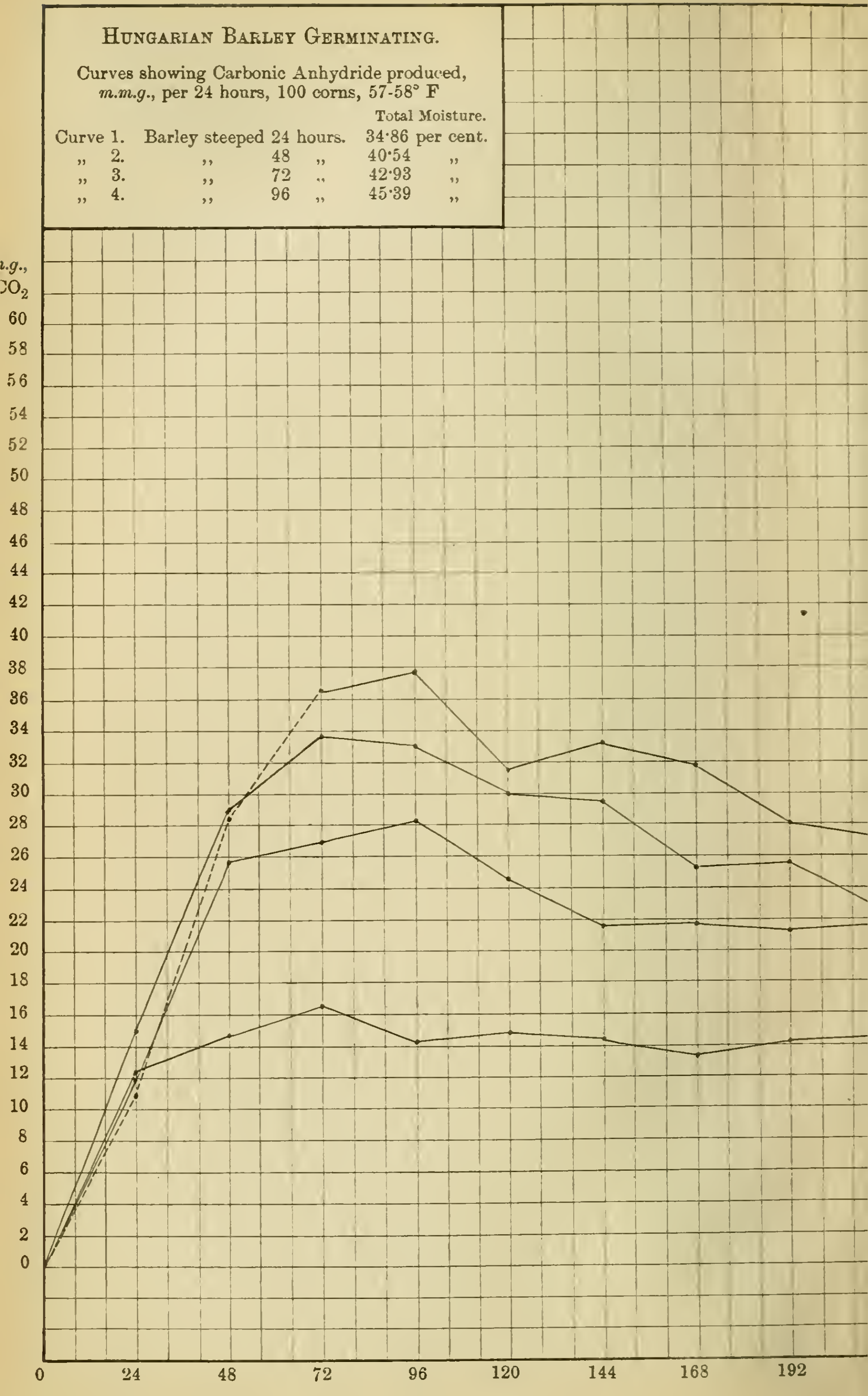

SCOTCH CHEVALIER BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced each 24 hours *m.m.g.*, at 57-58° F., 100 corns.
Total Moisture.
Curve 1. Barley steeped 72 hours. 42·95 per cent.
„ 2. „ 96 „ 44·85 „
2
1
24
48
72
96
120
144
Hours.

FIG. 5.


Hungarian Barley Germinating.
Curves showing Carbonic Anhydride produced, m.m.g., per 24 hours, 100 corns, 57-58° F
Total Moisture.
Curve 1. Barley steeped 24 hours. 34·86 per cent.
„ 2. „ 48 „ 40·54 „
„ 3. „ 72 „ 42·93 „
„ 4. „ 96 „ 45·39 „
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
24
48
72
96
120
144
168
192

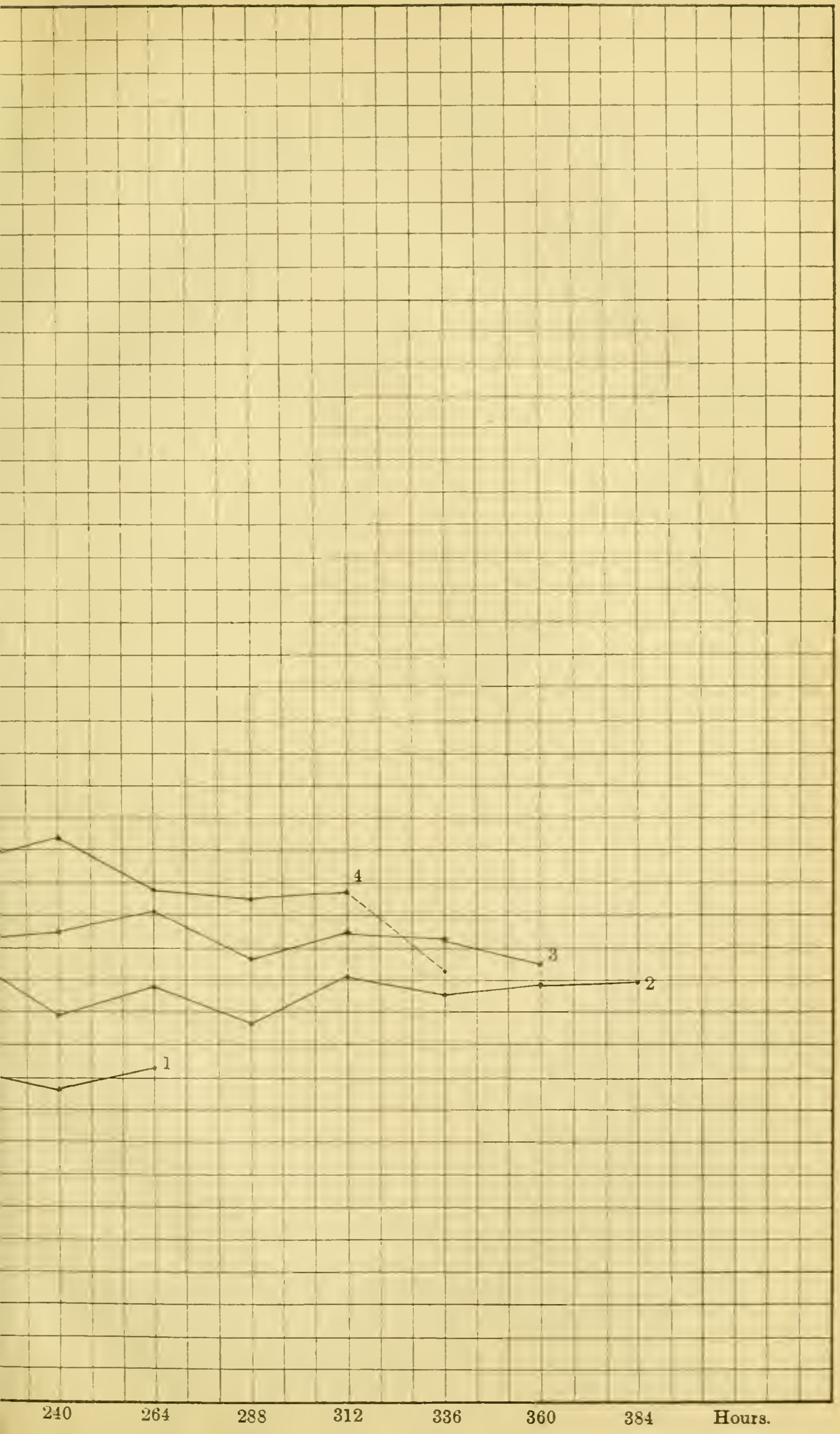
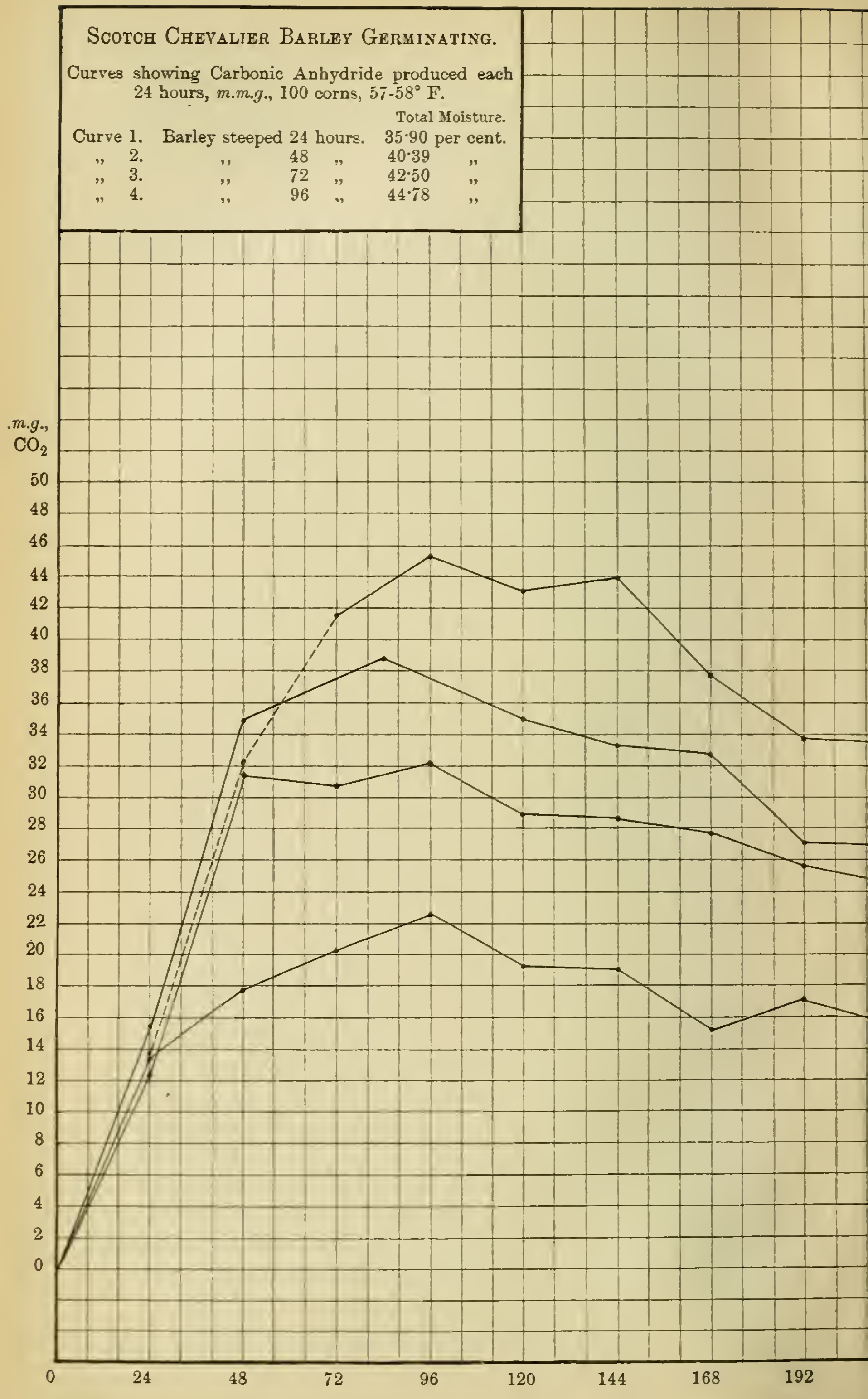


FIG. 6.



Scotch Chevalier Barley Germinating.
Curves showing Carbonic Anhydride produced each 24 hours, m.m.g., 100 corns, 57-58° F.
Total Moisture.
Curve 1. Barley steeped 24 hours. 35·90 per cent.
" 2. " 48 " 40·39 "
" 3. " 72 " 42·50 "
" 4. " 96 " 44·78 "
.m.g., CO_2
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
24
48
72
96
120
144
168
192

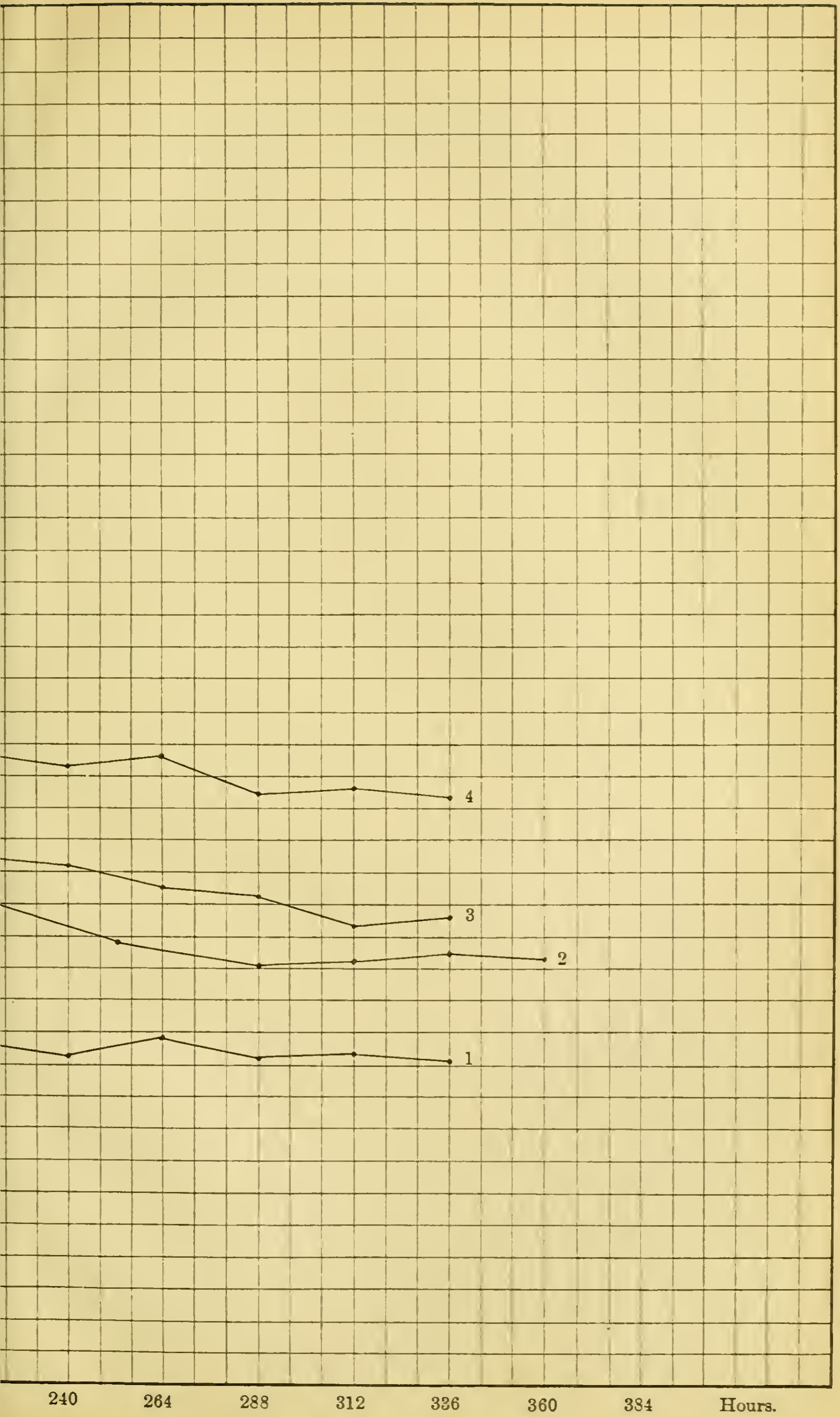
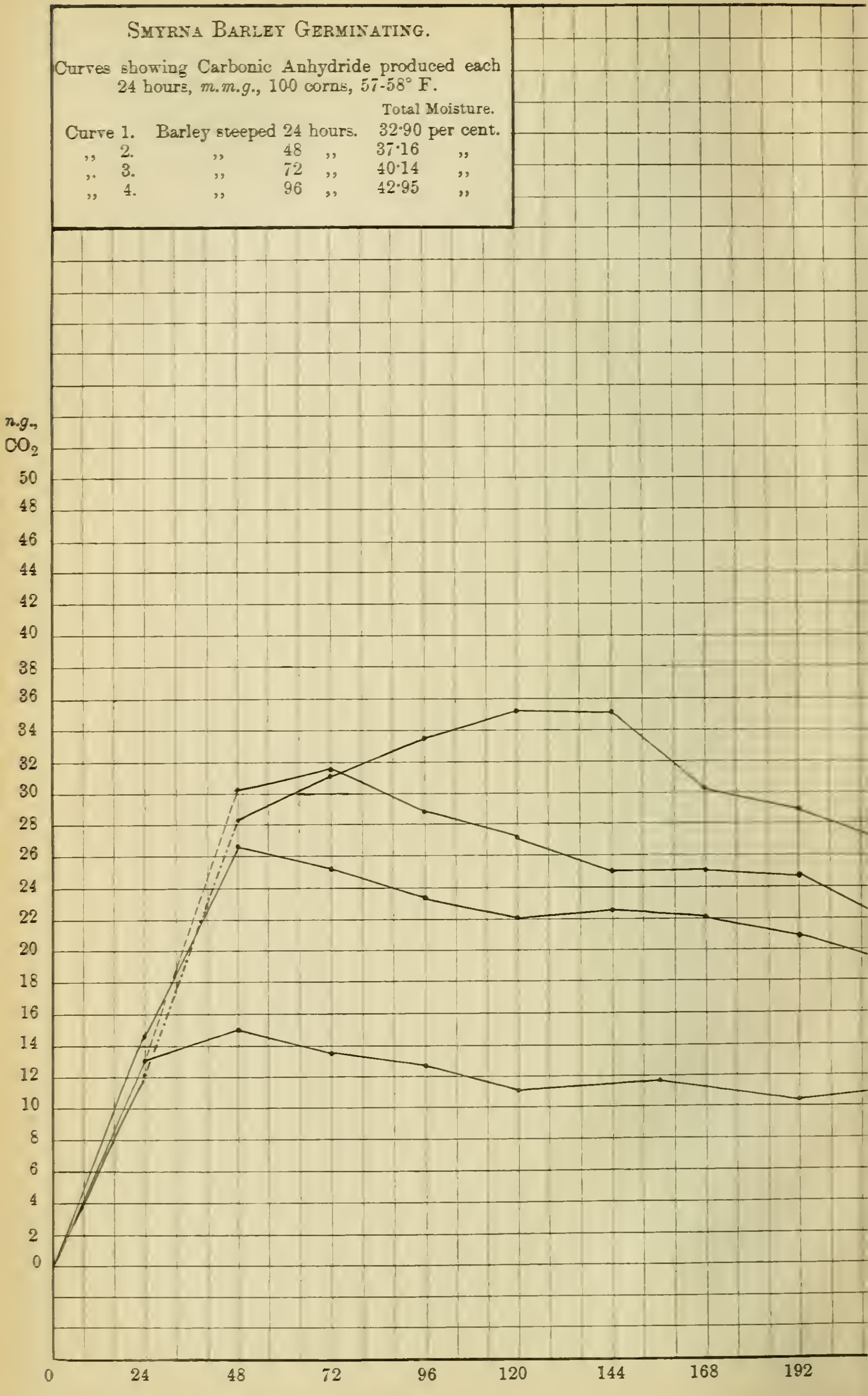


FIG. 7.


SMYRNA BARLEY GERMINATING.
Curves showing Carbonic Anhydride produced each 24 hours, m.m.g., 100 corns, 57-58° F.
Total Moisture.
Curve 1. Barley steeped 24 hours. 32·90 per cent.
" 2. " 48 " 37·16 "
" 3. " 72 " 40·14 "
" 4. " 96 " 42·95 "
m.g., CO2
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
24
48
72
96
120
144
168
192

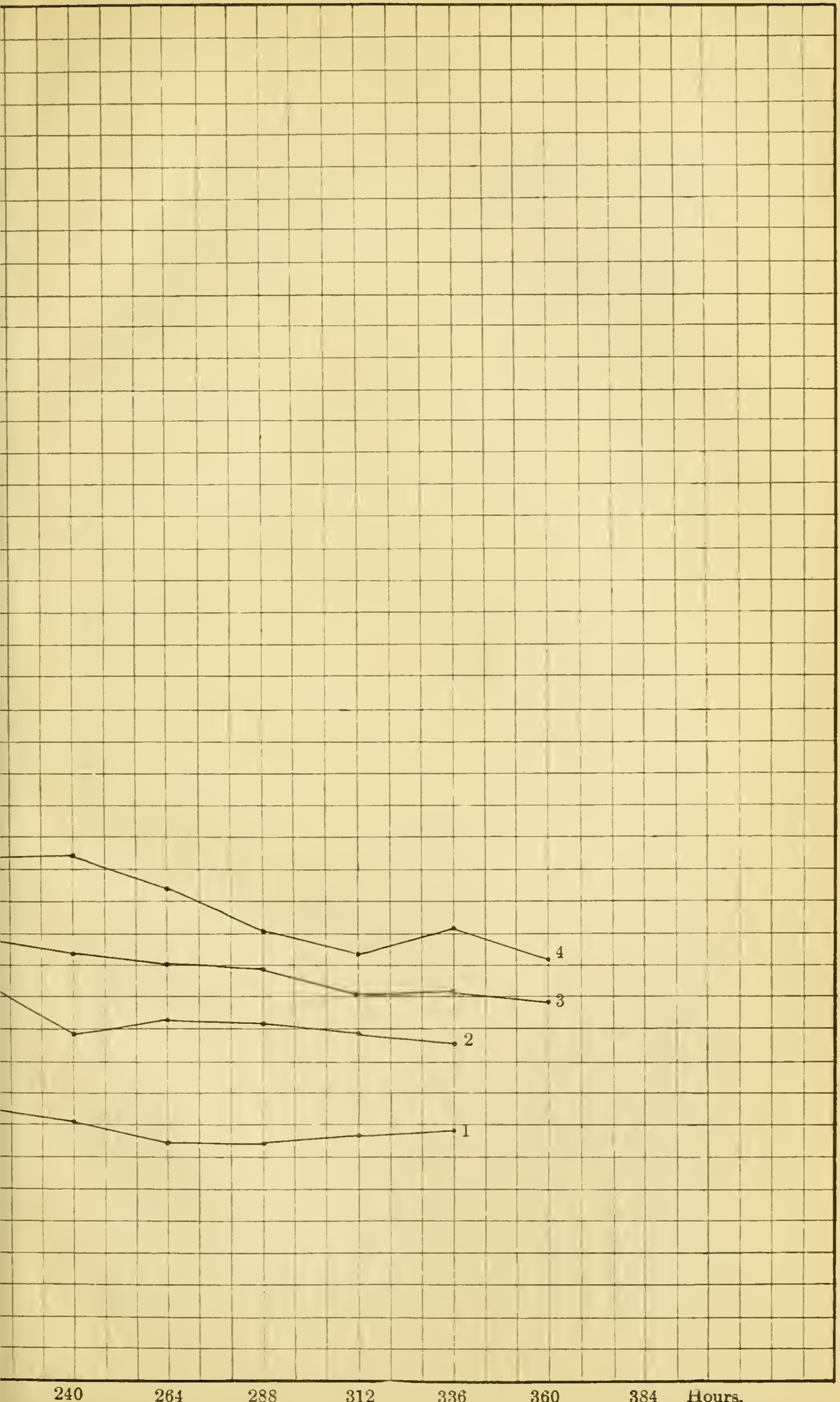


FIG. 8.

through which *very dry* air at a pressure of about 10 to 20 m.m. of mercury was slowly aspirated. After 12 hours the boats were taken out and again weighed, the loss giving the amount of moisture in each case.

Having now described as fully as necessary the method of experiment followed, I will proceed to discuss shortly a few of the results obtained under the five heads before mentioned.

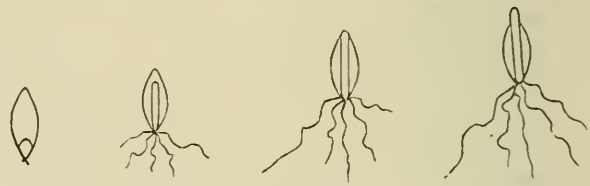
1. The Quantity of Carbonic Anhydride exhaled.—These experiments show clearly the influence of moisture on the amount of this gas produced; an increase of moisture always producing a corresponding increase in the carbonic anhydride. When the moisture is considerably increased it is invariably found that during the first day or two of germination the quantity of carbonic anhydride excreted is a little less than for lower degrees of moisture, but the grain soon recovers its partial drowning as it were, and increased activity due to increase of moisture soon asserts itself. The effect of moisture on the production of carbonic anhydride is clearly shown in Table I., and graphically in the curves on diagrams Figs. 1 to 4. I need give but one instance here:—Scotch Chevalier barley steeped for 24 hours was found to contain 35·90 per cent. water. On germinating for 14 days at constant temperature the carbonic anhydride collected weighed ·2330 gramme. The same barley steeped for 96 hours contained 44·78 per cent. water, and produced in 14 days, at the same temperature, ·4852 gramme carbonic anhydride. So for an increase of moisture amounting to 8·88 per cent. the quantity of carbonic anhydride was more than doubled.

2. The Dry Weight of the Embryo at the end of the Germinative Period.—Table II. gives the results obtained on this point. Corn germinated for 14 days, after a 96 hours' steep, gives a dry embryo weighing rather more than double that obtained when the steep is only 24 hours.

3. The Ratio of the Weight of Carbonic Anhydride exhaled to the Increase in the Dry Weight of the Embryo.—When the number representing the increase in the dry weight of the embryo during germination is divided by the weight of carbonic anhydride exhaled, it is found that the product increases in value as the quantity of moisture

used in germination is increased. So it appears that with the larger quantities of moisture, the embryo increases more in weight for the same amount of carbonic anhydride exhaled than it does when less moisture is present. This feature is well brought out in Table I.

4. The Amount of Moisture in the Endosperm and in the Embryo at the end of the Germinative Period.—Roughly speaking, the percentage of moisture found in the embryo at the end of the germinative period, was always nearly double of that found in the endosperms, the disparity being always greatest the smaller the quantity of moisture employed in the experiment. Thus, for Scotch Chevalier barley, steeped 24 hours with 35·90 per cent. moisture, gave, after germination, endosperms with 32·64 per cent. moisture, and embryos with 63·60 per cent. moisture; the ratio between the two being 1·95. The same barley, steeped for 96 hours with 44·78 per cent. moisture, gave, after germination, endosperms with 38·56 per cent. moisture, and embryos with 68·46 per cent. moisture; the



24 Hrs. 48 Hrs. 72 Hrs. 96 Hrs.

Fig. 2.

ratio between the two being 1·78. Table III. gives a complete review of all the results obtained under this head. Three experiments to ascertain the initial amount of moisture in the embryos, immediately after steeping for 72 hours, and before germination had commenced, showed about 60 per cent., a quantity considerably below any recorded in Table III. The results of the moisture determinations seem to show that the new forming tissue cannot grow with any degree of success unless the moisture it contains is above 63 per cent. All the barley which had only a 24 hours' steep, grew to a very slight extent. The above accompanying rough figure (Fig. 2) will convey an idea of the amount of growth for different lengths of steep after 14 or 15 days' germination at 57° F.

5. The Activity of Growth as shown by the Daily Amount of Carbonic Anhydride exhaled.—Taking the production of carbonic anhydride as the measure of growth during germination, the period of greatest activity, with varying quantities of moisture, was generally found to occur about the third or fourth day, the period being generally somewhat delayed with increase of moisture, especially in the case of the Scotch and Smyrna barleys. After this point of greatest activity is reached, there is a gradual fall in vitality to the end of the 14 days or so according to the experiment.

The progress of vital activity is well shown in the series of curves on diagrams Figs. 6, 7, and 8.

Four experiments, two with Hungarian barley, and two with Scotch Chevalier, were performed to ascertain if, at the period of greatest vitality, as indicated by the curve of daily excretion of carbonic anhydride, the moisture present in the embryo was also at its greatest amount. The result showed that if the germination were stopped about the fourth or fifth day, the moisture present in the embryo was then at its greatest quantity, ranging from 70·94 per cent. to 74·57 per cent., and considerably higher than that found in any experiment lasting 14 days or so. The curves relating to these four curtailed experiments will be found on diagrams Figs. 4 and 5, and the numerical results in all the tables at the end.

This, then, is all I have to bring before you to-night. I have only just mentioned as it were the results obtained, as it would not be of interest to wade through a lot of tables. The results of the work, if meagre, will have served their end if they suggest to others, who have more time at their disposal than I have, some line of inquiry that will lead to an increase of our knowledge on many of the obscure points connected with germination.

TABLE I.—Total Carbonic Anhydride excreted, and total increase in the dry weight of the Embryo, together with the ratio of the weight of Carbonic Anhydride to the *increase* in the dry weight of the Embryo, in germinating Barley under different degrees of moisture, grown at a Temperature of 57° to 58° F. 100 Corns of Barley in each case.

Kind of Barley.	Hours Steep.	Total Moisture in Barley before Germination.	Carbonic Anhydride Excreted.	Increase in Dry Weights of Embryo.	Ratio of Carbonic Anhydride to Increase in Dry Weight of Embryo.	Days Germinated.
		%	Grammes.	Grammes.	Wt Embryo / CO_2	
Hungarian .	24	34·86	·1705	·1555	0·912	12
Do. .	48	40·54	·3379	·3835	1·135	16
Do. .	72	42·93	·3703	·4165	1·124	15
Do. .	96	45·39	·3907	·5290	1·354	14
Chevalier .	24	35·90	·2330	·2005	0·860	14
Do. .	48	40·39	·3678	·3225	0·877	15
Do. .	72	42·50	·4037	·4110	1·018	14
Do. .	96	44·78	·4852	·5890	1·214	14
Smyrna . .	24	32·90	·1572	·1155	0·735	14
Do. . .	48	37·16	·2726	·2040	0·748	14
Do. . .	72	40·14	·3349	·4040	1·206	15
Do. . .	96	42·95	·3991	·5920	1·483	15
Hungarian .	72	43·07	·1010	·1290	1·277	4
Do. .	96	45·31	·1532	·2640	1·723	5
Chevalier .	72	42·95	·1694	·2860	1·688	5
Do. .	96	44·85	·1793	·3170	1·768	5

TABLE II.—Weight of the Embryo in the natural moist state, and in the dry state, of Barleys germinated under different conditions of moisture, grown at a Temperature of 57° to 58° F. 100 Corns of Barley in each case.

Kind of Barley.	Hours Steep.	Weight of 100 Embryos, Moist.	Weight of 100 Embryos, Dry.	Dry Weight of Embryo compared with Natural Weight of the Barley.	Days Germinated.
		Grammes.	Grammes.	%	
Hungarian	24	·850	·316	7·30	12
Do.	48	1·618	·544	12·57	16
Do.	72	1·747	·577	13·33	15
Do.	96	2·184	·690	15·95	14
Chevalier	24	·996	·362	7·16	14
Do.	48	1·513	·484	9·57	15
Do.	72	1·825	·573	11·34	14
Do.	+96	2·381	·751	14·85	14
Smyrna	24	·668	·253	4·63	14
Do.	48	1·288	·341	6·25	14
Do.	72	1·664	·541	9·91	15
Do.	96	2·260	·729	13·35	15
Hungarian	72	1·140	·290	6·70	4
Do.	96	1·220	·425	9·82	5
Chevalier	72	1·541	·448	8·59	5
Do.	96	1·782	·479	9·47	5
Hungarian	...	Ungerminated	·161	3·72	...
Chevalier	...	Ungerminated	·162	3·20	...
Smyrna	...	Ungerminated	·137	2·51	...

TABLE III.—Moisture in the Endosperm and in the Embryo of Barleys germinated under different conditions of moisture, and grown at a Temperature of 57° to 58° F., and the ratio of the moisture in the Endosperm to that in the Embryo. 100 Corns taken in each case.

Kind of Barley.	Hours Steep.	Moisture in Steeped Barley. Absolute.*	Moisture in Endosperm after Germination.	Moisture in Embryos after Germination.	Ratio of Moisture. Embryo Endosperm.	Days Germinated.
		%	%	%		
Hungarian .	24	34·86	31·61	62·79	1·99	12
Do. .	48	40·54	35·94	66·35	1·85	16
Do. .	72	42·93	—36·84	66·95	1·82	15
Do. .	96	45·39	38·50	68·41	1·78	14
Chevalier .	24	35·90	32·64	63·60	1·95	14
Do. .	48	40·39	35·98	67·98	1·89	15
Do. .	72	42·50	37·49	68·60	1·83	14
Do. .	96	44·78	38·56	68·46	1·78	14
Smyrna . .	24	32·90	29·64	62·15	2·10	14
Do. . .	48	37·16	33·39	65·74	1·97	14
Do. . .	72	40·14	35·39	67·46	1·91	15
Do. . .	96	42·95	37·45	67·73	1·81	15
Hungarian .	72	43·07	37·08	74·57	2·01	4
Do. .	96	45·31	38·43	74·17	1·93	5
Chevalier .	72	42·95	37·57	70·94	1·89	5
Do. .	96	44·85	38·84	73·13	1·88	5

* The absolute moisture means the water absorbed during steep, plus the natural moisture of the barley.

NOTE.—Average Natural Weights of 100 Corns :—

	Grammes.		%
Hungarian Barley . .	4·327	Natural Moisture . . .	14·46
Kiln-dried Chevalier do. .	5·057	Do. . . .	11·13
Smyrna do. .	5·460	Do. . . .	11·90

THE TWISTING OF THE LEAVES ON THE HORIZONTAL SHOOTS OF THE FLAT-LEAVED SPRUCES AS CONSTRASTED WITH THE SAME PHENOMENON IN OTHER FIRS. By A. D. RICHARDSON.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF DECEMBER 1895. By ROBERT LINDSAY, Curator.

Like the preceding month, December has been remarkable for the extreme mildness of weather which prevailed. Notwithstanding the open nature of the weather, not a single plant came into flower out of doors during December, although there were several plants still in blossom which had been previously recorded.

On the rock-garden the total number of alpine and dwarf-growing herbaceous plants that flowered during the past year amounts to 1222, as against 1143 during 1894.

The number of species and varieties which came into flower each month was as follows:—January and February, 0; March, 44; April, 133; May, 346; June, 402; July, 190; August, 59; September, 41; October, 6; November, 1; December, 0—total, 1222.

II. METEOROLOGICAL OBSERVATIONS RECORDED AT ROYAL BOTANIC GARDEN, EDINBURGH, DURING THE MONTH OF DECEMBER 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-Level, 76·5 feet. Hour of Observation, 9 A.M.

Days of the Month.	Barometer, corrected and reduced to 32°. (Inches.)	Thermometers, protected, 4 feet above grass.				Direction of Wind.	Clouds.			Rainfall. (Inches.)
		S. R. Thermometers for preceding 24 hours.		Hygrometer.						
		Max.	Min.	Dry.	Wet.		Kind.	Amount.	Direc-tion.	
		°	°	°	°					
1	29·627	47·1	40·6	47·2	45·1	S.W.	Nim.	10	S.W.	0·180
2	29·794	45·6	35·8	42·7	40·0	S.W.	St.	10	S.W.	0·140
3	29·631	50·3	40·0	41·0	38·0	W.	...	0	...	0·195
4	29·438	43·1	36·4	42·2	40·2	S.W.	Nim.	10	S.W.	0·435
5	28·973	52·7	40·2	45·2	41·0	W.	Cir.	3	W.	0·265
6	28·999	45·8	33·6	34·0	32·1	W.	Cir.	1	W.	0·005
7	29·345	37·0	31·2	33·4	31·8	W.	Cir.	3	N.W.	0·000
8	29·915	38·3	29·1	32·4	30·0	W.	Cir.	10	N.W.	0·010
9	29·459	45·2	32·2	45·0	43·8	S.W.	Nim.	10	S.W.	0·015
10	29·653	47·8	38·8	39·6	37·0	W.	...	0	...	0·000
11	29·777	43·8	35·0	40·8	39·3	S.	Cir. St.	8	S.	0·000
12	29·345	45·1	32·1	40·2	38·0	S.W.	St.	10	S.W.	0·040
13	29·067	40·6	34·8	38·8	34·0	W.	St.	8	N.W.	0·000
14	29·485	43·1	33·1	39·4	37·1	Var.	St.	10	S.W.	0·140
15	29·928	50·2	34·1	39·9	39 6	E.	Nim.	10	E.	0·135
16	28·964	43·9	35·0	35·2	34·1	S.E.	St.	10	S.E.	0·000
17	29·561	42·9	34·9	41·0	40·1	E.	Cum. St.	8	E.	0·030
18	29·795	44·1	38·4	40·1	39·9	E.	Nim.	10	E.	0·030
19	29·754	42·8	36·2	36·1	35·8	N.E.	St.	10	N.E.	0·000
20	29·963	39·8	31·7	32·0	32·0	S.	Fog	5	...	0·000
21	29·929	32·8	25·7	28·4	28·4	W.	St.	10	W.	0·000
22	29·732	36·2	27·7	33·2	32·1	S.E.	{ Cir. { St.	3 2	N.W. } S.E. }	0·010
23	29·757	39·8	33·7	39·8	37·0	S.E.	St.	10	S.E.	0·010
24	29·685	42·6	37·0	37·9	35·1	S.E.	{ Cir. { St.	3 3	W. } S.E. }	0·010
25	29·803	38·7	33·9	37·8	33·8	S.E.	St.	10	S.E.	0·005
26	29·962	38·5	33·8	38·0	34·1	E.	St.	10	E.	0·015
27	30·249	37·4	34·7	36·2	33·8	E.	St.	10	E.	0·000
28	30·168	37·1	30·2	32·6	30 8	S.E.	St.	10	S.E.	0·530
29	29·609	40·6	31·7	40·2	40·0	W.	St.	5	W.	0·105
30	29·516	45·6	40·1	41·3	41·3	N.E.	Nim.	10	N.E.	0·380
31	29·766	41·6	40·0	40·8	40·7	N.	St.	10	N.	0·020

Barometer.—Highest, 30·249 inches, on the 27th. Lowest, 28·964 inches, on the 16th. Monthly Range, 1·285 inch. Mean, 29·634 inches, being 0·138 inch below the average for December for five preceding years.

Protected S. R. Thermometers,—Highest, 52°·7, on the 4th. Lowest, 25°·7, on the 21st. Monthly Range. 27°·0. Mean of all the Highest, 42°·6. Mean of all the Lowest, 34°·6. Mean Daily Range, 8°·0. Mean Temperature of Month, 38°·6, being 0°·6 above the average for December for five preceding years. Frost occurred on 7 days.

Hygrometer.—Mean of Dry Bulb, 38°·5. Mean of Wet Bulb, 36°·6. Temperature of Dew-point, 34°·0. Mean Humidity, 84·1 %.

Radiation Thermometers.—Highest in Sun, 85°·9, on the 29th. Lowest on Grass, 15°·4, on the 22nd. Frost occurred on Grass on 18 days.

Sunshine.—Total recorded for month, 13 hours 30 minutes, being 6·2 % of the possible amount. The sunniest day was the 7th, with 3 hours, being 42 % of the possible amount. None was recorded on 17 days.

Rainfall.—Rain fell on 22 days. Total Fall, 2·705 inches, being 0·293 inch above the average for December for five preceding years. Greatest Fall in 24 hours, 0·530 inch, on the 28th.

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer.*

A.M.

Range	Sunshine. (Hours.) Amount.	Percentage of Possible.	Greatest Amount in One Day. Date.	Amount.	Percentage of Possible.	Sunless Days.	Rainfall. (Inches.) Number of Days on which Rain fell.	Amount.	Difference from Average.	Greatest Fall in 24 Hours. Date.	Amount.
° 87·4	36·5	15·5	21	5·6	71·6	13	21	1·850	+0·705	17	0·280
88·9	75·4	28·4	21	8·2	82·8	4	7	0·460	−2·334	1	0·235
80·3	58·2	16·0	17	7·8	67·3	8	21	2·295	+0·723	27	0·650
93·3	119·7	28·3	14	11·3	80·8	3	14	1·085	−0·046	25	0·330
98·0	186·4	37·1	8	11·7	74·7	2	11	1·000	−1·171	25	0·380
02·2	191·0	36·6	6	13·5	78·3	0	15	2·560	+0·611	18	0·675
91·1	133·2	25·5	15	11·6	68·0	5	17	4·900	+2·665	26	1·335
89·0	92·2	19·8	8	7·0	44·9	3	27	4·635	+1·082	5	0·715
95·7	148·8	38·9	23	9·3	76·7	2	11	0·700	−1·329	16	0·350
92·8	107·7	33·4	4	8·9	79·0	5	17	3·230	+0·635	1	0·620
72·1	40·4	16·3	11	6·2	72·5	12	23	2·305	+0·297	15	0·320
70·5	13·5	6·2	7	3·0	42·0	17	22	2·705	+0·293	28	0·530
22·0	1203·0	26·5	June 6	13·5	78·3	74	206	27·725	+2·340	July 26	1·335

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer.*

III. Abstract of Meteorological Observations recorded at Royal Botanic Garden, Edinburgh, during 1895.

Distance from Sea, 1 mile. Height of Cistern of Barometer above Mean Sea-level, 76·5 feet. Hour of Observation, 9 A.M.

Months.	Barometer, corrected and reduced to 32° (Inches): Highest Observed: Date.	Highest Observed: Reading.	Lowest Observed: Date.	Lowest Observed: Reading.	Range.	Mean.	Difference of Mean from Average.	S. R. Thermometers, protected, 4 feet above grass: Highest: Date.	Highest: Reading.	Lowest: Date.	Lowest: Reading.	Range.	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Mean Temperature.	Difference of Mean from Average.	Hygrometer, protected, 4 feet above grass: Mean of Dry Bulb.	Mean of Wet Bulb.	Temperature of Dew-point.	Mean Humidity. (Saturation = 100.)	Radiation Thermometers: Highest in Sun. (Black Bulb in vacuo, 4 feet above grass.): Date.	Highest in Sun: Reading.	Lowest on Grass: Date.	Lowest on Grass: Reading.	Range.	Sunshine. (Hours.): Amount.	Percentage of Possible.	Greatest Amount in One Day: Date.	Greatest Amount in One Day: Amount.	Greatest Amount in One Day: Percentage of Possible.	Sunless Days.	Rainfall. (Inches.): Number of Days on which Rain fell.	Amount.	Difference from Average.	Greatest Fall in 24 Hours: Date.	Greatest Fall in 24 Hours: Amount.
									°		°	°	°	°		°	°	°	°	°					°	°											
...uary	30	30·663	24	28·927	1·736	29·671	−0·085	22	41·1	10	15·1	25·3	36·5	26·8	9·7	31·6	−5·0	31·1	29·9	26·7	83·3	27	98·2	10, 11	10·8	87·4	36·5	15·5	21	5·6	71·6	13	21	1·850	+0·705	17	0·280
...ruary	16	30·580	26	29·622	0·958	30·071	+0·312	23	47·4	10	11·8	35·6	37·0	25·1	11·9	31·0	−8·3	29·3	28·1	23·9	79·0	23	97·9	10	9·0	88·9	75·4	28·4	21	8·2	82·8	4	7	0·460	−2·334	1	0·285
...ch	16	30·133	28	28·592	1·541	29·541	−0·280	21	55·1	3	27·2	27·9	46·0	36·9	9·1	41·4	+1·1	40·9	39·0	36·6	84·3	17	101·3	3	21·0	80·3	58·2	16·0	17	7·8	67·3	8	21	2·295	+0·723	27	0·650
...il	14	30·324	6	28·979	1·345	29·767	−0·181	23	62·0	7	28·8	33·2	51·9	39·8	12·1	45·8	+0·9	46·3	43·0	39·3	76·2	23	113·2	7	19·9	93·3	119·7	28·3	14	11·3	80·8	3	14	1·085	−0·046	25	0·330
...y	8	30·529	31	29·587	0·942	30·013	+0·198	30	74·2	2, 5	39·0	35·2	60·3	44·0	16·3	52·1	+2·6	52·3	48·4	44·5	74·8	28	126·0	8, 11	28·0	98·0	186·4	37·1	8	11·7	74·7	2	11	1·060	−1·171	25	0·380
...e	24	30·408	30	29·456	0·952	29·976	+0·067	26	77·7	18	37·1	40·6	64·6	48·0	16·6	56·3	+0·7	57·8	52·5	47·7	69·1	9	131·0	15	28·8	102·2	191·0	36·6	6	13·5	78·3	0	15	2·560	+0·611	18	0·675
	5	30·153	19	29·314	0·839	29·702	−0·086	6	74·2	13	44·7	29·5	63·8	50·8	13·0	57·3	−0·4	58·5	54·1	50·1	73·7	5	126·1	13	35·0	91·1	133·2	25·5	15	11·6	68·0	5	17	4·990	+2·665	26	1·335
...gust	15	30·105	4	29·218	0·887	29·683	−0·028	17	76·7	25	45·7	31·0	65·5	53·6	11·9	59·5	+1·5	59·2	56·2	53·5	81·5	17	128·8	15	39·8	89·0	92·2	19·8	8	7·0	14·9	3	27	4·685	+1·082	5	0·715
...tember	20	30·311	11	29·180	1·131	29·972	+0·170	26	73·9	21	38·1	35·8	65·0	50·7	14·3	57·8	+3·3	58·1	55·0	52·2	80·9	1	123·1	21	27·1	95·7	148·8	38·9	23	9·3	76·7	2	11	0·700	−1·329	16	0·350
...ber	17	30·480	2	28·960	1·520	29·708	0·000	1	62·8	23	28·2	34·6	50·4	38·5	11·9	44·4	−2·5	44·1	41·6	38·6	81·0	12	107·7	28	14·9	92·8	107·7	33·4	4	8·9	79·0	5	17	3·230	+0·635	1	0·620
...vember	25	30·478	12	28·726	1·752	29·717	−0·018	10	57·4	2	29·9	27·5	48·1	39·2	8·9	43·6	+1·9	42·7	41·3	39·6	88·7	10	91·6	2	19·5	72·1	40·4	16·3	11	6·2	72·5	12	23	2·305	+0·297	15	0·320
...cember	27	30·249	16	28·961	1·285	29·634	−0·138	4	52·7	21	25·7	27·0	42·6	34·6	8·0	38·6	+0·6	38·5	36·6	34·0	84·1	29	85·9	22	15·4	70·5	13·5	6·2	7	8·0	42·0	17	22	2·705	+0·293	28	0·530
...ar	Jan. 30	30·663	Mar. 28	28·592	2·071	29·790	−0·001	June 26	77·7	Feb. 10	11·8	65·9	52·6	40·7	12·0	46·6	−0·3	46·6	43·8	40·6	79·9	June 9	131·0	Feb 10	9·0	122·0	1203·0	26·5	June 6	13·5	78·3	74	206	27·725	+2·340	July 26	1·335

A. D. RICHARDSON, *Observer.*
W. H. WAITE, *Interim Observer.*

IV. NOTES ON PLANTS IN THE PLANT HOUSES. By R. L. HARROW.

December of 1895 has been a favourable one for plants cultivated under glass, being generally mild, and thus any extremes of artificial heating, which often prove a weakening agent during the dull winter months, have been rendered unnecessary. Among the first plants to break into a new season's growth are the tropical ferns, and the adiantums are usually a few weeks in advance of other genera in producing fresh fronds.

Among the most interesting plants that have flowered the following may be noted:—

Epidendrum paniculatum, Ruiz et Pax. An epiphytal orchid, one of the most widely distributed in S. America. The terete stems are about two feet long under cultivation, but in their native habitat are said to reach from three to four feet. The pale lilac and dull green flowers are very fragrant. The date of introduction is unknown.

Saccolabium giganteum, Lindl. This strong growing species is, under culture in this country, a dwarf-growing plant, with a close-set spike of fragrant flowers having white sepals and petals dotted with amethyst spots. It was first introduced in quantity by Messrs. Veitch in 1864 from Burmah.

Masdevallia polysticta, Rchb. This winter-flowering species is a native of Peru, and was introduced to this country by Messrs. Veitch in 1874. Its scape of five to seven fragrant flowers rises well above the leaves. The sepals are pale lilac, dotted with numerous purple spots, and the tails are light yellow, about half an inch long.

Other species of orchids which have flowered during the month are:—*Cypripedium Leeanum*, Hort.,—a hybrid of *C. insigne* × *C. Spicerianum* raised by Messrs. Veitch; *C. venustum*,—a pretty species with mottled foliage from Nepal, the petals bearing several dark blotches along their margins; *C. Dautherii*, Hort.,—with rather large flowers, a hybrid of *C. Harrisianium* × *C. villosum*; *Rodriguezia pubescens*, Rchb.,—the pendulous racemes of yellowish white flowers are sweetly fragrant. The plant is said to be rare in its native habitat, Brazil. *Oncidium Cavendishianum*, Batem.,—a native of Guatemala. This species is distinguished as one of a group of this genus without pseudo-bulbs, the leaves springing from a stout rhizome. The flower scape is strong, terminating in a branched panicle. *Epidendrum ciliare*, Linn., var., *giganteum*, — one of the oldest known orchids in this country, introduced in 1790 from the West Indies. The pseudo-bulbs resemble those of a Cattleya, while the most conspicuous parts of the white flowers are the middle lobes of the filiform lip. *Pleurothallis ornata*, Rchb.,—a curious little species from tropical America.

MEETING OF THE SOCIETY,

Thursday, February 13, 1896.

Dr. WILLIAM CRAIG, Vice-President, in the Chair.

The CHAIRMAN made intimation of the death of the Rev. THOMAS ANDERSON and of Dr. JAMES CARTER, Resident Fellows of the Society.

Professor BAYLEY BALFOUR informed the Society that Major Sprott, of Stravithie, had presented the Herbarium of the late Dr. Cleghorn to the Royal Botanic Garden.

Mr. R. STEWART MACDOUGALL exhibited specimens of the Larva of *Sirex juvencus* (Pine-Wood Wasp), also specimens of the Imago and Larva of *Rhagium bifasciatum*, with examples of the damage done by them to timber.

Specimens of plants in flower in open air in Mr. CAMPBELL'S Garden at Ledaig were exhibited.

Mr. RUTHERFORD HILL exhibited a pale coloured variety of Ergot of Rye from the Canary Islands.

Specimens in flower of *Masdevallia leontoglossa*, *M. Hinksciana*, *Brassavola grandiflora*, *Saccolabium bellinum*, and *Tecoma Smithii*, were exhibited from the Royal Botanic Garden.

The following papers were read:—

Issued November 1896.

AUSTRALIAN AND OTHER FOREIGN TREES AND PLANTS IN ARRAN—ALL UNPROTECTED. By Rev. DAVID LANDSBOROUGH.

Girth measured, unless otherwise stated, at 5 feet, 1895. Revised 1896—Measurements unchanged.

INTRODUCTION.

The winter of 1879-80 was so severe that it occurred to the late Mr. Sadler, Curator of the Royal Botanic Garden, Edinburgh, to request persons in various parts of Scotland, who took an interest in plants, to send him reports regarding the effects of the frost in their districts, that from these he might prepare for the Botanical Society of Edinburgh a condensed report of the effect produced throughout Scotland.* The writer, though not residing in Arran, having been long associated with the island, was requested to report for it. The Arran report so interested Mr. Sadler that he asked the writer to make one yearly. This was done until 1885, when one more detailed than any previous was given, with the intimation that now the reports for a time would cease, but at the end of six years the writer hoped to send another. The year named arrived, but found him so busy as to be unable to carry out his intention. The frost, however, of last winter (1894-95) has been so severe and so protracted as to recall his promise, for a report immediately after such a winter ought to be one of peculiar value. Besides, during the intervening ten years, many additional plants have been tried in Arran, and thus much new information can be given. The object of this paper will be threefold,—Firstly, to mention the rare plants that have been tried in Arran; Secondly, to relate how they have succeeded; Thirdly, to give the intensity of frost to which those killed have succumbed.

* See Transactions and Proceedings of Edin. Bot. Soc., 1879, 1885-86.

Arran.—The Island of Arran, in the Firth of Clyde, $55\frac{1}{2}$ latitude, is $20\frac{1}{8}$ miles in length by $10\frac{1}{4}$ at greatest breadth. It is nearly equally divided into a hilly and a flat portion. The northern part is mountainous, several summits rising above 2500 feet; the highest (Goatfell) being 2866 feet. The southern part is more flat, the mountains being not more than half the height of those in the north. On the east side, Arran is from ten to thirteen miles from Ayrshire, and six from Bute. On the west side, it is from three to four miles (narrowest at Dougrie) from the Peninsula of Cantyre. The north of Arran is opposite to the mouth of Loch Fyne; the south lies open to the North Channel. The bed of the surrounding sea is deep, especially around the north of the island, and remains deep to within a short distance from land, and thus tells powerfully in preventing great cold, especially on the coast.

Situation of the Gardens in Arran.—The trees and shrubs to be mentioned, excepting those at Pirn Mill and Whitefarland, all grow on the east side of Arran and in grounds adjoining the sea, those at Cooper Lodge, Whiting Bay, and at Cromla, Corrie, being separated from it at high tide by only the breadth of the highway; Craigard, Lamlash, has only a narrow field between it and the sea; while Brodick Castle grounds are also in close proximity to the waters of Brodick Bay. Pirn Mill and Whitefarland are also alongside of the sea. All of them derive the fullest advantage from the sea. The garden at Cooper Lodge, Whiting Bay, is on level ground, and the soil light and well drained. That of Cromla is also level, and like the other thoroughly drained, but here the soil has in it more clay. The Brodick Castle Garden is on sloping ground lying eastward, and averaging 100 feet above sea-level—soil neither light nor heavy. The plants at Craigard, Lamlash, grow on a steep, moist, well drained bank. Whitefarland, on the west coast, is a beautiful and sheltered spot.

Temperature—Winter.—The temperature of Craigard, Lamlash, can be given exactly, as alongside of it is a coast-guard station where this is recorded daily at 6.30 a.m. and 4 p.m., the hours in mid-winter of maximum and minimum temperature. Here the greatest cold last winter (1894-95) was on the morning of 9th February, when the thermometer fell to 22.° It was probably a degree lower in the winter of 1880-81, but a record was not then kept. At the Queen's Park, Glasgow, temperature recorded in 1880-81 was 2° lower than in 1894-95, having been at zero, whilst last winter it was 2° above zero. All the gardens have, probably, nearly the same temperature, except that of Brodick Castle, which must be several degrees lower; but the difference of the places lies more in shelter than in mildness.

Temperature—Summer.—The summer temperature of Arran is higher than might have been expected. In the coldest weather in winter the temperature at Lamlash is 12° higher than at Girvan, the warmest place in Ayrshire; and 20° higher than at the Queen's Park, Glasgow. But the temperature of summer in Arran is little below that of either of these places. Mr. Whitton, superintendent of the public parks, Glasgow, informs me that the highest shade temperature at the Queen's Park (144 feet above sea-level) in the summer of 1894 was on 1st July, when it reached 79°. The temperature of Lamlash on the same day, at 4 p.m., was only 3° lower. In the previous year the highest shade temperature at the Queen's Park, Glasgow, was 74°, while at Lamlash, at 4 p.m., it was 73°, only 1° degree lower. In 1894, at Lamlash, it reached on one occasion at noon 114° in the sun.

PALMS.

It is highly interesting that one species of palm, *Chamærops excelsa*, which in its native countries of China and Japan attains the height of 30 feet, has proved perfectly hardy in Arran and in the sea-lochs of the Clyde.

I. Chamærops excelsa.—1. Ardchapel, near the water, Gareloch. Planted about 1866. In the spring of 1896, height 8 feet 3 inches; girth, 3 feet 9 inches; length of leaf-stalk, 2 feet 8 inches; breadth of lamina, 4 feet 2 inches. Bloomed in 1881 and onward.

2. Craigard, Lamlash. Planted 1886. Height of stem, 3 inches; girth, 1 foot; length of leaf-stalk, 8 inches; breadth of lamina, 2 feet 6 inches. Untouched. Did not grow in height until six years after planting.

3. Cromla, Corrie. Planted 1892. Grows at the same rate as No. 2. Untouched.

II. C. humilis (Gibraltar Palm).—The rock is covered with it. The wild monkeys eat the fruit. Planted 1892. Leaves injured, 1895. Died the following year.

III. Corypha australis.—Cromla, Corrie. Planted 1874. Lived for several years, but made no progress.

Planted by Mr. Fullarton at Pirn Mill, west side of Arran. Three years old in 1896.

IV. Pritchardia filifera.—Cromla, Corrie. Did not succeed.

TREE-FERNS, Etc.

Arran takes the first place in Britain for a tree-fern growing in the open air without protection of any kind to soil, stem, or crown—not even moss to its stem.

I. Dicksonia antarctica (Great Bush-Fern of Australia). —Cromla, Corrie. Sown 1865. Planted 1867. In 1871, fronds 3 feet by 1 foot 4 inches. In 1875 the plant changed its habit, and instead of producing about half a dozen fronds in spring and almost an equal number in autumn, it nearly doubled the spring fronds, while few were sent forth in autumn. In a year or two after this change, spores were produced. In 1892 spores were sent to Edinburgh Royal Botanic Garden, from which plants were raised, one of which is now growing on the north side of Cromla House; the original plant being on the south side, and thus in a much warmer situation.

1894. Height of stem, 2 feet; girth, 2 feet 10 inches at 2½ feet. Fronds, 7 feet 3 inches—from 17 to 19 produced each year, forming with those of previous years a magnificent crown of between 30 and 40 leaves.

1895. All the fronds killed, as also all the frond-buds, excepting one. This one, however, was perfectly sound, and became a well developed frond. By midsummer others shot forth, and the fern speedily recovered its former grandeur. Only one bud, however, was a narrow escape, as one degree more of frost would probably have destroyed it also, and the plant would have been killed. The minimum temperature that the plant will stand in Arran has thus been ascertained; and in future, in a winter of frost equal to that of last, and especially if of as long continuance, the plant ought to receive a little protection. From what, however, this paper records regarding the increased hardiness of eucalypts raised from Scottish seed, it may be hoped that some of the tree-ferns raised at the Royal Botanic Garden, Edinburgh, from Arran spores will be hardier than their parent, and that in a third or fourth generation such hardiness will be obtained, and the plants will become so acclimatised that the sea-coast dells of Arran will be adorned with tree-ferns well nigh as luxuriant as those which now grace the islands of New Zealand.

II. DICKSONIA SQUARROSA (Black-stemmed Tree-Fern).—This plant originally grew near Canterbury, New Zealand. In 1878, when its stem was 4 inches in height, it was brought to this country, and the following year planted at Cromla, Corrie. Whether from being in a colder situation than the Great Tree-Fern,—for it grew in a sheltered corner at the *north* side of the house, while the other occupies a similar situation at the *south*,—or that the plant is itself more delicate, it always suffered more from frost than the other, more frequently losing its fronds.

1894. Height of stem, 1 foot 10 inches; girth, 1 foot 11 inches. Never bore spores. Killed last winter.

III. CYATHEA DEALBATA (Silver Tree-Fern). Planted 1875. Uninjured by the following winter. Was stolen in the winter of 1876–77.

IV. CYATHEA MEDULLARIS (Pithy Tree-Fern).—Planted 1878. The following winter was decidedly severe, but, protected by a heap of leaves and a heavy fall of snow, the fern came up fresh in spring. The next winter was very severe, and no protection of leaves having been given, and there being little snow, the fern was killed. It would stand if protected in winter by a heap of hedge cuttings.

V. TODEA SUPERBA (Moss Fern).—Planted 1879. Is in good health, and with a little attention would grow luxuriantly.

VI. TODEA HYMENOPHYLLOIDES (Filmy Moss-Fern).—Planted 1879. Grew luxuriantly, but died the winter before last through the crown having become bare.

VII. TRICHOMANES RADICANS (Killarney Fern).—Planted 1879. Throve for many years. Was at length killed by a cart of lime being emptied and allowed to remain upon it. This was the more to be regretted, as it was an offshoot of the native plant found between Corrie and Sannox in 1863. I am happy to be able to add that Cromla is still to have a native plant,—an offshoot of one found on the opposite side of Arran by Mr. Robert Kidston, F.G.S. He found two plants, took one and left the other.

PALM-LILIES.

I. CORDYLINE AUSTRALIS (Blue-seeded).—Sown 1872. Planted at Cromla 1874. 1895, height, 22 feet 8 inches; girth, 1 foot 11 inches; at base, 3 feet 3 inches. Bloomed and bore seed 1890.

Ardchapel, Gareloch. A large plant cut to the ground last winter.

II. CORDYLINE VEITCHII.—Brought from Canterbury, New Zealand, in 1878. Planted at Cromla, 1879. Height, 20 feet; girth, 2 feet; at base, 4 feet. Bloomed 1892.

Pirn Mill and Whitefarland (west side of Arran). Sown from 1890–94. Planted 1894, '95, and '96.

III. CORDYLINE COOKII (Blue-seeded).—Brought from near Canterbury, New Zealand, in 1878. Planted at Cromla, Corrie, 1879. Is not so vigorous as the other two.

IV. CORDYLINE LINEATA. — Whitefarland. Sown 1890–93. Planted 1896. Seven plants.

These cordylines so much resemble palms that they generally receive this name, being called "Club Palms," in reference to the shape of their crown, and "Cabbage Palms," from the buds being in spring used in New Zealand and Australia for the table. This edible quality was discovered by the deer in Arran, the heart of one planted in a wood having been eaten by them. The stem of No. 2 was eaten by a goat, which resulted in shoots coming from the upper part of the wound, and stout rootlets from the under. The plant could thus be easily propagated.

None of those at Cromla appeared at first to be injured by the frost of 1894–95, though those in other parts of Arran, one at Craigard, Lamlash, not excepted, were either killed or cut to the ground. I now (Feb. 1896), however discover that serious injury has been done to two of the Corrie plants; the bark on the south side is peeling off, though that on the north is unaffected. *Cordyline Veitchii* has, however, escaped, apparently owing to being particularly sheltered from the early sun by a large araucaria. Fortunately this is the best specimen. This species is best adapted for Britain, having the thickest stem and the most compact head, and therefore better able to encounter wind.

ACACIA, AGALMA, RHODODENDRON, GREVILLEA, AND LOMATIA.

Plants of the following five species of the above genera grow vigorously as standards in Arran. At no other place in Scotland have I seen the first four growing unprotected. They are thus worthy of being placed alongside the palms, tree-ferns, and palm-lilies of Arran. The last is so little known, and so remarkable, that I have associated it with them.

I. ACACIA DECURRENS (Black Wattle, Sydney Wattle, Feather Leaf).—Craigard, Lamlash. Planted 1882. 1894, height, 12 feet; girth, 1 foot 3¾ inches; circumference of spread of branches, 37 feet.

This plant well deserves the name Feather Leaf, as its long tender leaves are beautifully pinnate. They are also of a rich green, and in every way most attractive. Till three years ago the Lamlash plant was perfect. Since then it has been declining, and last winter it died, apparently of old age. It never bloomed. It seems to require shelter and a moist soil to grow it in perfection. In the hope of obtaining bloom I planted one at Cromla, Corrie, on dry soil, and against a south wall, but it did not thrive, and at the end of two years it died. Had I been living in the neighbourhood I might have given it special attention till it was established, when it might have bloomed.

II. AGALMA TOMENTOSUM.—Craigard, Lamlash. Planted 1883. Height, 9 feet 7 inches; girth, 5¾ inches; length of leaf-stalk, 2 feet 3 inches; breadth of lamina, 2 feet 1½ inch. There are no side shoots. The leaves resemble those of a horse chestnut. It belongs to the family of Araliaceæ. Never bloomed. Untouched.

III. Grevillea robusta. — Cromla, Corrie. Planted spring of 1896. Growing vigorously.

IV. Lomatia ferruginea.— Cromla, Corrie. Planted March 1895. Made good shoots in the autumn. This plant much resembles *Grevillea robusta*, but is much darker in hue, and its fronds more spiny and robust. Mr. Fullarton, Glencairn, Greenock, drew my attention to it as growing at Levanne Castle, Gourock. He writes: "It grows alongside of the front door, and is protected by projecting eaves. The house is close to the seashore, the sub-soil gravel. It bloomed during a recent hot summer." Uninjured by winter 1894–95. Unprotected.

V. Rhododendron Gibsoni.—Cromla, Corrie. Planted 1892. Neither leaves nor flower-buds were touched by winter of 1894-95. This is one of the free growing, small leaved, large flowered (white) Indian rhododendrons. It is often seen in greenhouses. It has been a magnificent success.

The hybrid Indian tree-rhododendrons, from 10 to 14 feet in height, bloom most gorgeously at Whitehouse, Lamlash. The original species, *R. arborea*, grows at Cromla, Corrie, and at Strathwhellan, Brodick. They did not bloom till more than thirty years of age, and even since then sparingly. The most waxy of the whole, *R. Thomsoni*, blooms at Benmore, Argyllshire, and at Kelburn, Largs, and would succeed in Arran. *R. Falconeri* blooms occasionally at Row and Greenock.

EUCALYPTS IN SCOTLAND.*

"It is remarkable that, with the exception of one in the Island of Timor, one in that of New Guinea, and two in Molucca, all the eucalypts, according to Index Kewensis—two hundred and thirteen in number, are natives of Australia, including Tasmania."—Birkbeck.

As the eucalypt is a most interesting tree, it was desirable to determine the species best adapted for Great Britain. In the case of a few the climate of Arran is not sufficiently severe to test them. Assistance, however, has most kindly been given by Mr. Birkbeck, proprietor of Lochhournhead; Mr. Garrett, gardener at Whittinge-

* In the order of hardiness.

hame, Haddingtonshire; the Established and Free Church ministers at Roseneath, Dumbartonshire; Mr. Cousland, Craigandaraich, Tighnabruaich, Argyllshire; and Mr. Fullarton, Glencairn, Greenock.

Lochhournhead, as the name denotes, is at the head of Loch Hourn (lat. 57° 7′), and is surrounded by lofty mountains, average rainfall over 100 inches. Whittingehame is 384 feet above sea-level, and is three and a half miles from the sea, the sub-soil sand and gravel. The winter temperature of Whittingehame and Lochhournhead is similar, as in both the thermometer fell last year (1894–95) to zero. The cold of Roseneath and Tighnabruaich is intermediate between the mildness of Arran and the severity of Lochhournhead and Whittingehame; the lowest temperature at Tighnabruaich in 1894–95 being 17° on 9th February. The Established Church Manse at Roseneath is close to the sea, and almost on a level with it as is Craigandaraich, Tighnabruaich. The Free Church Manse at Roseneath is half a mile from the sea, and about 150 feet above it.

I. EUCALYPTUS WHITTINGEHAMEII SECUNDUS (Grown from seed matured at Whittingehame).—1. Sown 1885. Height, 20 feet. "Has not lost a leaf, though the temperature was twice at zero."—Mr. Garrett.

2. Lochhournhead. "Flowered when five years old. Largest trees about 9 feet high. Rather cut by winter 1894–95."—Birkbeck.

3. Cromla, Corrie. Planted 1896. It had stood 1894–95 as a standard at Kilmarnock. In the severest weather it had a covering of paper.

E. Whittingehameii secundus is the first eucalypt raised in Britain from home-grown seed. Regarding these seedlings Mr. Lindsay, Royal Botanic Garden, Edinburgh, wrote in 1895: "I am glad that a few seeds from the eucalypt at Whittingehame have germinated. We may expect among them types hardier than their parent." How satisfactorily this prophecy has been fulfilled appears from Mr. Garrett's statement. See Eucalypt II.

II. EUCALYPTUS WHITTINGEHAMEII PRIMUS (from Australian seed).—Sown 1845. Height about 70 feet; girth, 12 feet 5 inches, at 2½ feet. Lost all its leaves. See engravings of this tree and also of its bloom (under the name *Eucalyptus urnigera*), "Gardener's Chronicle," April 14, 1888, pp. 460 and 461. This is by much the largest eucalypt in Scotland. Leaves small. In young plants round, colour blue-green, with a whitish bloom, the bloom so engrained as to stand much exposure—much more than the abundant whitish bloom of *E. cordata*. Flowers pale yellow, in clusters of three. The Whittingehame eucalypt sprang from seed given by the Marquis of Salisbury to Mr. Balfour. It was sown in 1845. The plant was cut to the ground by the severe frost of 1860–61, but sent forth shoots from its stem.

No eucalypt has so puzzled scientific botanists as this. Several of them have sought to identify it, hence the names it has received—*E. viminalis, E. urnigera, E. Gunnii*, etc.

Sir Joseph Hooker writes regarding the eucalypts: "Their limits of variation are very wide"; and Mr. Birkbeck adds, "The Whittingehame gum may be a distinct variety; although I can see little difference between it and *E. Gunnii*." It is certainly unlike to the Arran *E. viminalis* and *E. Gunnii*, and as unlike to the Roseneath *E. urnigera*.

III. Eucalyptus Gunnii.—(The mountain variety is called Cider Gum, from the beverage made from its sap. The low ground variety is named Swamp Gum.) "Bees obtain much honey from its flower. Cattle and sheep browse on its foliage. Timber strong."—Mueller.

1. Stonefield, Tarbert. Sown 1881. Height, 38 feet; girth, 2 feet 3 inches. Uninjured.

2. Lochhournhead. "Hardly touched. The largest tree, five years old, and 15 feet in height, is full of flower-buds."—Birkbeck.

3. Craigard, Lamlash. Planted 1884. Blown down by the storm of December 1894.

4. Whiting Bay Free Church Manse. Planted 1884. Situation exposed. Leaves and twigs killed.

5. Pirn Mill and Whitefarland. Planted by Mr. Fullarton in 1895. Five plants.

IV. Eucalyptus vernicosa (Varnished leaved Gum).

1. Lochhournhead. Planted 1890. Height, 2 feet "Not even a leaf browned."—Birkbeck.

2. Whittingehame House. Height, 7 feet. Killed to within 3 feet of ground. "This most interesting species grows only on the top of Mount Fatigue, Tasmania, lat. 46°. It is far the hardiest, and the most dwarf of eucalypts."—Birkbeck.

IV. (*b*). EUCALYPTUS VERRUCOSA.—Clauchog, Lag, Arran. Planted 1890. Height, 3 feet. Killed. It grew under a tree. Is this plant distinct from *E. vernicosa?* It is mentioned by Johnson as having been introduced to Britain in 1820, nor is *verrucosa*, as given by him, a misprint for *vernicosa*, as he adds, within brackets, the translation "warted," In the Greenhouse of the Edinburgh Royal Botanic Garden there are at present (March 1896) plants labelled with these names, and the plants appear distinct, but Mr. Birkbeck informs me that *E. verrucosa* is not recognised in Index Kewensis.

V. EUCALYPTUS COCCIFERA (Coccus-bearing Gum).

1. Lochhournhead. "Several of the younger plants cut to the ground; the older trees a good deal browned. One had bloomed when five years old."—Birkbeck.

2. Whittingehame. "A plant 10 feet in height. Killed."—Garrett.

3. Stonefield, Tarbert. Sown 1881. Height, 21 feet; girth, 15½ inches. Bloomed 1895. Not much injured.

4. Arran, Lag. (Upper Clauchog, 250 feet above sea-level, and with the exception of a low wall and a thorn hedge, exposed to all the fury of the Atlantic.) Planted 1886. Height, 14 feet; girth, 1 foot 4 inches at 2½ feet. The exposed leaves killed. Has not bloomed. The exposed situation the probable hindrance.

5. Roseneath, Free Church Manse (opposite Greenock, and only five miles direct from it). Planted 1886. "Bloomed middle of June 1891, when only 6 feet 7 inches in height, and has continued to bloom every year. Height, 15 feet. Uninjured."—Rev. John M'Ewan.

6. Gadgirth, Ayrshire, on banks of River Ayr, 4¾ miles (direct) from the sea. Sown in the open border in 1881. Germinated well. The leaves of this species are generally glaucous, but those of one of the seedlings were covered on both sides with a hoary bloom, rendering them almost white. It seemed not to be so hardy as the others, grew

more slowly, and died when about 5 feet in height. It was a most desirable variety.

7. Silverbank, Whiting Bay, Arran. Planted 1890. Leaves and smaller branches killed. Silverbank is on sea-level and alongside of it. Much exposed.

8. Balinakill, Argyllshire. Planted 1884. Grew well for many years; at length blown down.

VI. EUCALYPTUS URNIGERA (Urn-calyxed Gum).—"One of the most antiseptic of all eucalypts."—Mueller.

1. Lochhournhead. Sown 1894. "Seedlings in cold frame seem as hardy as *E. coccifera*."—Birkbeck.

2. Roseneath Established Church Manse. Planted 1883. Height, 12 feet. (Was eaten, when young, both by deer and squirrels.) "Not touched in the slightest by the frost of last winter."—Rev. A. Warr, A.M.

3. Strabane, Brodick. Planted 1885. Killed by winter 1894–95. Grew in a wood among higher trees, and did not prosper.

"This tree, in its native state, seems to be strictly confined to the alpine regions of Tasmania, and probably never attains a height of over 50 feet. Leaves extremely variable and never glaucous. Flowers pale yellow, in threes. Fruit at times 1 inch long. Tree not ornamental." —Mueller.

VII. EUCALYPTUS PAUCIFLORA (White Gum, Weeping Gum, or Swamp Gum).

1. Craigard, Lamlash. Sown 1879. Height, about 25 feet (was topped lest it should be blown down): girth, 2 feet 3¼ inches. Bloomed 1890, and plants were raised from the seed in the Edinburgh Royal Botanic Garden. This is now the largest eucalypt in Arran. Known also as *E. coriacea*.

2. Cromla. Under a sweet bay. Never throve. Last winter the top suffered little, yet it died to the ground.

3. Pirn Mill. Planted by Mr. Fullarton in 1896 Sown 1895. "A handsome tree, attaining considerable size. Grows best in moist ground. Ascends to Alpine height, and shows a preference for basaltic soil."—Mueller.

In the spring of 1879 I received the seed of this species, gathered on the Blue Mountains (4100), New South Wales, and most kindly sent me by Mr. Bailey, Government Botanist, Queensland. I sowed at once. Next year, when only 9 inches in height, one of the seedlings was planted at Craigard, Lamlash. The following winter was very severe,—zero at the West End Gardens, Glasgow, and probably down to 21° at Craigard, yet not a leaf was browned. In 1886 it was 21 feet in height and 9½ inches in girth, having grown at the yearly rate of 3½ feet in height and 2½ inches in girth. Lest it should be blown over it has been twice more or less polled, yet it has continued to increase in girth by 2 inches yearly. It blooms and bears seed every year. Its seed has germinated at the Edinburgh Royal Botanic Garden. Uninjured last year. It is named White Gum from the whiteness of its bark, specially when the old bark is newly shed; Weeping Gum from its habit; Swamp Gum from the soil in which it is often seen. It grows in Australia to the height of about 150 feet.

VIII. EUCALYPTUS CORDATA (Silver Gum).

1. Craigard, Lamlash. Planted 1889. Height, 8 feet; girth, 5¾ inches. Much injured; yet some leaves fresh, even on the top branch. Has not bloomed.

2. Cromla, Corrie. Planted 1895. Height, 3 feet 7 inches.

3. Lochhournhead. "A tree planted out in 1894 when two years old was very slightly cut by winter of 1894–5, is now about 6 feet high, and growing fast."—Birkbeck.

This is a dwarf gum growing to a maximum height of 50 feet; but in poor soil it often remains shrubby, blooming and ripening seed when not more than three feet in height. In this state it is the most dwarf of all gums, except *E. vernicosa*."—Mueller. In Arran, owing to the abundant moisture, the tendency to shrubbiness has not shown itself. The species is remarkable when young for the silvery bloom upon its leaves, specially in dry weather in summer, rain washing it off. The odour of its leaves is very similar to that of the Blue Gum (*E. globulus*) and almost as powerful. It has not as yet bloomed in Arran.

IX. EUCALYPTUS RUDIS (Slender Gum).

Cromla, Corrie. Planted 1887. Height, 14 feet (to prevent the storm breaking the slender stem the tree was frequently topped); girth, 5 inches. All the leaves and branches killed; the collar also a good deal cracked by the frost. It has developed flower-buds; but somehow they have not opened. If the collar were even slightly covered, this gum would be perfectly hardy in Arran.

This is an exquisite tree, very beautiful and delicate-looking. The stem, as the name denotes, is very slender, the leaves small, of a pinky-blue shade, rendered more lovely by a slight bloom. The stem is milk-white, specially when the old bark is newly shed. It is thus a White Gum. It is thus one of the slowest in girth-growth of all the eucalypts. It has increased in girth little more than half an inch yearly. "It grows to the height of 50 to 80 feet. Bees and honey-sucking birds delight in its flowers."—Mueller.

X. EUCALYPTUS VIMINALIS (Manna Gum).

Cromla, Corrie. Planted 1874. Height, 40 feet; girth, 2 feet 7½ inches. Bloomed in 1886 and subsequent years. See fig. in Gard. Chron., 24th Nov. 1888.

This was the oldest of all the Arran gums. It proved hardy till last winter, when to my surprise it was killed to within three feet of the ground. It afterwards died. The mountain variety probably would have been uninjured. In my paper of 1886 this species is mentioned under the name *E. amygdalina regnans*, the packet of seed having been misnamed. "This is the only species of gum which yields copiously melitose manna."—Mueller.

XI. EUCALYPTUS AMYGDALINA (Almond-leaved Gum or Brown Peppermint Tree).

1. Lochhournhead. Raised from seed in 1890. "All killed by winter of 1894–95, except one growing in a gorge which was cut to the ground."—Birkbeck.

2. Cromla, Corrie. Planted 1894. Survived the following winter, but having lost all its leaves and twigs, it was pulled up by a person who thought it to be dead.

This is the most graceful of the eucalypts. The branches are weeping, the leaves small, dark green, shining, narrow-lanceolate, very like those of *E. stricta*. It is "The Queen of the Arran Eucalypts." The plant was given me by Robert Birkbeck, Esq., Lochhournhead.

Another from the same kind donor has taken its place—planted 1895. "This and the following yield much more eucalypt oils, than any other species."—Mueller.

XII. EUCALYPTUS REGNANS (Giant Gum).

1. Cromla, Corrie. Planted 1872. Grew for ten years. Was killed by being transplanted.

2. Cromla, Corrie. Planted 1892. In autumn of 1894 its height was 10 feet 5 inches. Cut to the ground.

This is the tallest tree in the world, one having been measured 415 feet in height. Regarding it and *E. amygdalina* Baron von Mueller writes: "Fresh branchlets of eucalypts, and specially of these species, should be placed daily in the bedrooms of phthisic patients, best under the bedstead, the effect being not only antiseptic, but also sedative, and to some extent hypnotic. The fresh leaves also purify the air of hospitals and unsalubrious dwellings. All eucalypts with strong-scented foliage are useful also as insecticides. By planting eucalypts parts of Rome, previously unhealthy, have been rendered most healthy."

XIII. EUCALYPTUS POLYANTHEMA (Red Box Tree). Cromla, Corrie. Planted 1886. Died 1892.

"This tree grows to the height of 150 feet. Its wood is only exceeded in transverse strength by the two ironbarks (*E. leucoxylon* and *E. siderophloia*). It differs from most eucalypts in the broad poplar shape of its leaf."—Mueller.

At Cromla it throve, but died without apparent cause. On examination the roots were found to be decayed. In Australia it grows on dry ridges and hills. The soil at Cromla though well drained, may have been too cold and wet. It was a beautiful tree. "It is more hardy than *E. globulus*."—Naudin.

XIV. EUCALYPTUS ALPINA (Alpine Gum).

1. Corrie Hotel. Planted 1884, when 2 feet in height. 1894—height, 16 feet 2 inches; girth, 1 foot. Killed.

2. Strabane, Brodick. Planted 1886. Killed.

This eucalypt is remarkable, first, for its limited natural habitat, being confined to the summit of Mount William (5600 feet, latitude 37°), the highest of the Grampian range, fifty miles north of Melbourne; second, for its bushy habit; third, as growing with much greater luxuriance in Arran than at Melbourne, Australia. At the Botanic

Gardens, Melbourne, it took twenty-five years to grow 12 feet, while the length of its leaves was only 3 inches. At Corrie Hotel, Arran, 35 yards from the sea, in eleven years it was 14 feet in height (2 feet when planted), while one of the leaves measured 9 inches × 5 inches, and weighed ¾ of an ounce. See also below as to leaves of *E. globulus*. This conforms with the fact that *Sequoia gigantea* grows much more rapidly in some places in Britain than on its native mountains of California. *E. alpina* will be tried in the south of Arran.

XV. Eucalyptus globulus (Blue Gum).

1. Stonefield, Tarbert, Lochfyne. Planted 1873. Bloomed 1878 or 1879. Died from being transplanted.

2. Stonefield, Argyllshire. Sown 1881. Height, 28 feet. Killed.

3. Craigandaraich, Tighnabruaich. Planted 1890. A few inches of the top killed.

4. Craigard, Lamlash. Sown 1874, by Mr. Paterson, at Whitehouse. Afterwards transplanted to Craigard. Girth, 3 feet 2 inches (was polled when 40 feet in height). The largest leaves were more than a foot in length, including one inch of stalk; breadth, 2½ inches. Killed. Had been blown down in 1892, and was not quite recovered.

5. Lochhournhead. "All those planted out killed."—Birkbeck.

6. Auchnames, Portencross, Ayrshire. The front of this house to its top was for years clothed with Blue Gum. Killed.

The Blue Gum from its rapid growth, great size, the excellence of its timber, the large amount of ozone generated by its leaves, the antiseptic power of its volatile oil, and the great amount of moisture absorbed by its roots fitting it for drying swamps, is one of the most important of the trees of the world. (See also note under *E. regnans*, p. 522). The following note regarding the growth of the Lamlash Gum is given by James Paterson, Esq., at the time Commissioner in Arran to the Duke of Hamilton:—"First year, 11½ inches; second, 4 feet 6 inches; third, 6 feet 7½ inches; fourth, 6 feet. Growth in four years, 18 feet 1 inch." It would, however, have been about

20 feet had the top not been injured during the fourth year. "Plants in Southland, New Zealand, raised from locally ripened seed, prove more hardy than those from seed imported from Australia."—Waugh.

XVI. Eucalyptus botryoides.—Cromla, Corrie. Planted 1896. "This is one of the most stately of eucalypts, and is remarkable for its dark-green shady foliage."—Mueller. This plant was the gift of Mr. Birkbeck.

XVII. Eucalyptus pulverulenta. — Pirnmill, 1896. Planted by Mr. Fullarton.

XVIII. Eucalyptus calophylla, E. diversicolor, E. hæmastoma, E. marginata, E. meliodora, and E. rostrata have also been tried in Arran, but all of them died before the winter of 1894–95.

SUMMARY OF FACTS REGARDING EUCALYPTS.

Whittingehame House. Temperature, 1894–95, twice at zero.

1. *E. Whittingehamei secundus* (Whittingehame seed). Uninjured.
2. *E. Whittingehamei primus* (Australian seed). Lost all its leaves.
3. *E. vernicosa.* Killed to 3 feet from the ground.
4. *E. coccifera.* Killed.

Lochhournhead. Temperature, 1894–95, at zero.

1. *E. vernicosa.* Untouched.
2. *E. Gunnii.* Hardly touched.
3. *E. Whittingehamei secundus* (Whittingehame seed). Some branches browned.
4. *E. coccifera.* Some of the younger plants cut to the ground.

Stonefield, Tarbert (Loch Fyne).

1. *E. globulus.* Killed. (Previously injured by storm.)
2. *E. Gunnii.* Uninjured.
3. *E. coccifera.* Not much injured.

Arran. 10° of frost at Lamlash in 1894–95.

1. *E. pauciflora.* Lamlash. Untouched.
2. *E. coccifera.* Upper Clauchog, Lag. Lost its exposed leaves and twigs.
3. *E. cordata.* Lamlash. Some branches killed.

4. *E. rudis.* Corrie. Killed to stem.
5. *E. amygdalina.* Corrie. Leaves and twigs killed.
6. *E. viminalis.* Corrie. Killed.
7. *E. regnans.* Corrie. Killed to the ground.
8. *E. alpina.* Brodick and Corrie. Killed.
9. *E. Globulus.* Killed. Had been blown down two years previously, and, though raised, was not fully recovered.
10. *E. calophylla*, *E. diversicolor*, *E. hæmastoma*, *E. marginata*, *E. meliodora*, and *E. rostrata.* Killed by ordinary winters.

CRAIGANDARAICH, Tighnabruaich, Argyllshire.
E. Globulus. Only lost its top.

ADDITIONAL EUCALYPTS AT LOCHHOURNHEAD.

(Alphabetically arranged, excepting first two.)

1. *E. angustifolia.* Planted 1894. Unhurt by 1894-95. Had Willesden canvas around it.
2. *E. obliqua.* Sown 1894. All killed in greenhouse except one.
3. *E. acervula.* Killed, 1894–95, in greenhouse.
4. *E. botryoides.* Killed in greenhouse.
5. *E. cinerea.* "Whitish bloom," allied to *E. pulverulenta.* Killed in greenhouse.
6. *E. citriodora* (Lemon-scented). Killed in greenhouse.
7. *E. colossea* (Native name, Karri). "One of the grandest trees in the world, and as hardy as *E. Globulus.*"—Mueller. Killed in greenhouse; called also *E. diversicolor.*
8. *E. cornuta.* Killed in greenhouse.
9. *E. corymbosa.* Loves dry soil. Killed in greenhouse.
10. *E. crebra.* Killed in greenhouse.
11. *E. cosmophylla.* Killed in greenhouse.
12. *E. eugenoides.* Killed in greenhouse.
13. *E. gigantea.* Killed in greenhouse.
14. *E. goniocalyx* (Spotted Gum). Killed in greenhouse.
15. *E. hæmastoma* (Bloody-mouthed). "Suitable for sandy soil, which few eucalypts are."—Mueller. Killed in greenhouse.

16. *E. Lehmanii.* Killed in greenhouse.
17. *E. leptophylla* (Uncinata). Killed in greenhouse.
18. *E. longifolia* (Woolly Butt). Killed, 1894–95, in greenhouse.
19. *E. marginata* (Jarrah, Mahogany Tree). Killed in greenhouse.
20. *E. microcorys.* Killed in greenhouse.
21. *E. occidentalis.* Killed in greenhouse.
22. *E. piperita.* "Foliage rich in volatile oil." Killed in greenhouse.
23. *E. Preissiana.* Planted 1894. Killed.
24. *E. pulverulenta* (Whitish bloom). Killed in 1894–95 in greenhouse.
25. *E. redunca.* Killed in greenhouse.
26. *E. resinifera* (Red Mahogany). Killed in greenhouse.
27. *E. Risdoni.* Allied to *E. pulverulenta.* Killed in greenhouse.
28. *E. robusta* (Swamp Mahogany). Killed in greenhouse.
29. *E. rostrata* (Red Gum). "Rather more hardy than globulus." Killed in greenhouse.
30. *E. saligna.* Killed in greenhouse.
31. *E. siderophloia.* White iron bark. Killed in greenhouse.
32. *E. Staigeriana.* "Foliage delightfully fragrant. Oil distilled from it has the fragrance of verbena (*Lippia*)." Killed in greenhouse.
33. *E. Stuartiana.* Killed in greenhouse.
34. *E. teriticornis.* Killed in greenhouse.
35. *E. virgata* (*Sieberiana*). Killed in greenhouse.

Regarding the greenhouse losses, Mr. Birkbeck writes: "I believe, in the winter of 1894–95, the pots in the greenhouse, which is unheated, were frozen, as some seedlings of *E. hæmastoma* in a box survived. Possibly the plants had been watered immediately previous to the frost."

"There are about twenty species of eucalypts planted out at Lochhournhead; but those not already mentioned are not here named, as they have not yet encountered a severe winter. *E. coccifera*, *E. urnigera*, *E. Whittinge-*

hameii, and a doubtful species raised from seed received from Tasmania under the name of *E. Gunnii*, have been planted on the hillsides in considerable numbers."—Birkbeck.

ADDITIONAL TREES AND SHRUBS IN ARRAN.

Trees.

I. Araucaria imbricata.—1. Brodick Castle. Planted 1841? Girth, 4 feet 11½ inches.

2. Cromla, Corrie. Planted 1861. Height, 33 feet; girth, 2 feet 6 inches (beautiful example).

II. A. excelsa (Norfolk Island Pine).—Lamlash 1882. Died in winter. Will be tried in the south of Arran.

III. Cunninghamia sinensis (Broad-leaved Chinese Fir).—Brodick Castle Garden. Planted 1858? Height, 10 feet. Has never grown well; but might succeed at Cromla or in the south of Arran.

IV. Pinus insignis.—Planted at Brodick Free Church Manse, 1894; Corrie Free Church, 1896. This is the most beautiful in hue of all pines.

V. Platanus orientalis (Oriental Plane).—On bank above Brodick Castle Low Garden. Planted 1848? Girth, 4 feet 2 inches at 4½ feet. Greatly broken by the high winds of last winter.

VI. Picea morinda (Morinda Spruce or Himalayan Weeping Pine).—Brodick Castle Grounds. Planted 1848? Girth, 4 feet 2 inches. In perfect health—very beautiful. "At Cultzean Castle, Ayrshire, it grows pretty well; but is browned on the side towards the sea."

VII. Quercus Suber (Spanish Evergreen Cork Tree).—Brodick Castle Park. Planted 1848? Growing well. Girth, 3 feet 2 inches at 4 feet 2 inches. Lost in 1894–95 all its leaves and small twigs; but otherwise not injured.

VIII. Sequoia gigantea (Mammoth Tree).—Brodick Castle Gardens. A large tree killed by the frost, yet *Cunninghamia sinensis*, growing near to it, though considerably injured, survived.

IX. Thuja dolobrata (Japan Hatchet-leaved Arbor Vitæ).—Cromla. Planted 1871. Height, 12 feet 6 inches;

girth, 11½ feet. "The favourite evergreen in Japan. Used for avenues. Delights in shaded and rather moist situations."—Mueller.

Shrubs.

I. Acacia melanoxylon.—Grew perfectly for years. Cut to the ground last winter. Now dead, 1896. Two were lost by being blown down.

II. Ampelopsis sempervirens (Evergreen Virginian Creeper).—Cooper Lodge, Whiting Bay. Luxuriant.

III. Arundinaria falcata (Indian Ningala Bamboo).—Mr. Clark's, South End. 1896.

IV. Azalea amoena.—Cromla. Planted 1882. Circumference of branches, 10 feet. Blooms most abundantly.

V. Brachychiton diversifolium (Bottle Tree).—Craigard, Lamlash. First planted 1888; second planted 1891. Both died during the first winter. Might succeed on drier soil.

VI. Buddleia globosa (Chilian Orange Ball Tree).—Whiting Bay, Lamlash (19 feet high), Brodick, etc. All cut to near the ground.

VII. Camellia alba plena.—Blooms.

VIII. Casuarina equisetifolia (Swamp Oak of Australia). Brodick Castle High Garden. Planted 1882. Grew well for several years.

IX. Ceanothus.—Cooper Lodge, Whiting Bay. Several kinds. Bloom abundantly.

X. Choisya ternata (Mexican Orange Flower). Cooper Lodge, Whiting Bay. Uninjured. Blooms abundantly.

XI. Convolvolus Cneorum.—Cooper Lodge, Whiting Bay. Blooms. Uninjured.

XII. Cytisus albus (Portugal White Broom).—Cromla, Corrie. Purchased under the name *Sparto-cytisus durus albus.* Planted 1874. Against a wall—height, 17 feet; girth, 6 inches. Bloomed most abundantly. Died in 1896, seemingly of old age.

XIII. Desfontainea spinosa (Colombia Flowering Holly).—Cromla. Planted 1865. Height, 9 feet 10 inches; girth, 1 foot 5 inches (2 inches from the ground); circumference of branches, 21 feet. Blooms most freely, June and onward. Three flowers still, 10th February 1896. Uninjured.

XIV. Deutzia gracilis.—Blooms abundantly. Uninjured.

XV. Edwardsia grandiflora.—Craigard, 1890. Died 1894, probably from an accident.

XVI. Elæagnus reflexa japonica variegata.—Cromla. Planted 1878. Height, 7 feet. Has not bloomed. Uninjured.

XVII. Erica arborea.—Brodick Castle High Garden. Planted 1848? Height in 1894, 8 feet 4 inches; circumference of branches, 15½ feet. Bloomed most profusely. "Blown right out of root by the storm of December 1894."

XVIII. Escallonia rubra, var. alba (Chilian Gum Box).—Brodick Castle High Garden. Planted 1858? Height, 9½ feet. Blooms freely. Uninjured.

XIX. Eurya latifolia.—Strathwhellan, Brodick. Planted 1887. Height, 2½ feet; diameter, 3½ feet. Has not bloomed.

XX. Fuchsia magellanica.—Introduced to Arran in 1833 by Mrs. Dennistoun. One at Whitehouse, Lamlash, trained against an old building. "Height in 1845, 18 feet; width, 22 feet." See Natural History of Arran, p. 260.—Rev. Dr. Landsborough. People went to Arran to see this plant.

XXI. Fuchsia microphylla.—Cromla. Planted 1878. Blooms abundantly, specially late in Autumn, continuing in flower till December or January. Slightly injured.

XXII. Griselinia macrophylla (lucidia).—Craigard. Planted 1889. Untouched. *G. littoralis* blooms at the Rev. Dr. Watson's, Largs, and at Levanne Castle, Gourock.

XXIII. Jasminum fruticans.—Cromla. Planted 1870. Blooms freely. Uninjured.

XXIV. Laurus nobilis (Sweet Bay).—Cromla. Planted–? Height, 3 feet 4 inches. Uninjured.

XXV. Morus (Russian Mulberry).—Brodick Castle Garden. Planted 1895.

XXVI. Myrtus communis.—1. Cromla. Planted 1862. Height, 11 feet. A standard bloomed yearly most freely. Was cut down in 1894, because it darkened a window. Leaves a little injured by frost.

2. Brodick Castle High Garden. Trained on wall. Height, 9½ feet; spread of branches, 20½ feet.

XXVII. PHOTINIA SERRULATA (Chinese Medlar).—Cromla. Planted 1879. Height, 12 feet. Has not bloomed. Leaves crimson when young, and when old the same. Uninjured.

XXVIII. PHILLYREA LATIFOLIA (Broad-leaved Jasmine Box).—Cooper Lodge. Uninjured.

XXIX. PITTOSPORUM EUGENOIDES ?—Black stems with beautiful translucent veins on the leaves. Craigard. Planted 1886. Height, 8 feet. Uninjured till this year. Killed by last winter. Did not bloom. Will be tried in the south of Arran.

XXX. PITTOSPORUM RALPHII.—Craigard. Planted 1886. Height about 10 feet. Blooms. Uninjured.

XXXI. PITTOSPORUM UNDULATUM.—Brodick Castle High Garden. Planted 1886. Uninjured.

XXXII. ROSA BANKSIÆ.—Cromla. Planted 1875. Height, 20 feet. Developed flower-buds (white) in 1894; but June being cold and wet they did not expand. Uninjured.

XXXIII. ROSE MARECHAL NIEL. — Cooper Lodge. Blooms abundantly. Uninjured.

XXXIV. ROSA POLYANTHEMA.—Cooper Lodge. Blooms abundantly. Uninjured.

XXXV. RUBUS SQUARROSUS (New Zealand Bush Lawyer).—Cut-leaved variety. Brodick Castle High Garden, on wall. Planted 1883. Height, in 1894, 7½ feet; diameter of branches, 6 feet. Cut to the ground.

XXXVI. SCHINUS MOLLE (Brazilian Pepper Tree).—Craigard. Planted 1887. Lived for years, but grew little. Died two years ago. Will be tried in the south of Arran.

XXXVII. YUCCA.—Whitefarland. Planted 1896 by Mr. Fullarton. Seed gathered in 1892 in Botanic Garden of Adelaide, Australia.

XXXVIII. XANTHORRHOEA ARBOREA (Australian Grass Tree).—Craigard. Planted 1886. Lived till this year; but did not grow. Now dead. Was in wettish soil. Might succeed in the south of Arran.

THE SOUTH OF ARRAN.

The south of Arran is mild. At the Island of Pladda, half a mile in front, the lowest temperature for the last thirty years was in January 1881, when it fell to 28°. The bay betwixt Kildonan Castle and Bennan Head is the mildest and sunniest portion of Arran, for it is most open to the ocean, and lies full to the sun at noon. It is also protected on the north by mountains, and immediately above by steep and high cliffs. As yet its fitness for Australian and other foreign plants is untried. I rejoice it is to be so no longer, as George Clark, Esq., who is building Drumlabarra House in the centre of the bay, sympathises with such experiments. To give a good start, the following plants from the Edinburgh Royal Botanic Garden have most kindly been gifted by Professor Bayley Balfour:—

1. *Brachyglottis repanda.*
2. *Camellia Thea.*
3. *Coprosma rhamnoides.*
4. *Dicksonia antarctica.* An Arran seedling.
5. *Eucalyptus vernicosa.*
6. *Eucalyptus verrucosa.*
7. *Eriobotrya* (*Photinia*) *japonica.*
8. *Illicium floridianum.*
9. *Mandevillea suaveolens.*
10. *Plagianthus betulinus.*
11. *Tecoma Smithii.*
12. *Weinmannia racemosa.*
13. *Widdringtonia Whytei.*

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.*

* The Meteorological and other Reports communicated under this heading will in future be published elsewhere.

MEETING OF THE SOCIETY,

Thursday, March 12, 1896.

Dr. AITKEN, President, in the Chair.

Mr. SYMINGTON GRIEVE exhibited specimens of *Picea excelsa* with galls of *Chermes Abietinis,* and Mr. STEWART MACDOUGALL sketched the life-history of the insect, and exhibited it in other stages of its life.

Professor BAYLEY BALFOUR exhibited *Primula officinalis* with trimerous flowers.

From the Royal Botanic Garden the following plants in flower were exhibited:—*Odontoglossum dicranophorum, Lælia glauca, Vanda parviflora, Oncidium pubes, Dendrobium moniliforme, D. Cassiope, Colax jugosus.*

The following papers were read:—

RECENT DESTRUCTION OF SPRUCE AND PINE FORESTS BY LIPARIS MONACHA AND FIDONIA PINIARIA. Illustrated by a Series of Lantern Slides. By R. STEWART MACDOUGALL, B.Sc.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

Issued November 1896.

MEETING OF THE SOCIETY,

Thursday, April 9, 1896.

Dr. AITKEN, President, in the Chair.

Mr. TAGG exhibited from the Museum of the Royal Botanic Garden a glass jar containing a dissection of the inflorescence of *Juglans regia*, to illustrate a method of preparation of Museum jars by the cementing together of plates of glass. The process is briefly this:—Pieces of glass to make the sides of the vessel are prepared, the edge being carefully smoothed, and then these are smeared with a cement made in the following way:—1 oz. Nelson's amber gelatine is soaked in water for twelve hours, the water not absorbed by the gelatine is then poured off and the softened gelatine melted over hot water. To the melted gelatine is now added 0·5 grammes of bichromate of potassium and 10 drops of glycerine. The whole is well stirred together. The cement is applied hot.

In cementing the plates of glass care must be taken to have the edges even, any uneveness of surface is likely to lead to the cracking of the glass when the cement hardens.

Mr. Tagg also explained that for fixing to glass for exhibition, in spirit, gelatine is preferable to photoxylin in the case of bulky and heavy subjects. The difficulty in applying the gelatine consequent on its rapid setting in spirit being got over by the use of a pipette with a hot-water jacket.

Professor BAYLEY BALFOUR informed the Society that the magnificent collection of species of *Masdevallia* brought together at Newbattle by the Marquess of Lothian had been acquired for the Royal Botanic Garden. A number of specimens from the collection were exhibited. A large series of species and hybrids of *Primula* in flower from the Royal Botanic Garden were also exhibited.

Issued November 1896.

The following papers were read:—

An attempt to Classify Common Plant Pigments, with some Observations on the Meaning of Colour in Plants. By Miss M. J. Newbigin, B.Sc. (Lond.).

It must be obvious to all who have followed the contemporary literature of pigments, that although there has been in many cases a lavish amount of experimentation, there is as yet little definiteness of knowledge. This is especially true in the case of the pigments of plants, where, for example, we find that the literature of chlorophyll is, even to a German eye, " Sehr umfangreiche," and yet exact results are few. Apart, however, from the general tendency to assume that all plant pigments are derivatives of chlorophyll, and most animal ones derivatives of hæmoglobin, there has undoubtedly been accumulated a mass of facts on the subject of chromatology. The present paper is an attempt to collect and systematise the known facts as to the pigments of plants, and to view them from the standpoint of the biologist rather than from that of the botanist proper.

We will take up first the lipochrome pigments, not on account of their functional importance, for of this nothing is known, but because they are common, readily recognised, and form a convenient starting-point. The lipochromes, or fat pigments, are known through the researches of Kühne (10), Krukenberg (9), and others, and are characterised by the combination of the following characters:—They are insoluble in water, but are soluble in alcohol, ether, chloroform, benzol, turpentine, carbon disulphide, etc. In the dry condition they are coloured blue by the addition of concentrated sulphuric or nitric acid. They are very readily destroyed by light, yielding cholesterin or some similar body. Their colour varies from yellow to red; they contain only carbon, oxygen, and hydrogen, and are usually found associated with fats. They usually give a spectrum of one, two, or three bands in the blue or violet. Although the above characters enable us to recognise the lipochromes very readily, their chemical nature is as yet very insufficiently known, and the ten years which have elapsed since Krukenberg's work have not advanced our knowledge much. They are probably of fatty nature. Good examples of lipochromes are the colouring matters of the feathers of the ibis or cardinal bird, and of the common carrot. As compared with animal lipochromes, those of plants appear to be characterised by a greater readiness to crystallise. Thus Krukenberg never succeeded in crystallising tetronerythrin, the animal lipochrome mentioned above, with which he worked much; and among the vast number of animal lipochromes, that of the yolk of hens' eggs seems to have been almost the only one crystallised. Among plant lipochromes, on the other hand, that of the carrot occurs naturally in crystals, while almost every worker with chlorophyll has obtained one of the associated lipochromes in a crystalline condition. This result is, perhaps, due to the fact that the lipochromes of plants occur in a purer condition than those of animals, but comparative investigations are few. Another peculiarity which may probably one day prove of service in the classification of lipochromes, is the reaction with iodine in potassium iodide. With this reagent some, but not all the lipochromes, are coloured a bluish green, the reaction being certainly much commoner with vegetable lipochromes than with animal. Thus Mr. Cunningham and Dr. MacMunn (3) who investigated the lipochromes of twenty-two species of fishes, distributed in fifteen genera, did not succeed in a single case in obtaining a definite colouration with iodine, although in some cases they obtained the reaction with Schultze's fluid. On the other hand, in the case of the lipochromes of Fungi, a greenish colour with iodine is usually readily obtained (see Zopf in Schenk's Handbuch der Botanik, vol. iv.), and this is generally true of plant lipochromes. It is possible that this again is an indication that the lipochromes of plants usually occur in a purer condition than those of animals.

First, as to the distribution of the lipochromes of plants. Lipochromes are associated with true chlorophyll in the chlorophyll bodies of the green Algæ, the higher cryptogams, and phanerogams. Phycoxanthin, an apparently well-defined lipochrome, occurs in the Phycochromaceæ, the Diatomaceæ, and the Phæophyceæ. Chlororufin, which is apparently of lipochrome nature, is found in the Chlorophyllaceæ. All these lipochromes occur in close association with chlorophyll, but without this direct association we have many of the pigments of Fungi, the carotin of the carrot, and the red and yellow colouring matters of many fruits and flowers. In almost all these instances, except in Fungi, the lipochrome either occurs in crystals, or associated with differentiated portions of protoplasm, the chlorophyll bodies, or chloroplasts. The lipochromes of Fungi occur as oily drops in the protoplasm. Recently Schrötter-Kristelli (16) has announced that in the aril of *Afzelia cuanzensis* a lipochrome, which he regards as identical with that of the carrot, occurs dissolved in a fatty oil, and not in connection with chromoleucites. In addition to the above, lipochromes are the cause of the colour of many autumnal leaves. The origin of such lipochromes is apparently always from the lipochromes of the chlorophyll corpuscles, but the lipochrome colour may be masked by other pigments.

In consequence of the frequent association of lipochromes with the chlorophyll corpuscles of plants, there has been a general tendency to regard the former as derivatives of true chlorophyll, but of this there is no direct evidence. There seems no doubt that chlorophyll contains nitrogen, while all the lipochromes are non-nitrogenous. Again, lipochromes occur in abundance in Fungi, and in animals, where an origin from chlorophyll is impossible. On the other hand, whatever future research may disclose as to the nature or origin of chlorophyll, it is at present a false simplification to assume that because it is usually found in association with a fatty pigment, it necessarily arises from this pigment.

So far, we have dealt with more or less well-established facts, but it is when we attempt to discriminate between the various lipochromes of phanerogams, that we enter upon controversial matter. Since Hansen first performed the experiment, now repeated in every laboratory, of separating the lipochrome of green leaves from the chlorophyll proper, the association of lipochrome and chlorophyll has been almost universally admitted. The point of dispute is whether there is only one or several such lipochromes. Hansen's experiment was to extract green leaves with alcohol, and shake up the extract with benzol. If the experiment be performed with care, a separation into two layers takes place, the benzol taking up the chlorophyll-green, and leaving the yellow lipochrome in the alcohol. To this lipochrome the name of chlorophyll-yellow, or xanthophyll, has been given. As Dr. Schunck (14) points out, however, it is impossible by such means to produce a chemically pure product, so that conclusions based only upon the results of the investigation of this alcoholic solution are not absolutely reliable. Be this as it may, the beauty and simplicity of the experiment have determined its persistence, and xanthophyll has found its way into all the more recent text-books. The probable existence of another lipochrome in connection with the chlorophyll of leaves, is shown by the following experiment, which is almost as simple. Boil green leaves with strong alcohol and filter hot, on standing in the dark the filtrate deposits a dark greenish precipitate, consisting of fats, impurities, a lipochrome, and a greater or less amount of (modified) chlorophyll-green, according to the time the solution is allowed to stand, and the degree of its concentration. The lipochrome frequently occurs in the form of reddish crystals. As might be assumed from its method of precipitation, it is little soluble in cold alcohol, but is readily soluble in chloroform, and can be easily obtained in pure crystalline condition. This experiment has been performed by many investigators, notably by Macchiati and Schunck, but usually only as part of the method of chlorophyll purification. Macchiati (11) washed his leaves with alcohol and ether before extracting with alcohol, and thus obtained on cooling a precipitate of nearly pure lipochrome (mixed with some modified chlorophyll-green?). He then removed the lipochrome by filtration, and succeeded in obtaining crystals of so-called "pure chlorophyll" by concentrating the filtrate. These crystals, when dissolved in alcohol, give Hansen's reaction with benzol, and undoubtedly consisted of a mixture of (modified) chlorophyll-green and xanthophyll. Schunck (15) allowed the hot alcoholic extract to stand until both the lipochrome and chlorophyll-green were precipitated, and then rejected the pale filtrate with its contained xanthophyll, and proceeded to separate the lipochrome and chlorophyll-green. This he did by treating the precipitate with a solution of caustic soda in boiling alcohol, which he says dissolves only the chlorophyll-green. The remaining lipochrome was purified by successive crystallisation from chloroform, and by treatment with hot glacial acetic acid to remove fatty impurities. This substance is the erythrophyll or chrysophyll of many authors, is said by Arnaud (1) to be indentical with carotin, and when pure forms crystals of "orange-red colour and golden lustre" (Schunck). It is very readily destroyed by light, is much more readily dissolved by benzol or chloroform than by alcohol, and gives a spectrum of two bands in the blue region. Although this substance can be so readily obtained from green leaves, there is some doubt as to whether it actually exists as such in the leaves, or whether it is not formed during the process of extraction. Schunck (14) opposes the theory of its existence on account of the absence of its bands in the ordinary spectrum of chlorophyll. For a converse reason he considers that it is present in some autumnal leaves. As, however, the spectrum of the same lipochrome frequently differs considerably according to the solvent used, conclusions based on isolated spectroscopic observations are not of very great value.

The lipochromes of autumnal leaves are apparently the same as those of green leaves, and do not therefore require separate consideration. The removal or destruction of the true chlorophyll in such leaves allows the lipochromes to become visible, and their slow modification gives rise to many of the brilliant tints of autumn.

FLOWERS AND FRUITS.

The lipochromes of flowers and fruits arrange themselves in two series, which apparently correspond to the xanthophyll and erythrophyll of leaves. The red and yellow pigments, in the case of flowers and fruits, are called respectively anthoxanthin and xanthin, though their distinct nature must be regarded as doubtful. They are always associated with chromoplasts, which, as is now well-known, frequently originate from modified chlorophyll corpuscles.

Looking generally at the lipochromes of phanerogams, we may say that, while little is known of individual pigments as a whole, they resolve themselves into two series. The one includes orange to orange-red pigments, which are little soluble in cold alcohol, but are readily soluble in chloroform and benzol. Of these, carotin is the type. The other series includes yellow pigments, which, according to Courchet (2) are not readily crystallisable, and which are readily soluble in cold alcohol, but less soluble in benzol and chloroform. Of these, xanthophyll, if it be a distinct pigment and not a mixture, is the type. As to the relations of the two series it is not yet possible to say much, but it is not improbable that further investigation will show that the members of one series can be readily transformed into members of the other, and that this occurs both in the living tissues, and as a result of chemical reagents. How far the deepening of colour, frequently observable when yellow lipochromes are treated with solutions of caustic soda or potash, corresponds to such a change, must also be left to be decided by further investigation. In this connection it may be noted that Courchet (2) separates the two lipochrome series named above very widely, on the ground that the orange series frequently occurs naturally in a crystalline condition, and can be readily crystallised artificially, whereas the yellow series is always amorphous. From his figures, however, there seems some reason to believe that his orange crystals were in part cholesterin, coloured with unaltered lipochrome, and until we have extended and exact investigations on the subject it seems better to regard the lipochromes as a natural group.

As to the meaning of the lipochromes in metabolism, and their direct origin, we unfortunately, as yet, know nothing. Recently, Schrötter-Kristelli (16) has put forward a hypothesis upon the subject, which has been adopted and elaborated by Simroth (17). Schrötter-

Kristelli proposes the name of Lipoxanthin for the lipochromes of plants, and takes carotin as the type of these; the necessity for a new term for plant lipochromes, while their relation to those of animals has not been worked out, can hardly, however, be said to be quite apparent. Further, he puts forward the view that while lipochromes (lipoxanthins), which occur in oily drops in the protoplasm, function as reserves, those associated with chromoleucites are of extreme importance as carriers of oxygen, the process not being accompanied by any destruction of the pigment. Simroth adds to this the suggestion that chlorophyll is merely an oxidised lipochrome, and that the colours of flowers and fruits are due to a deoxidation of chlorophyll. The last suggestion is just the common one of the connection between chlorophyll and lipochrome, and of the first we can only say that it seems to be premature as yet.

Zopf (21 and 22), who of late has worked much at the pigments of plants, also inclines to the opinion that the lipochromes function as reserves, and instances the case of the disappearance of the lipochrome and the associated fat during the germination of the spores and gemmæ of various species of *Pilobolus*. The fact is of the same nature as that of the disappearance of fat and pigment from the muscles of the fasting salmon, and cannot be regarded as a conclusive proof that the lipochromes are in themselves really reserves,—indeed, speculation as to their function is perhaps better postponed until their chemical composition is known.

As to the classification of the lipochromes, Zopf, who prefers the term carotin, proposes the following:—

1. Eucarotins, hydrocarbons which do not form compounds with the alkalies or alkaline earths, and which in alcohol, ether, and petrol-ether form yellow solutions.

2. Carotinines, oxygen-containing bodies which form compounds with the alkalies and alkaline earths, and which in alcohol, ether, and petrol-ether form red solutions.

It will be observed that this classification agrees with that proposed by Courchet in separating the two series very widely, in this case on the ground of different chemical composition. In working at the pigments of the Norway lobster, however, I have found that the red pigment of the skin gives a reddish orange solution in alcohol, and a pure yellow one in petrol-ether, while it undoubtedly forms a sodium compound. It thus falls into neither of Zopf's classes. So far as my own experience goes, the question as to the formation of sodium compounds is much more complicated and more dependent upon the method employed than is apparent from Zopf's statements, and, in consequence, should not be too rashly employed for purposes of classification. For purposes of convenient reference the following scheme of the common lipochromes of plants may be suggested; it is chiefly based upon the solubilities in the various solvents as described above, and, therefore, can be readily refuted or confirmed in practice.

CLASSIFICATION OF PLANT LIPOCHROMES

All give in dry state blue colouration with H_2SO_4	1st Series. Colour yellow. All readily soluble in benzol and chloroform. Not readily crystallised.	Xanthophyll. Xanthin. Phycoxanthin.
	2nd Series. Colour orange to red. All insoluble in cold alcohol, but very soluble in benzol and chloroform. Readily crystallised.	Carotin. Erythrophyll(chrysophyll) Anthoxanthin. Chlororufin.

The next great group of pigments which we shall consider includes these often known as the anthocyan series, which are soluble in water, and frequently produce very conspicuous colouration. On account of their solubility they occur in the cell-sap and not in chromatophores like the lipochromes, which are often called *fixed* colours as opposed to these *fluid* ones. Anthocyan, or the series of pigments included under this name, occurs as a red, blue, or violet colouring-matter, and gives their colour to many flowers and fruits, to some autumnal leaves (*e.g.* vine and Virginian creeper), to the purple or "copper" varieties of forest trees (*e.g.* beech), and to many plants or parts of plants which, either habitually or as a variation, show a red colour (*e.g.* "runners" of strawberry plants, shoots of rose, purple cabbage, etc.). The distinguishing characteristic of these pigments, besides their solubility, is that they vary in colour according to the reaction of the solvent.

Thus red anthocyan can be converted into blue by the addition of a small amount of an alkali, while the blue can be converted into red by the addition of acids. The addition even of a small amount of a strong alkali like caustic potash or soda produces a greenish colour, which becomes yellow on further additions of alkali, and finally becomes colourless. The cautious addition of a salt like disodium hydrogen phosphate, on the other hand, to red anthocyan, produces first a violet and finally a blue colour (Hansen). These reactions can be very readily observed with anthocyan obtained from a rosy apple. A pretty and familiar illustration of the same fact is seen in nature in the change of colour in the flowers of many Boraginaceæ from pink to blue, which is associated with a corresponding change in the reaction of the cell-sap.

It is curious to note that, while there are practically no suggestions as to the functions of the lipochromes, those as to the meaning of the anthocyan pigments are as numerous as could be desired. As, however, in most cases these suggestions have been offered in relation to particular cases, it may be well first to give a complete list of the conditions under which anthocyan is found to occur. Frank in his Lehrbuch der Botanik (Bd. I. s. 646) classifies the organs in which anthocyan occurs under the following heads:—First, in flowers and fruits; Second, in vegetative organs. In vegetative organs in the following conditions:—(*a*) In many young growing shoots in spring; (*b*) In many autumnal leaves; (*c*) In many organs when exposed to cold, whether in spring or autumn; (*d*) In many stems, petioles, etc., on the side which is exposed to the sun; (*e*) In many leaves and fruits at spots where injury has taken place; (*f*) In many parts of plants as a variation. To this list may be added the case of Alpine plants, which exhibit a general tendency to develop anthocyan.

As to the meaning of the anthocyan the commonest suggestion, based especially on conditions *c* and *d*, is of course that it is a direct adaptation destined to prevent the decomposition of chlorophyll by strong light. Detmer especially supports this theory in his Pflanzenphysiologie, pointing to the reddening of some evergreen leaves in winter, and to an experiment by Kerner, who transplanted some valley plants to a mountainous district, and found that only those which became red flourished.

Hassack (7), studying especially the case of coloured leaves, also regards the colour as an adaptation, but adds that it is also a direct result of the action of light. Wigand with greater caution says that the favouring conditions are feeble or suppressed assimilation and strong light. Pick (13), on experimental grounds of very doubtful validity, holds that the pigment is of direct importance in the transport of starch, and believes that the conditions of formation are sunlight and low temperature—two somewhat opposed factors. The anthocyans of flowers and fruits are of course usually ascribed to the continued selection of insects and birds.

In attempting to reach a decision as to the meaning of anthocyan, the most important point is first to obtain a definite statement as to the effect produced by its presence in the cell-sap of leaves. Although the question involves considerable technical difficulty, there seems little doubt that careful experiments prove that leaves, such as those of the copper beech, which contain abundant anthocyan assimilate more slowly than ordinary green leaves. See for example Jumelle (8). It might, however, be said that although such examples as the copper beech are dependent upon man for their persistence, yet, under certain circumstances, the diminished assimilation of red leaves and shoots may be temporarily compensated by the preservation of the chlorophyll, and that in this way the reddening of conifer leaves in autumn is an advantage. This explanation hardly, however, applies to the reddening of growing shoots in spring. We can hardly suppose that the light is then strong enough to lead to the decomposition of the chlorophyll, especially in view of the fact that the red colour is frequently lost when such parts have made their growth. Further, the parts of the plants which frequently redden on exposure to strong light are not such as to make us suppose that the preservation of their chlorophyll is of great importance, being usually stems, petioles, veins of the leaf, etc. As far as the effect of external conditions is concerned, we must note that the apparent contradiction between the two usually assigned causes for the production of anthocyan (*i.e.* strong sunlight and diminished temperature), make it appear very doubtful whether we have not to do with indirect, rather than direct environmental effects; while the hypothesis of universal adaptation is negatived by such facts as that fruits, *e.g.* apples, redden only on the side exposed to the sun. We shall return to this subject after considering the origin of anthocyan; but it may be noted meantime that the evidence points to the conclusion that anthocyan arises primarily as a consequence of particular states of metabolism, and that any function which it may possess is secondary.

As to the origin of the anthocyan series, there is a general consensus of opinion that it arises from tannin or a related substance. Gautier (4), who analysed the colouring matters of the vine, calls these tannic acids. Wigand (19) says that the anthocyan colours arise from a colourless chromogen which is directly derived from tannin, and that the disappearance of the colours is associated with the reformation of tannin. Pick (13) confirms this, adding the interesting remark that the colours are notably absent from plants with little or no tannin. Hansen, as quoted by Krukenberg (9), found a colourless chromogen in the leaves of the aloe, which took up water and oxygen, and became converted into a pigment resembling the anthocyan series; but no opinion is expressed as to the nature of the chromogen. An origin from tannin seems, on the whole, to be fairly well established, and is of great interest, because it connects these pigments with many other plant pigments. Thus the phlobaphenes, the colouring matters of bark and of many injured tissues, *e.g.* cut apples, are almost certainly produced by the direct oxidation of tannins. The yellow or brown colours of some autumnal leaves, *e.g.* oak and beech, are produced in the same way. See Sorby (18). Again, according to Vines, the colouring matters of woods, such as hæmatoxylin, santalin, brasilin, etc., are probably derived from tannins. Further, since most tannins are glucosides, it seems not unnatural to associate with the chromogens mentioned above, those well-known glucosides which, outside the organism, act the part of chromogens. Thus there is reason to suppose that the process by which indican and ruberythric acid give rise respectively to indigo blue and alizarin, is paralleled by the process by which within the organism another glucoside (?) gives rise to the colour of the rose. These facts are of more importance than is apparent at first sight. They surely suggest that whatever part the selection of insects has played in the final development of the colour of the rose, this is primarily due to the chemical properties of the tannin which ontogenetically precedes it. Now tannin is almost certainly a waste product, a result of destructive metabolism. As such it probably tends to occur wherever assimilation is feeble or suppressed. What the conditions are which determine the conversion of the tannin into the chromogen of anthocyan, rather than into the chromogen of other pigments, such as the phlobaphenes, is of course unknown, but it is probable that they are purely chemical. It may of course be said that this is the point at which selection intervenes, favouring the production of the useful (*i.e.* attractive) anthocyans rather than of the useless dull-coloured phlobaphenes. This, however, is doubtful on the following grounds. When tissues are injured as by gall-producing insects, pigment is usually produced, but this may be either one of the phlobaphenes or anthocyan. As it is difficult to see how such colouration can be subject to selection, this furnishes a strong presumption that the particular pigment produced is determined primarily by chemical agencies. Again such a vigorous selection as the statement would imply does not seem to be borne out by facts. Thus, observations on our fruit-eating birds do not lead one to suppose that the result of their preference would be to favour the dissemination of red varieties of apples rather than of the "russet" ones, supposing the size of the apples to be such that they could be readily carried off. In this case, the fact that "russet" apples, when cut, become discoloured far more rapidly than red ones, suggests that the russet colour is the consequence of the marked tendency of the tannins of the apple to become converted into phlobaphenes, and is, therefore, simply a consequence of the chemical composition of the cell contents.

Although so little is known as to the conditions upon which the presence of anthocyan is dependent, yet the following observations by Molisch seem to shed a little light on the problem. Molisch (12) found that in many cases, *e.g.* brightly coloured leaves of *Coleus*, the anthocyan was so rapidly destroyed on boiling with water, that it was impossible to obtain a solution. This rapid destruction, he believes, apparently with good reason, to be due to alkaline substances contained in the protoplasm of the cells. While the cells are living, the cell-sap with its contained anthocyan is separated from the alkaline protoplasm; in dying cells, a mingling takes place, and in some cases the alkalinity of the protoplasm is sufficient to destroy the anthocyan (*e.g.* effect of strong alkalies as detailed above). Molisch finds that this destruction of anthocyan is especially liable to take place in cells which contain chlorophyll. As this cannot easily be a direct effect, he concludes that, in chlorophyll-containing cells, the conditions for the production of alkaline substance must be especially favourable. Further, he found that leaves, whose anthocyan did not change at death, were especially remarkable for the acidity of their cell-sap.

Now, although Molisch does not himself make the suggestion, it seems hardly possible to doubt that the alkalinity of the protoplasm must have some effect upon the anthocyan of the cell-sap during life; there must surely be a constant process of diffusion going on between protoplasm and cell-sap. If this be so we can readily understand how it is that anthocyan is so frequently associated with diminishing chlorophyll. The particular (alkaline) condition of the protoplasm, which is associated with the development of chlorophyll, is unfavourable to the production of anthocyan tending to decolourise it; the process being probably the "reconversion into tannin" of Wigand. Conversely, conditions which are unfavourable to the development of chlorophyll are directly favourable to the development of anthocyan. This is probably the physiological reason for that association of anthocyan with diminishing powers of assimilation which we have already noticed as a fact of experience.

The following table is intended to illustrate the suggested relations between the various chromogens of glucoside nature found in flowering-plants :—

CLASSIFICATION OF THE CHROMOGENS WHICH ARE OF GLUCOSIDE NATURE.

Chromogens = tannins or other glucosides.	1. Usually remain in plant in condition of chromogens.	i. Tannins of many tissues.		When oxidised.	= Brown colouring matters of injured tissues. = Phlobaphenes.
		ii. Glucosides of many tissues, *e.g.*	Indican.		= Indigo blue.
			Ruberythric acid.		= Alizarin.
		iii. Hansen's chromogen (= tannin ?)			= Anthocyan pigment.
	2. Give rise to pigments within the plant.	*a.* Tannins of young shoots, of young floral leaves, of unripe fruits, etc.		When oxidised (?)	= Anthocyan pigments.
		b. Tannins (?) of wood.			= Hæmatoxylin, Brasilin, etc.
		c. Tannins of bark.			= Phlobaphenes.

Of the other plant pigments not yet mentioned, chlorophyll and etiolin are, of course, by far the most important. From the present point of view, however, there is little to say of either, for, in spite of numerous investigations, little is known of their constitution or origin. The two are probably very nearly allied in composition, and differ from most other plant pigments in containing nitrogen. That many plants, when grown in normal conditions, contain chlorophyll, is at present an observed fact beyond which it is impossible to go.

We have already seen that, normally, chlorophyll seems to be always associated with lipochromes, and this is probably also true of etiolin. The lipochromes are not, however, the only pigments thus associated; many cryptogams have their chlorophyll masked by other well-defined colouring-matters. Thus the Red Algæ owe their apparent colour to a reddish pigment which is soluble in water, forming a fluorescent solution, and which, according to Krukenberg, resembles very closely a red pigment found in some sponges. Its presence in the Florideæ appears to be associated with some modification of the chlorophyll. Again, both the Phæophyceæ and the Cyanophyceæ have associated with their chlorophyll both a lipochrome and another pigment soluble in water. Phycophæin, the pigment of the former, is of a brownish colour, while phycocyan, that of the latter, forms a beautifully blue solution with red fluorescence.

The only other pigments which need to be mentioned here are the soluble yellows, which are liable to be confused with the lipochromes. The rind of the lemon, the florets of the dahlia, and some other plant tissues, contain yellow colouring-matters, soluble in both hot and cold water, which do not give the lipochrome reactions; of their chemistry little is known.

In concluding this discussion of the common pigments of plants, it seems not out of place to consider the bearing of the facts mentioned upon current theories as to the origin of colour. In spite of criticism from various quarters, it is still the custom to regard the colours of fruits and flowers as entirely the result of the selective action of other organisms. The colours of these structures are, as we have seen, generally speaking, due to lipochromes or to anthocyan pigments, or to a combination of the two. Now we know nothing of the origin of the lipochromes, it may be that they are simply the outward expression of a well-nourished condition of the organism; but the colours of autumnal leaves, and of the variegated leaves of cultivated plants, show that the predominance of the lipochrome pigments is simply evidence of diminishing powers of assimilation. It is, therefore, eminently natural that these pigments should become increasingly prominent, as the parts of the flower, including the carpellary leaves, diverge more and more from the leaf type, and become increasingly incapable of assimilation. (For an essentially similar line of argument, see a paper by Mr. Philip Sewell (17).) This fact of observation is quite independent of theories such as that of Simroth, which assume that the lipochromes are directly produced by the alteration of chlorophyll. Again, the anthocyans arise in certain conditions from tannins, which tend to occur naturally in parts of the plant which are growing actively or assimilating feebly. Thus we see that the presence of anthocyan, or of other derivatives of the tannins, in flowers and fruits is essentially the same phenomenon as their appearance in young growing shoots, and in injured tissues. Whatever part birds and insects have played in the development of the colours of flowers and fruits, it can only have been the acceleration of the movement of organisms along lines of development upon which their own inherent tendencies have led them. It is most probable that the effect of the choice of birds and insects has been to convert a merely indifferent property into one important for the maintenance of the species. The colours of the rose and tulip were primarily of no more importance to them than the indican of *Indigofera* is to it now, and all are still facts of the same nature. The result of the preference of the bee has been to render the colour of the rose of some importance to the species, but the colour is independent of this preference, and is no more likely to disappear, if the bee's preference were to disappear, than is the hæmatoxylon of *Hæmatoxylon campechianum* likely to disappear if man's preference for it faded.

It may be said that the occurrence of white flowers is contrary to this reasoning, because here there is no pigment at all, and yet the æsthetic effect is well-marked. On the other hand, a very similar appearance of whiteness occurs in many variegated leaves. See Hassack (7). Here there is no doubt that the albinism is due to degeneration, and is probably a consequence of the artificial conditions of cultivation. It is again an indication of diminishing capacity for assimilation, and may therefore be naturally expected in floral leaves.

On the whole, a consideration of the pigments of plants certainly seems to support the view, now rendered familiar by Mr. Bateson's work, that conspicuous variations are determinate rather than indefinite, are primarily dependent upon the physical and chemical conditions existing within the organism, rather than upon the result of the selective action of other organisms working upon minute fortuitous variations, as Weismann and his followers would maintain.

REFERENCES.

1. Arnaud, A.—Recherches sur les Matières Colorantes des Feuilles, —Comptes Rendues, T. c. p. 751. 1885.
2. Courchet, L.—Recherches sur les Chromoleucites.—An. Sci. Nat. Bot., vii., T. 7, pp. 263–374. 6 plates. 1888.
3. Cunningham, J. T., and MacMunn, C.A.—On the Colouration of the Skins of Fishes, especially the Pleuronectidæ.—Phil. Trans. Roy. Soc., 184 B. pp. 765–812. 3 plates. 1895.
4. Gautier, A.—La Mechanisme de la Variation des Etres vivants. —Hommage à Chevreul, pp. 29–52. 1886.
5. Hansen, A.—Die Farbstoffe der Bluten u. Früchte.—Verh. d. Physic.-Med. Gesellschaft zu Wurzburg, N. F. xviii. 1884.
6. Hansen, A.—Die Farbstoffe des Chlorophylls, 88 pp. 2 plates. Darmstadt. 1889.
7. Hassack, C.—Untersuchungen über den anatomischen Bau bunter Laubblätter.—Botan. Centralbl., xxviii. pp. 84–5, 116–121, etc. 1 plate. 1886.
8. Jumelle, H.—Comptes Rendues, cxi. p. 382.
9. Krukenberg, C. Fr. W.—Grundzüge einer Vergleichenden Physiologie der Farbstoffe u. der Farben. Heidelberg. 1884.
10. Kühne, W.—Unters. a. d. Physiol., Instit. d. Univ., Heidelberg. Bd. iv. pp. 169–248. 1882.
11. Macchiati. L.—Malpighia., i. pp. 478-86. 1887.
12. Molisch, H.—Ueber den Farbenwechsel anthokyan-hältiger Blätter bei rasch eintretendem Tode —Bot. Zeit. 47, pp. 17–23. 1889.
13. Pick.—Bedeutung des rothen Farbstoffes bei Phanerogamen.—Bot. Centralbl., xvi. pp. 281–4, 314–8, etc. 1 plate. 1883.
14. Schunck, E.—The Chemistry of Chlorophyll. Annals of Botany. iii. pp. 65–120. 1 plate. 1889–90.
15. Schunck, E.—Contributions to the Chemistry of Chlorophyll. —Proc. Roy. Soc., vol. xliv. pp. 448–54. 2 figs.
16. Schrötter-Kristelli, H. Ritter.—Ueber ein neues Vorkommen von Carotin in der Pflanze, nebst Bemerkungen über die verbreitung, Entstehung und Bedeutung dieses Farbstoffes.—Bot. Centralbl., lxi. pp. 33–46. 1895.
17. Sewell, Philip.—The Colouring Matters of Leaves and Flowers. —Trans. and Proc. Bot. Soc., Edinburgh, xvii. pp. 276–308. 1888.
18. Simroth, H.—Ueber die einfachen Farben im Thierreich.—Biolog. Centralbl., xvi. pp. 33–51. 1896.
19. Sorby, H. C.—On the Autumnal Tints of Foliage.—Nature, vol. xxxiii. pp. 105–106. 1884.
20. Wigand.—Bot. Hefte. ii. pp. 218–43. 1887.
21. Zopf, W.—Beiträge zur Physiologie u Morphologie niederer Organismen. Leipzig. 1892. Heft. i. pp. 3–32. 3 plates.
22. Zopf, W.—Beiträge zur Physiologie u Morphologie neiderer Organismen. Leipzig. 1893. Heft. iii. pp. 26–58. 2 plates.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

MEETING OF THE SOCIETY,

Thursday, May 14, 1896.

Dr. AITKEN, President in the Chair.

Mr. R. STEWART MACDOUGALL exhibited specimens of larch damaged by squirrels.

Mr. TAGG exhibited from the Museum of the Royal Botanic Garden a turnip showing proliferation of the tuber.

The following plants in flower from the Royal Botanic Garden were exhibited:—*Cypripedium montanum*, *C. pubescens*, *C. niveum*, *C. bellatulum*, *Platanthera montana*, *Restrepia elegans*, *Angræcum falcatum*, *Disa sagittalis*, *Crassula Saxifraga*, *Serissa fœtida*, *Cyrtanthus Huttoni*, *Crossandra undulæfolia*, *Masdevallia rosea*, *M. xanthina*.

The following papers were read:—

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

Issued November 1896.

MEETING OF THE SOCIETY,

Thursday, June 11, 1896.

Dr. AITKEN, President, in the Chair.

Colonel BAILEY exhibited and described specimens of subcortical roots from a tree of *Fagus sylvatica* in Dalmeny Park.

Mr. GRIEVE described a method of propagating tomatoes by means of shoots formed at the basis of the leaves when these are cut back.

A series of Alpine Plants in bloom was exhibited from the Royal Botanic Garden, in addition to the following plants in flower:—*Arisæma fimbriata, Begonia Davisii, Rodriguezia planifolia, Geissorhiza secunda, Dracophyllum gracile, Cyclobothra cærulea, Dyckia rariflora, Saxifraga longifolia vera, Masdevallia calura, M. muscosa, Gladiolus gracilis, Dendrobium Falconeri, Cirrhopetalum Griffithianum, Blandfordia aurea, B. nobilis, B. flammea, Hæmanthus Katherinæ, Incarvillea Delavayi.*

The following papers were read:—

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

Issued November 1896.

MEETING OF THE SOCIETY.

Thursday, July 9, 1896.

Dr. AITKEN, President, in the Chair.

Professor BAYLEY BALFOUR exhibited a quantity of charred grains of barley and wheat, together with fragments of charred oak and willow, and some pieces of coal sent by Dr. DAVID CHRISTISON from the Roman Camp, Birrens, Dumfriesshire.

Mr. A. D. RICHARDSON gave a description of the features which distinguish the golden elder, *Sambucus canadensis*, var. *aurea*, from the common elder, *Sambucus nigra*, and exhibited specimens of both of them in flower.

The following plants in flower were exhibited from the Royal Botanic Garden :—*Bessera miniata*, *Hypoxis stellata*, *Trichonema rosea*, *Trichinum Manglesii*, *Vaccinium montanum*, *Æschynanthus grandiflorum*, a white Cape Hæmanthus, species unknown, *Pelargonium tetragona*, *Ixia conica*, *Globba coccinea*, *Ixora salicifolia*.

The following papers were read :—

A PRELIMINARY NOTE ON THE DEVELOPMENT OF CERTAIN LENTICELS. By J. A. TERRAS, B.Sc.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

Issued November 1896.

The Genus Gloiopeltis. By the late Professor Fr. Schmitz, Greifswald.

Read 10th January 1895.

The typical species of the modern genus *Gloiopeltis*, J. Ag., was first described and figured by Turner[1] in the year 1806, under the name *Fucus tenax*.[2] Turner obtained the material for his species, through Sir Joseph Banks and Mr. Goodall, from China, where the Alga grows "on almost every part of the coast." His drawing in the "Historia" shows a well-developed sterile and a smaller fertile example of the Alga, the latter provided with numerous fructifications which stand out clearly as roundish elevations on the branched thallus.

On the Alga which C. Agardh[3] mentions, under the name of *Sphærococcus tenax*, as "species *Mihi parum nota*," J. Agardh[4] founded, in 1842, his new genus *Gloiopeltis*, and there is no doubt that he knew amongst the characters of the plant, from personal examination, alike the anatomical structure and the form of the fructification.

Kützing[5] in 1849 accepted Agardh's genus unchanged. and expressly adds "n. v." to the description of the typical species. His drawing[6] of an example of the fructification of *Gloiopeltis tenax* is, as he himself states (l.c., p. 4), taken from Turner.

In 1851 J. Agardh[7] included as another species in the genus, *Gloiopeltis*, the Alga from the northern part of the Pacific Ocean, which Postels and Ruprecht[8] had described in 1840 under the name *Dumontia furcata*, and gave the following characters for the genus:—"favellidia intro pericarpium hemisphærice elevatum, carpostomio demum apertum, nidulantia, gemmidiis inter fila a placenta ad pericarpum excurrentia evolutis ovato-angulatis, in nucleum laxius coalescentibus constantia."

[1] König & Sims, Ann. of Bot., ii. 376. t. 13.

[2] A further description and fig. of this species is to be found in Historia Fucorum, t. 141–142. t. 125, by the same author.

[3] Sp. Algarum, i. 325.

[4] Alg. Mar. Medit., 68.

[5] Sp. Algarum, x. 754.

[6] Tab. Phycol., xviii. t. 10.

[7] Sp. G. O. Florid., 234–236.

[8] Ill. Alg., 19.

A short time before this revision of the genus *Gloiopeltis* by J. Agardh another species of *Dumontia* closely related to *D. furcata*, and growing in Awatscha Bay, Kamtschatka, had been described by Ruprecht[1] as *D. dura*. In both these species he found cystocarps and "tetraspores," and indicates (p. 119) as a peculiar feature that "both forms of fructification are met with near one another on the same individual." He makes no mention of Agardh's genus *Gloiopeltis*.

Some years later Harvey[2] published a new species of *Gloiopeltis*, *G. coliformis*, from the coast of Japan (Hakodadi and Straits of Sangar).

A detailed study of the Algæ belonging to this genus *Gloiopeltis* was subsequently carried out by Suringar.[3] This author obtained from the coast of Japan a complete series of peculiar forms of *Gloiopeltis*, and has examined them in the most painstaking manner, collecting the results of his observations in a very careful and thorough Monograph, in which not only has he described most accurately the separate species occurring in Japan, but has also examined in detail the anatomy of the thallus, and the finer structure of the cystocarps. Moreover, he proposed a new distinct species *G. cervicornis*, Sur., as the type of the new genus *Endotrichia*.

J. Agardh in his revision of the genus *Gloiopeltis* in "Epicrisis Floridearum," follows closely this work of Suringar; he, however, defines certain species of the genus in a manner somewhat different from that of that author, and besides the species mentioned by him also includes *Dumontia dura*, Rupr., in the genus *Gloiopeltis* under the name of *G. dura*.

Accordingly up to the present time two very closely allied genera have been recognised, viz. *Gloiopeltis*, J. Ag., and *Endotrichia*, Suringar.

Both genera show a great similarity in the structure of the thallus. From the cells of a septate central axis

[1] Algæ Ochotenses, 1850, 118–119.

[2] Character of New Algæ, chiefly from Japan and adjacent regions, in Proc. Amer. Acad., iv. (1859), 332.

[3] Algæ Japonicæ, 1870, p. 30: Illus. des especes du genre Gloiopeltis, 1871-72. Compare also, Index præcursorius in Miq. Ann. Mus. Bot. Lugd. Bat., iii. (1867), p. 259.

there arise cell filaments which, as they pass outwards, give rise to constantly increasing ramifications, the upper branches of which become intimately coherent. In *Gloiopeltis* there arises in this manner a firm, closed thallus surrounding a tubular internal cavity, through the centre of which runs the axis. In *Endotrichia*, on the other hand, this cavity becomes subsequently filled with rhizoids, which grow out from the inner side of the wall.

The form of the sporangia is identical in the genera, but there is a slight difference in the structure of the cystocarps.[1]

Of the species of the above-mentioned genera specimens of *Gloiopeltis furcata* (Post et Rupr.), J. Ag., in fruit reached me for the first time in the summer of 1884, in Japan. I found the structure of the thallus to correspond with Suringar's description, but the exact explanation of the fruit structure caused me some difficulty. The fruits which I examined corresponded throughout to the "cystocarps" which Suringar had figured, but it was in vain that I sought for procarps.

Somewhat later (1885), I obtained for examination from the Berlin Herbarium a larger supply of material of *Gloiopeltis.* This consisted in part of a number of undetermined Algæ, crushed together as they come into the Japanese market under the name "Funori;" in part of isolated and named specimens of the same species of Algæ; and finally of the original specimens of *Gelidium rigens*, Mertens.[2]

On a closer examination of this material I found in it numerous specimens of *Endotrichia cervicornis*, Sur., with which the Alga described by Mertens[3] as *Gelidium rigens* has proved to be identical,[4] as well as numerous specimens

[1] Suringar (Alg., Japon. p. 33) says of the cystocarps of *Endotrichia* "Cystocarpium quod in ceteris cum illo Gloiopeltidis convenit, in hoc tamen ab eo discedit, ut nucleus, intra frondis spatium pericentrale ramello axis impositus, ab utraque parte strato peripherico integro obtegatur neque ex uno latere frondis in ipsum illud stratum immersus sit."

[2] Ostasiatischen. Algen, p. 118.

[3] L.c. (1866).

[4] Grunow Fidschi Algen (1874). p. 33. has described the same Alga as *Endocladia rigens.* but, as he wrote me later, he had been convinced for some time that his *Endocladia rigens* was identical with *Endotrichia cervicornis.* In any case the species *Endocladia rigens*, Grun., which J. Agardh in the Epicrisis (p. 559) reckons as "species inquirenda" of *Endocladia*, must henceforth be assigned to this genus.

of *Gloiopeltis furcata* (Post. et Rupr.), J. Ag., of varying form; with which species, following Suringar's[1] example, *G. coliformis* and also the formerly distinct *G. intricata* are to be considered as identical. There were also some specimens of *G. capillaris*, Sur. The first species showed both sporangia and "cystocarps." I was, however, only able to find a few specimens of *G. capillaris* with cystocarps. An examination of these species[2] showed that the anatomical structure of the thallus of *Endotrichia* does not differ essentially from that of *Gloiopeltis.* In both cases the thallus grows by congenital fusion of the branches of a septate central axis, which elongates by continued oblique division of a very small apical cell placed at the summit of the somewhat pointed shoots, and projecting to a greater or less extent above the neighbouring cells.[3] The segments of this apical cell, which are cut off in a spirally alternating manner, give rise at their upper ends to two[4] branch cells near one another and directed obliquely outwards. They then form by their union the central axis, which gradually increases in strength. Each of the two branch cells, however, becomes elongated obliquely outwards, and gives rise to a cell filament which branches copiously in a sub-dichotomous manner. Moreover, all these branched filaments remain congenitally united to form a tissue of many small cells. In consequence of the unequal tension of its parts, this tissue becomes more or less hollowed out internally in a tubular manner, so that an intercellular space of varying width is formed round the central axis.

The fully developed branch exhibits a hollow cylindrical thallus, towards the exterior very small-celled and com-

[1] Suringar (illus. pp. 14–15) without hesitation unites this *G. furcata* (Post. et Rupr.), J. Ag., which he almost always but erroneously calls *G. bifurcata* with *G. coliformis*, Harv., nevertheless retaining the more recent designation *G. coliformis*, Harv., as the specific name. This does not appear to be permissible, and I have therefore in the present paper always replaced Harvey's name, *G. coliformis*, by the name *G. furcata* (Post. et Rupr.), J. Ag., although I agree throughout with Suringar as regards the limitation of the species.

[2] Comp. the corresponding statements of Suringar, Alg. Japon., pp. 31–35, and illustr. pp. 10–11, 38–40.

[3] Comp Suringar, illustr. plate 21, figs. 8–11.

[4] Sometimes only one of these branch cells is cut off, I have not decided whether this occurs in an absolutely irregular sequence or regularly in definite positions.

posed of anticlinal filaments, while through its internal cavity there runs a tolerably thin central axis of elongated cells. From each of the component cells of this axis arise (usually at about the middle of the cell at the same or a slightly different level and close together) two branched filaments which pass out either directly or in more or less elongated ascending curves to the small-celled wall of the thallus, the tissue of which they form by their congenital fusion at varying distances from the axis, as well as by their cohesion by means of mucilage (collode) in such a manner that the inner side of the wall is defined with varying degrees of sharpness. The interstitial mucilage (collode) which unites the ramifications of these wall-forming filaments in the formation of the thallus is sometimes terminated abruptly towards the central cavity of the stem, while in other cases it is only indistinctly bounded in that direction and may extend inwards to various distances at different points in the same shoots. Moreover, this mucilage, which shows in the living plant a considerable tenacity, is always very liable to disappear after the death of the alga ; it swells up very rapidly in fresh water, and forms a thin gelatinous mucilage, which is made practical use of to a considerable extent in China and Japan.

In the interior of this more or less hollow thallus are formed rather small-celled thin rhizoids, which vary in number according to the species. They arise from the cells of the branched filaments which go to form the wall, and from their lower and middle cells, *i.e.*, from those which lie next the inner limit of the thallus wall. From these cells the rhizoids, which generally spring from the middle of the cell, grow towards the interior of the thallus and extend to varying lengths within the hollow inner space of the shoot towards the central axis. They are frequently unbranched, though in other cases they are beset with isolated spreading branchlets.

These rhizoids are very copiously developed in *Endotrichia cervicornis ;* in fact, in this species they usually arise from the inner side of the wall in such numbers that they invest the central axis pretty closely, and to a great extent fill up the space here very narrow, between it and the wall. Similar rhizoids occur in *G. furcata*, but only sparingly, while in *G. capillaris* they are entirely absent. Consequently the hollowing out of the cylindrical or slightly flattened thallus is generally very well marked in *G. furcata*, while, on the other hand, it is more indistinct in *G. capillaris* and *E. cervicornis*. Hence the distinction between these various species is only a question of gradation, and therefore no ground for a generic separation of of *Gloiopeltis* and *Endotrichia* is to be found in the anatomical structure of the thallus.

On account of this similarity as regards the thallus, the difference in the "cystocarps" appeared to me the more striking.

In *Endotrichia cervicornis* were found, as correctly described and figured by Suringar,[1] numerous small cystocarps immersed in the upper part of the copiously branched thallus. The reniform fruit nucleus is embedded in the interior of the thallus, and only induces a very slight local protuberance on the wall. Within this fruit nucleus can be distinguished a small sterile "placenta" with irregularly branched cells. Its whole mass when ripe breaks down into spores, which escape to the exterior through a simple aperture in the wall of the thallus. In comparison with this fruiting specimens of *G. furcata* showed, as Suringar has figured,[2] a marked mamillation due to small but strongly projecting fruit protuberances. Sections through these "cystocarps" showed that in this case roundish masses of closely compressed spores were embedded in the wall of the thallus which at that point projected outwards in a marked degree. Moreover, those fruit nuclei were always penetrated in the most varied manner by thin isolated strands of sterile branched filaments. Their surface was often undulated, but above all a distinct "placenta" was always absent, its place at the lower end of the "fruit nucleus" being taken by a bunch of quite short rhizoids which projected towards the interior of the thallus.

To me, however, the most striking feature of those fruiting examples of *G. furcata* was that those specimens

[1] Alg. Japon. t. 21.
[2] Alg. Japon., t. 19, illustr. plate 20, fig. 2–3.

which in the older parts bore the numerous "cystocarps" were always characterised by the presence of numerous sporangia with tetraspores, arranged in pairs in the outer cortex of the younger branches, while in *E. cervicornis* sporangia and cystocarps were always borne on different individuals. A detailed examination of the development brought the cause of this difference to light.

I first found that in *E. cervicornis* the cystocarps always proceeded from well-formed procarps. In the younger branches of the thallus these procarps are in great numbers on the margin between the closely coherent tissue of the wall and the interwoven rhizoids filling the internal cavity. They grow out towards the exterior of the thallus from the lower cells of the wall-forming filaments, and are represented when mature by small short umbel-like fascicles of filaments, the lateral branchlets of which frequently develop a terminal carpogonium, while one of the upper cells of the central main branch is converted into an auxiliary cell rich in protoplasm.[1] These brush-like procarps thus appear sometimes on the inner side of the thallus wall, surrounded by its interstitial mucilage, while in other cases they lie in the interior of the internal cavity of the shoot closely pressed against the inner surface of the wall.

From each fertilised procarp there arises a single cystocarp. After fertilisation of one of the numerous carpogones, the auxiliary cell becomes fertilised by a second act of fecundation, it then swells up and the gonimoblast proceeds from it towards the outside of the thallus in the form of a small compact tuft of closely coherent filaments. This gonimoblast during its growth presses the superincumbent wall slightly outwards, but is itself at the same time forced by its enlargement increasingly further into the inner cavity of the shoot, within which it appears embedded when mature. In consequence of the extremely close union of its congenitally coherent branched filaments it

[1] Thus several (or even numerous) carpogone filaments, with terminal carpogones, which ripen in succession, and a single auxiliary cell filament have always a share in the formation of each procarp. It nevertheless appeared to me in isolated cases as if in specially thick copiously branched procarp fascicles, there were occasionally formed two or three auxiliary cells on distinct branchlets of the fascicle.

becomes more or less hemispherical in form with a sharply defined outline. At its base a shortly stalked fusion-cell, showing irregularly stellate branching, and arising by the fusion of the auxiliary cell on the one hand with the downward directed cells of the procarp, and on the other with the lowest component cells of the gonimoblast branches, attaches the gonimoblast to a lower cell of one of the wall-forming filaments.[1] This fusion-cell, together with some adjoining cells of the gonimoblast branches, remains sterile as a "placenta" (in J. Agardh's sense), but the entire mass of upper cells of the laterally coherent gonimoblast branchlets become fertile, and form a dense reniform mass of tissue, all the cells of which ripen at approximately the same time into spores (in the same way as does the fruit nucleus of *G. capillaris*).

The development of the "cystocarps" of *G. furcata* follows an entirely different course. Procarps like those of *E. cervicornis* are altogether absent. After sporangia have been formed in large numbers in the outer cortex of one of the younger branches of the thallus, and have shed their contents, a number of new structures begin to appear in the inner cortex on the cells of the wall-forming filaments, in the inner part of the wall. From any one of these cells, which does not differ at all from the others around it, composing the wall-forming filaments (especially from one of the larger cells of the inner part of the wall), there proceeds asexually a thin cell filament composed of short elements, and resembling a rhizoid. This grows out laterally, and at once gives rise to a copious ramification in the mucilage-containing inter-spaces between the neighbouring cells of the cortex. In the small compressed monopodially branched pencil of filaments which arises in this way, one branch, stronger than the others and directed

[1] In older fruiting specimens of *Endotrichia cervicornis* it seems as if the gonimoblast was attached to the central axis itself. But the younger stages in the development show clearly that the tuft-like procarps arise from the lower or lowest component cells of the wall-forming filaments; never from the central axis. The accurate examination of the ripe fruit also shows that the gonimoblasts, which arise from the procarps, and project a considerable distance into the feltwork of interwoven rhizoids filling the central cavity of the shoot, although closely pressed against the central axis, which may even be displaced thereby, are never directly attached to it.

towards the exterior of the thallus, repeats this branching in an especially copious manner. There is thus formed a a dense tuft of variable thickness, composed of thin filaments with short elements, and showing a copious monopodial branching. This is penetrated by the previously existing somewhat stronger cell filaments of the cortical tissue, which is locally a little compressed.

Now, in this tuft of filaments, the stronger branch directed towards the exterior of the thallus becomes fertile throughout its whole extent, its component cells all swelling up, and with the exception of the one to three lowermost ripening into spores. The other weaker branchlets of the tuft usually form a rather loose tuft of short rhizoid-like filaments, which project towards the interior of the thallus from the lower ends of the swollen fertile branches. The component cells of these fertile branches, as they swell up into spores, cohere together laterally with increasing closeness, and so form in a short time a dense mass of spores with a roundish outline embedded in the tissue of the wall, which at this point always projects outwards to a considerable extent. This rounded mass of spores, however, appears to be permanently pierced by separate branched or unbranched filaments and strands of sterile cortical tissue. When more completely ripe it causes the formation on the exterior of a protuberance of varying height, but always very distinctly raised above the outer surface of the thallus.

It follows from this mode of development that the "cystocarps" of *G. furcata* are asexual in origin, in the same way as the sporangia which proceeded them on the same plants. They are, therefore, not homologous with the cystocarps of *E. cervicornis*, and do not in any way represent true cystocarps, but are to be considered as paraspore fruits, analogous to the paraspore fruits and paraspore complexes which have been described in another place [1] for *Plumaria elegans, Antithamnion plumula, Scirospora Griffithsiana*, etc.

In contrast with those fruiting examples of *G. furcata*, the few specimens in fruit of *G. capillaris* which I found

[1] Comp. for example Fr. Schmitz, Die Gattung *Microthamnion*, J. Ag., in Ber. d. Deutch. Bot. Gesellsch. 1893, p. 285.

among the above-mentioned material from the Berlin Herbarium, showed cystocarps quite similar in shape and mode of development to those of *E. cervicornis*. Although, here also, the procarps originated from the lower cells of the wall-forming filaments, they were not embedded in the internal cavity of the shoot, but in the tissue of the wall itself, the mucilage of which enclosed them. In the same way the gonimoblasts also, which developed from the fertilised procarps, were embedded in the projection formed at this point by the wall of the thallus. The ripe cystocarps of this species form small almost hemispherical elevations, which project distinctly from the outer surface of the fertile branches of the thallus.[1]

From these observations I have now, for the first time, proved that the genus *Endotrichia* can no longer be maintained. Neither the structure of the thallus, nor the form or mode of development of the cystocarps [2] present any decided points of difference from *Gloiopeltis*. I formerly united *Endotrichia*, Sur., with *Gloiopeltis*, J. Ag., in my list of the Genera of Florideæ [3], and have now proceeded to designate *E. cervicornis*, Sur., by the older synonym *Gloiopeltis cervicornis*, Sur.

The results obtained by these observations, however, lead up to the question, how are the cystocarps developed, and what is their form in the other two species of *Gloiopeltis*, namely, in the typical species *G. tenax?* I therefore made it my object to search wherever I could for the species of *Gloiopeltis*.

By the help of the various European Herbaria, which I was enabled to examine, but also especially by the willing assistance of the monographer of the genus *Gloiopeltis*, Prof. Suringar, of Leiden (to whom I must here once more express my best thanks), I was able finally to collect a quantity of material for observation, and by its means to solve at least in part the above problems.

[1] Comp. Suringar Alg. Japon., Tab. 18, and illustr. pl. ii. figs. 3, 6, 9, 13, 17, 24, 28, 33.

[2] The circumstance that in *E. cervicornis* the ripe gonimoblasts are immersed in the inner cavity of the shoot, while in *G. capillaris* they are, on the other hand, embedded in the locally thickened and outwardly projecting mass of the thallus wall, is in no way sufficient to cause the separation into two distinct genera of species otherwise quite similar in structure.

[3] Flora, 1889.

I discovered from it that *G. furcata*, the species which is commonest and most widely distributed in Japanese seas, develops not only paraspore fruits, but also true cystocarps. Still I found that fruits of the latter kind, which always appeared on other plants than those which bore the paraspore fruits, were much less common than the former. In specimens with cystocarps the presence of the fruit was only recognisable from the exterior by small elevations[1] obviously distinct from the pronounced projection caused by the paraspore fruits. The procarps here, as in *G. capillaris*, were throughout embedded in the inner part of the wall, and enclosed in its mucilage; moreover they were identical in form with those of the other species of *Gloiopeltis*, and they also originated secondarily in the same way from the lower and middle cells of the wall-forming filaments.

In the second Japanese species, *G. capillaris*, which appears to be much more rare in Japanese waters than *G. furcata*, I have only observed cystocarps, never paraspore fruits. The specimens which I examined bearing sporangia were always devoid of structures of the latter kind. At the same time I have only seen a few true specimens[2] of this species, and it is therefore not impossible that the formation of paraspore fruits may also occur here.

In the same way I have never seen paraspore fruits in *G. cervicornis*, the peculiar small and characteristically

[1] I may mention that fig. 1, xx., in Suringar's illustr. (comp. pl. l.c. p. 21) represents the transverse section of such a cystocarp-bearing specimen of *G. furcata*. Regarding the figure in J. Agardh's Morphologia Floridearum, t. xviii. fig. 10, I am, however, doubtful whether it represents a specimen bearing cystocarps or paraspore fruits. This drawing which, according to the explanation of the figure, illustrates the shape of the cystocarp of *G. intricata* is too insufficient to allow the nature of the fruit represented to be determined. However, since J. Agardh (Epicrisis, p. 274) ascribes to the genus *Gloiopeltis* cystocarps, the fruit-nucleus of which may be penetrated by strands of sterile filaments (Columnis filorum sterilum a placenta excurrentibus), it may be assumed that he had throughout only examined paraspore fruits in *Gloiopeltis*, and that, therefore, the drawing had been designed from a paraspore-bearing specimen.

[2] In many cases the specimens of *G. capillaris*, which I examined, were not correctly determined, and belonged rather to *G. furcata*. But among the incorrectly named material of *G. capillaris* I saw several specimens with sporangia and paraspore fruits.

branched Japanese species which is also apparently very widely distributed in those seas. The specimens of this species bearing sporangia, which I was able to examine, never showed any indication of paraspore fruits.

The same is true also of *G. dura* (Rupr.), J. Ag., a species which has hitherto been known only from the coasts of Kamtschatka[1] and the neighbouring Behring Island.[2] In this species,[3] which closely resembles *G. capillaris* in the anatomical structure of the thallus, I found procarps, as in the last-named species, embedded in the inner part of the wall of the thallus and enclosed in its mucilage. The shape and mode of development of these procarps was the same as in *G. capillaris* and *G. furcata*. The mature cystocarps formed small projections on the surface of the fertile shoot, the gonimoblast of each cystocarp was moreover embedded in the loose inner part of the wall of the thallus, which was locally very much thickened. I have not seen paraspore fruits of this species, but as I have only been able to examine very little correctly named material, I cannot say whether the formation of paraspore fruits is quite absent[4], or only occurs occasionally.

[1] Ruprecht. Algae Ochotenses, p. 118.

[2] Kjellman Om Beringhafvets Alg. Flora, p. 28.

[3] I examined authentic fertile material of this species (*Dumontia dura* Rupr. cum tetrasp. Herb. Acad. Petrop—Kamtschatka ad portum St. Petri et Pauli)—from the Hamburg Herbarium.

[4] I have not attempted to determine definitely whether this *G. dura* (Rupr.), J. Ag., from Kamtschatka, represents an independent species or not. The habit of the specimens, which I examined, recalled the simpler forms of *G. capillaris* (Suringar Illustr., pl. ii. fig. 1-13). The form and arrangement of the procarps and cystocarps appeared also to correspond closely with that in *G. capillaris*. The only constant difference lay in the anatomical structure of the thallus, and only to this extent that in *G. dura* the cavity of the inner space of the shoot was somewhat wider than in *G. capillaris*. The wall-forming filaments, together with their branches, do not all enter into the composition of the thallus wall from their very bases. The lower parts of the basal branches of these filaments rather run through a tract continuous with the internal cavity, and only subsequently become united by mucilage to form the wall of the shoot. Moreover, on the inner limit of the wall, separate short rhizoids directed towards the interior of the thallus arise, and here and there reach the inner space of the shoot. I must leave it to others to determine whether a special significance for the recognition of species is to be attached to these small anatomical differences, especially as Suringar (Illustr., p. 11-12) has already called attention to the occurrence of similar variations of anatomical structure in *G. capillaris*. My experience with *G. dura* has hitherto been too

Only in the case of the typical species of the genus *Gloiopeltis* have I been unable to attain my object.

Turner, and after him Kützing, figure a specimen of this species, *G. tenax*, with outward projecting cystocarps. Were these true cystocarps or paraspore fruits? This question can only be answered by an examination of authentic fruiting material. But it proved very difficult to obtain accurately determined material of this species. Almost all the large herbaria I have seen contain material of *G. tenax*, but this I found to be in many cases wrongly named. It has occurred in this case, as so frequently happens with Algæ from extra-European seas, that material arriving from abroad is labelled with the best known specific name in the genus, and then placed in the Herbarium with this determination. Within the genus *Gloiopeltis*, the best known name is *G. tenax*, and this name therefore occurs in many collections, and one sees, not unfrequently, specimens so named in fruit. But I have come across very few true specimens of *G. tenax*, and, although I sought them carefully, have never found specimens with cystocarps.[1]

Sterile specimens of *G. tenax*, nevertheless, show an anatomical structure quite analogous to that of the above described species of *Gloiopeltis*. It is, however, worthy of remark that the wall-forming filaments which arise in pairs from the cells of the central axis of this species (in this case always stretched straight, not curving hither and thither as often occurs in *G. furcata*) do not run straight across the inner space to the wall, but bend upwards in long ascending curves, giving off numerous branchlets to the wall, and only subsequently allowing their terminal

slight to enable me to say how far its variability in anatomical structure can go. But I must call attention to the fact that the above-mentioned small difference in the structure of the thallus is the only distinction I can find between *G. dura* and *G. capillaris* Perhaps the comparative examination of a larger bulk of material will lead to the discovery of important specific differences between the Japanese *G. capillaris*, which is distributed according to Suringar (Illustr., p. 12) over the southern part of Japan, and *G. dura* from the North Pacific, which occurs on the coasts of Kamtschatka and the neighbouring Island of Behring. Ruprecht (Alg. Ochot., p. 118) calls attention to "the firm tenacity and elastic consistency" as primarily characteristic of the species.

[1] Professor Suringar writes to me (in January 1892) that he does not possess cystocarps of *G. tenax*.

branches to enter into its composition. *G. tenax* is also characterised by the fact that, as in *G. cervicornis*, very numerous rhizoids spring from the frequently uneven inner limit of the thallus wall, are directed towards the interior of the thallus, and finally ensheath the central axis in a rather close felt.[1]

My search after fruiting specimens of *G. tenax* was, however, finally crowned with success.

In August 1892 I found in the Herbarium of the Royal Botanic Garden, Edinburgh, on the sheet "ex herb. Greville," in the cover "*Gloiopeltis tenax*," two small plants which bore the inscription "*Fucus tenax*, Turn., ab ipso Turner, e China. Mertens, 1829." These two specimens, therefore, originated from Turner himself, and may be assumed, from the foregoing, to be true *G. tenax*. Thick, strongly projecting "cystocarps," like those in Turner's figure, were not, it is true, found on these specimens. The most careful examination with a lens only revealed, in the dry alga, quite small elevations distributed over the surface of the upper branches of the thallus. However, the microscopic examination left no doubt of the occurrence of true cystocarps.

I found in the small branchlets which I examined procarps and cystocarps in process of ripening quite similar in structure to those of *G. cervicornis*. The procarps which arise from the lower cells of the wall-forming filaments, and project towards the outside of the thallus, show individually a form quite analogous to that formerly observed in the procarp of *G. cervicornis*, *G. capillaris*, *G. furcata*, and *G. dura*. They are distributed on the limit between the wall of the thallus and the inner space of the shoot, sometimes extending further into the former, sometimes more immersed in the latter, but always imbedded in the mucilage of the wall. The mature gonimoblast also shows a formation which is quite analogous to that of the gonimoblasts of the previously observed species. Throughout very small, they cause the superincumbent walls of the thallus to project outwards in a scarcely perceptible manner, but, on the other hand, they project to a greater or less

[1] Compare Suringar's statements on the anatomical structure of *G. tenax* in Illustr., pp. 32, 33, pl. xvii.

extent into the inner space of the shoot, without, however displacing to any marked degree the central axis.

It is further proved by this fertile specimen of *G. tenax* that the figure of Turner (and Kützing) could not have shown cystocarps. In this figure paraspore fruits[1] alone could have been represented, since the true cystocarps of *G. tenax* have a quite different appearance. They remain much smaller, are sunk in the inner tissue of the mature thallus, and only cause a very slight external projection on the dry plant, (on the moistened alga the surface of the fertile shoot was quite smooth, entirely without fruit warts).

Since the assumption that the fertile specimen represented in Turner's plate was of a different species (perhaps *G. furcata*) from his specimens in the Edinburgh Herbarium is not very probable,[2] Turner's figure must conversely indicate that *G. tenax* can, like *G. furcata*, form two kinds of fruits, viz., cystocarps and paraspore fruits. But above all, the Edinburgh specimen of *G. tenax* has now rendered it possible to accurately define the genus *Gloiopeltis*. This specimen allows us for the first time to establish the fact that the form of the cystocarp, which I had observed in *G. cervicornis*, *G. capillaris*, *G. furcata*, and *G. dura* is also proper to the typical species of the genus, and must, therefore, be regarded as characteristic of the genus as a whole. On the basis of this specimen it is possible for the first time to establish with certainty the generic diagnosis of *Gloiopeltis*, as follows:—

GLOIOPELTIS, J. Agardh, 1842 (including *Endotrichia*, Suringar, 1867). Type *G. tenax* (Turner), J. Agardh.

Thallus erect, cylindrical, or slightly flattened, branched in a more or less dichotomous or irregular manner, internal tissue loose or usually hollowed out to form an inner tubular cavity.

Central axis of long cells stretched straight or bent hither and thither in a zigzag manner. Sometimes more

[1] The same is true of the "cystocarps" of *G. tenax* which J. Agardh described in his time (Sp. Gen. Alg., ii. 1. p. 234 ff.). This is shown without doubt in the following statement:—"favellidia intra pericarpium hemisphærice elevatum . . . . nidulantia." The specimens of *G. tenax* with cystocarps which I saw in September 1888, in Agardh's herbarium at Lund, showed likewise strongly projecting fruit elevations. Thus no true cystocarp-bearing specimen of *G. tenax* can have been known.

[2] Still this assumption, it is clear, is not absolutely excluded.

or less closely ensheathed by small celled rhizoids, which grow towards the interior of the axis from the inner limit of the wall of the shoot. Alternately beset with paired cell filaments extending horizontally, and copiously branched towards the exterior, their upper ramifications, which cohere to form the wall of the shoot composed of anticlinal rows of cells, and on the exterior very small celled, while somewhat more loosely arranged internally.

Apical cell very small, dividing alternately in an oblique manner. Mucilage very easily changed into mucus.

Sporangia arranged in pairs scattered in the outer cortex.

Procarps, in the form of small compact tufts of filaments, distributed over the inner margin of the shoot wall, each composed of a hook-like auxiliary cell-filament with intercalary auxiliary cells, many pluricellular carpogone cell-filaments adhering together laterally as well as many sterile short filamentous twigs.

Cystocarps distributed over the upper portion of the shoot of fertile individuals projecting externally as small elevations, or quite sunk in the tissues. Fruit nucleus imbedded in the inner cortex, or projecting to a greater or less distance into the inner cavity of the shoot.

Gonimoblast hemispherically reniform, firmly coherent without separate successively ripening gonimolobes, attached by means of an irregularly branched basal fusion-cell, becoming entirely converted into spores, with the exception of a few sterile basal cells.

Paraspore fruits appear on the sporangium-bearing specimens of certain species. These are rounded or indistinctly lobed masses of spores which, embedded in the inner part of the wall of the shoot, cause more or less marked outward projections of the outer cortex. These spore masses remain penetrated by separate filaments and strands of sterile tissue. Paraspore fruits of this kind may easily be mistaken for cystocarps.

Number of species, perhaps five (in part very variable), from the northern part of the Pacific Ocean.

As has been already done in my review of the hitherto known genera of Florideæ,[1] *Gloiopeltis* must be placed, on account of its form and mode of development of the cysto-

[1] Flora, 1882.

carps, in the family of the Gloiosiphonaceæ along with the genera *Gloiosiphonia*, *Schimmelmannia*, and *Thuretella*.

The determination of the species of the genus *Gloiopeltis* is a matter of great difficulty. J. Agardh has, in the Epicrisis Floridearum, sought to employ the more or less marked projection of the "cystocarps" as a means of distinguishing the species. But the utility of this character is very much diminished by what I have said above. In all the species the true cystocarps are either immersed or project outwards to a very slight extent, only the paraspore fruits stand out strongly towards the exterior, and the amount of projection of these paraspore fruits is not always the same in one and the same species.

For the determination of the species it is much better to employ the characters which Suringar turned to such good account, namely, the formation of rhizoids, the course of the wall-forming filaments, the more or less marked tubular hollowing out of the shoot, with the straight or zigzag winding of the central axis which is dependent thereon.

There is still much to be done towards the more certain discrimination of the species. It remains for us to hope that the algologists of Japan, where alone, on the spot and in the area of its distribution, the genus *Gloiopeltis* can be worked out with any prospect of success, will soon undertake the task.

Provisionally it appears to me that the following are to be distinguished as independent species of *Gloiopeltis*:— *G. cervicornis*, Sur.; *G. tenax* (Turn.), J. Ag.; *G. furcata* (Post. et Rupr.), J. Ag.; *G. capillaris*, Sur.; and (perhaps?) *G. dura* (Rupr.), J. Ag.

Note.—Owing to the untimely death of Prof. Schmitz this paper has not had the benefit of his revision in print. Mr. George Murray, Keeper of the Botanical Department of the British Museum, has kindly read through the proof.

APPENDIX.

THE BOTANICAL SOCIETY OF EDINBURGH.

Founded 1836.

I.—GENERAL VIEWS AND OBJECTS OF THE SOCIETY.

The attention of the Society is turned to the whole range of Botanical Science, together with such parts of other branches of Natural History as are more immediately connected with it. These objects are cultivated:—

1. By holding Meetings for the interchange of botanical information,—for the reading of original papers or translations, abstracts or reviews of botanical works, regarding any branch of botanical knowledge, practical, physiological, geographical, and palæontological,—and the application of such knowledge to Agriculture and the Arts.

2. By publishing annually *Proceedings and Transactions*, including a List of Members and Donations.

3. By the formation in Edinburgh of an Herbarium of Foreign and British Plants, and of a Library and Museum for general consultation and reference.

4. By printing from time to time Catalogues of Plants, with the view of facilitating the study of their geographical distribution, and furthering the principle of exchange.

5. By making Botanical Excursions both in the neighbourhood of Edinburgh and to distant parts of Britain.

6. By appointing Local Secretaries, from amongst the Members of the Society, from whom, in their respective districts, all information regarding the Society's objects and proceedings may be obtained.

II.—LAWS OF THE SOCIETY.

Chapter I.—Fundamental Laws.

1. The Society shall be denominated "The Botanical Society of Edinburgh."

2. The object of the Society shall be the advancement of Botanical Science, by means of periodical meetings, publications, correspondence, and interchange of specimens amongst its Members.

3. The Society shall be open to Ladies and Gentlemen, and shall consist of Honorary, Resident, Non-Resident, and Corresponding Members, who shall have the privilege of denominating themselves Fellows of the Society; of Lady Members elected under the rule Chapter IV., Section 6 hereof, and of Associates elected under the rule Chapter IV., Section 5 hereof.

Chapter II.—Ordinary Meetings.

1. A Meeting of the Society shall be held on the second Thursday of every month, from November to July inclusively.

2. Intimation of all papers to be brought before the Society must be given to the Secretary and submitted to the Council ten days at least previous to the Meeting at which they are to be read.

3. Any Member may transmit to the Society Papers and Communications, which, if approved of by the Council, may be read by the author, or, in his absence, by the President or Secretary at any of the Ordinary Meetings.

4. The following order of business shall be observed:—

PRIVATE BUSINESS.

1. Chair taken.
2. Minutes of Private Business of preceding Meeting read.
3. Report of Council read.
4. Applications for Admission read.
5. Members proposed at preceding Meeting balloted for.
6. Motions intimated at previous Meetings discussed.
7. New Motions intimated.
8. Miscellaneous Business.
9. Society adjourned.

PUBLIC BUSINESS.

1. Chair taken.
2. Laws signed by New Members.
3. Minutes of Public Business of preceding Meeting read.
4. Papers and Communications for next Meeting announced.
5. Specimens, Books, etc., presented.
6. Communications and Papers read.
7. Society adjourned.

Chapter III.—Extraordinary Meetings.

An Extraordinary Meeting of the Society may be called at any time, by authority of the Council, on the requisition of three or more Resident Fellows.

Chapter IV.—Admission of Members.

SECTION I.—HONORARY FELLOWS.

1. The Honorary Fellows shall be limited to six British and twenty-five Foreign,—by British, being understood British subjects, whether resident in the British Islands or not.

2. The Council shall have the privilege of proposing Honorary Fellows, — the names of the gentlemen proposed being always stated in the Billet calling the Meeting at which they are to be balloted for. The election to be determined by a majority of at least two-thirds of the votes, provided fifteen Fellows are present and vote.

3. Any Fellow may submit to the Council the names of individuals whom he would wish proposed as Honorary Fellows; and should the Council decline to bring these forward, he may demand that they be balloted for.

4. Honorary Fellows shall be entitled to all the privileges of Resident Fellows, and shall receive copies of the *Transactions* free of charge.

SECTION II.—RESIDENT FELLOWS.

1. A candidate for admission into the Society, as a Resident Fellow, must present an application, with a recommendation annexed, signed by at least two Resident Fellows. The application shall be read at the proper time during private business, and at the next Ordinary Meeting shall be determined by a majority of at least two-thirds of the votes, provided fifteen Fellows are present and vote.

2. Resident Fellows shall, on admission, sign the Laws, and pay the sum of Fifteen Shillings to the funds of the Society; and shall contribute Fifteen Shillings annually thereafter at the November Meeting. Resident Fellows are entitled to receive the *Transactions* provided their subscriptions are paid.

3. Resident Fellows may at any time compound for their annual contributions by payment of Six Guineas. They shall be entitled to receive the *Transactions* yearly as published.

4. Resident Fellows leaving Edinburgh may be enrolled as Non-Resident Fellows, if they have paid by annual subscriptions the sum of Six Guineas, and have also paid any arrears due at their departure. By a further payment of Two Guineas they shall be entitled to receive the *Transactions*.

5. Fellows who are not in arrear in their subscriptions, and in their payments for the *Transactions*, will receive copies of the latter provided they apply for them within two years after publication. Fellows not resident in Edinburgh must apply for their copies either personally, or by an authorized agent, to the Secretary or Treasurer.

6. The Society shall from time to time adopt such measures regarding Fellows in arrears as shall be deemed necessary.

SECTION III.—NON-RESIDENT FELLOWS.

1. Any person not residing in Edinburgh may be balloted for as a Non-Resident Fellow, on being recommended by two Fellows of the Society, and paying a contribution of Three Guineas. From such no annual payment is required.

2. Non-Resident Fellows, by payment of Two Guineas

additional, shall be entitled to receive the *Transactions* yearly as published.

3. Non-Resident Fellows wishing to become Resident, must intimate their intention to the Secretary, who shall put them on the Resident list. They shall pay the annual subscriptions of Fifteen Shillings, or Three additional Guineas, or One Guinea if they have compounded for the *Transactions*.

4. Non-Resident Fellows must arrange with the Assistant-Secretary for the transmission of their copies of the *Transactions*; and they are requested to acknowledge receipt. Billets of the Meetings may, if desired, be also obtained.

5. Non-Resident Fellows coming to Edinburgh shall, for a period of two months, be entitled to attend the Meetings of the Society, and participate in the other privileges of Resident Fellows; after which, should they remain longer, they must pay the usual annual subscription of Resident Fellows, unless they have compounded by payment of Six Guineas.

SECTION IV.—CORRESPONDING MEMBERS.

1. Any person residing abroad may be balloted for as a Corresponding Member, on the recommendation of the Council.

SECTION V.—ASSOCIATES.

1. The Society shall have power to elect by ballot, on the recommendation of the Council, Associates from those who, declining to become Resident or Non-Resident Members, may have acquired a claim on the Society by transmitting specimens or botanical communications. Associates have no vote in elections or in the transaction of the business of the Society, are not entitled to receive copies of the *Transactions*, and have no interest in the property of the Society.

SECTION VI.—LADY MEMBERS.

1. Any Lady, whether Resident or Non-Resident, may become, on the recommendation of the Council, a Member for life on payment of a single contribution of Two Guineas, or may be elected and continue a Member on payment annually of a subscription of Ten Shillings; but Lady Members elected under this rule shall not be entitled to receive copies of the *Transactions*, shall have no voice in the management of the Society, nor any interest in the property thereof.

Note.—Diplomas may be procured by Fellows from the Acting Secretary, the sum payable being Five Shillings, and Two Shillings for a tin case. But no Fellow shall be entitled to receive a Diploma until his contributions have amounted to Three Guineas.

CHAPTER V.—OFFICE-BEARERS.

1. The Office-Bearers of the Society may be chosen from the Resident or Non-Resident Fellows, and they shall consist of a President, four Vice-Presidents, ten Councillors, an Honorary Secretary, an Assistant Secretary, a Foreign Secretary, and a

Treasurer, who shall be elected annually at the Ordinary Meeting in November. If a Non-Resident Fellow be elected an Office-Bearer, he must become a Resident Fellow, in conformity with Section III., Law 3.

2. The Council shall annually prepare a list of Fellows whom they propose to nominate as Office-Bearers for the ensuing year. This list shall be printed and put into the hands of Fellows along with the Billet of the November Meeting; and Fellows shall vote by putting these lists into the ballot-box, with any alterations they may think proper to make. The lists shall not be signed. Every Fellow present at the Meeting is entitled to vote.

3. All the Office-Bearers may be re-elected, except the two senior Vice-Presidents and the three senior Councillors, who shall not be re-eligible to the same offices till after the interval of one year.

4. These Office-Bearers shall form the Council for the general direction of the affairs of the Society. Three to be a quorum.

5. The Council shall nominate annually an Auditor and an Artist, to be recommended to the Society.

6. The Council shall appoint annually at the December Meeting five of their number, including the President and Honorary Secretary, to superintend the printing of the *Transactions* of the Society.

7. The Council may at any time be called upon by the President, Vice-Presidents, or Secretaries, to meet with them for the transaction of private business.

8. The Council shall hold a Meeting for business on the second Tuesday before each General Meeting.

Chapter VI.—The President and Vice-Presidents.

1. It shall be the duty of the President and Vice-Presidents when in the chair, and of the Chairman in their absence, to conduct the business of the Society according to the order of the business laid down in Chapter II., Law 4, and to attend carefully to the enforcement of the Laws of the Society, and to signing the Minutes. The Chairman shall have a vote and a casting vote.

Chapter VII.—The Secretaries.

1. The Honorary Secretary, with the aid of the Assistant-Secretary, shall give intimation of all General and Committee Meetings, shall Minute their proceedings in Books to be kept for the purpose, and shall conduct all the Society's Correspondence in Britain. He shall also take charge of all Donations of Plants and Books, and shall see them deposited in the Herbarium and Library, in conformity with any arrangements made by the Society with Government.

2. The Foreign Secretary shall have charge of all the Foreign Correspondence.

Note.—Agreeably to an Act of the Town Council of the City of Edinburgh, dated January 8, 1839, the Professor of Botany in the University of Edinburgh is constituted Honorary Curator *ex officio*. with free access to the Society's Collection, whether a Member of the Society or not.

Chapter VIII.—The Treasurer and Auditor.

1. The Treasurer, subject to the inspection of the Council, shall receive and disburse all money belonging to the Society, collecting the money when due, and granting the necessary Receipts. His Accounts shall be audited annually by the Auditor appointed by the Society.

2. It shall be the duty of the Treasurer to place all money belonging to the Society in one of the Chartered Banks of this City, unless the same shall have been ordered by the Society to be otherwise invested; and he shall never keep more than Ten Pounds of the Funds of the Society in his hands at a time. The Bank Account shall be kept in the name of the Society, and all drafts thereon shall be signed by the Treasurer.

3. The Treasurer shall, at the November Meeting, submit a certified Statement of the Receipts and Expenditure of the past year, with the Auditor's Report thereon.

Chapter IX.—Visitors.

Each Fellow shall have the privilege of admitting one Visitor to the Ordinary Meetings of the Society at the close of the private business.

Chapter X.—Additional Law.

In the event of any Member acting in such a way as shall seem to the Fellows of the Society to be detrimental to its interests, the Council may recommend that the name of such Member be deleted from the roll. The recommendation shall be brought before the Society at its first Ordinary Meeting. It shall be finally decided at the immediately succeeding Meeting by ballot. If confirmed by a majority of two-thirds of the votes of at least fifteen Fellows, the name of such person shall be deleted from the roll of membership, and all his privileges connected with the Society shall be forfeited.

Chapter XI.—Making and Altering Laws.

Any motion for the alteration of Existing Laws, or the enactment of new ones, shall lie over till the second Ordinary Meeting, and shall then be determined by a majority of at least two-thirds of the votes, provided fifteen Fellows are present and vote. The motion must be intimated to the Council, and shall be printed in the Billet calling the Meeting at which it is to be brought forward, and also in the Billet of the Meeting at which it is to be discussed.

ROLL

OF

THE BOTANICAL SOCIETY OF EDINBURGH.

Corrected to November 1896.

Patron:

HER MOST GRACIOUS MAJESTY THE QUEEN.

HONORARY FELLOWS.

Date of Election.

April 1863. His Royal Highness The PRINCE of WALES, K.G., Hon. F.R.S. L. & E.

Nov. 1863. His Royal Highness The DUKE of EDINBURGH, K.G., K.T., LL.D. Edin.

Dec. 1877. His Majesty Oscar II. KING of SWEDEN.

BRITISH SUBJECTS (limited to six).

Nov. 1896. J. G. Baker, F.R.S., F.L.S., *Keeper of the Herbarium, Royal Gardens, Kew.*

Nov. 1888. Dyer, William Turner Thiselton, M.A., LL.D., C.M.G., C.I.E., F.R.S., *Director, Royal Gardens, Kew.*

Jan. 1866. Hooker, Sir Joseph Dalton, M.D., K.C.S.I., C.B., D.C.L. Oxon., LL.D. Cantab., F.R.S., F.L.S., F.G.S., *The Camp, Sunningdale, Berks.*

Mar. 1895. King, George, M.D., C.I.E., LL.D., F.R.S., F.L.S., *Director of the Royal Botanic Garden, Calcutta;—Corresponding Member, April* 1878.

Dec. 1882. Oliver, Daniel, F.R.S., F.L.S., *Kew;—Non-Resident Fellow, Nov.* 1851.

Nov. 1896. H. Marshall Ward, F.R.S., *Professor of Botany, Cambridge.*

FOREIGN (limited to twenty-five).

Jan. 1866. Agardh, Jakob Georg, For. F.L.S., *Emeritus Professor of Botany, Lund.*

Mar. 1895. Bornet, Dr. Ed., *Member of the Institute, Paris;—Corresponding Member, June* 1879.

Dec. 1877. Cohn, Dr. Ferdinand, For. F.L.S., *Professor of Botany in the University, and Director of the Botanical Museum and Physiological Institute, Breslau;—Corresponding Fellow, Jan.* 1873.

May 1891. Cornu, Dr. Max, *Director of the Jardins des Plantes, Paris.*

Dec. 1885. Delpino, Dr. Frederico, *Professor of Botany in the University, and Director of the Botanic Garden, Bologna;—Corresponding Fellow, Jan.* 1873.

May 1891. Engler, Dr. Adolf, For. F.L.S., *Professor of Botany in the University, and Director of the Royal Botanic Garden and Museum, Berlin;—Corresponding Fellow, Jan.* 1886.

Dec. 1892. Goebel, Dr. K. E., For. F.L.S., *Professor of Botany in the University, and Director of the Botanic Garden, Munich.*

Date of Election.

Dec. 1885. GRAND'EURY, F. C., *St. Etienne.*
May 1891. HARTIG, Dr. ROBERT, For. F.L.S., *Professor of Forestry in the University, Munich.*
Dec. 1885. HILDEBRAND, Dr. F., *Professor of Botany in the University, and Director of the Botanic Garden, Freiburg i. Br.*
Dec. 1878. LANGE, Dr. JOHANNES MARTIN, For. F.L.S., *Professor of Botany, Copenhagen;—Corresponding Fellow, Dec.* 1847.
Dec. 1877. NYLANDER, Dr. GUILLAUME, For. F.L.S., *Paris;—Corresponding Fellow, Jan.* 1865.
Mar. 1895. PFEFFER, Dr. WILHELM, Geh. Hofrat, *Professor of Botany, and Director of the Royal Botanic Garden, Leipzig;—Corresponding Member, Jan.* 1886.
Jan. 1873. SACHS, Dr. JULIUS VON, For. F.R.S., For. F.L.S., *Professor of Botany in the University, and Director of the Botanic Garden, Würzburg;—Corresponding Fellow, Dec.* 1869.
Mar. 1895. SARGENT, CHARLES S., *Professor of Arboriculture, and Director of the Arboretum, Harvard;—Corresponding Member, March* 1878.
Dec. 1885. SCHWENDENER, Dr. S., For. F.L.S., *Professor of Botany in the University, Berlin.*
Dec. 1892. SOLMS-LAUBACH, GRAF. H. ZU., For. F.L.S., *Professor of Botany in the University, and Director of the Botanic Garden, Strasburg.*
Feb. 1876. STRASBURGER, Dr. EDOUARD, For. F.R.S., For. F.L.S., *Professor of Botany in the University, and Director of the Botanic Garden, Bonn;—Corresponding Fellow, Jan.* 1873.
Dec. 1885. TIEGHEM, PHILLIPE VAN, Membre de l'Institut, For. F.L.S., *Professor of Botany, Paris;—Corresponding Fellow, April* 1877.
Mar. 1895. TREUB, Dr. M., *Professor in the School of Agriculture, and Director of the Botanic Garden, Bruitenzorg;—Corresponding Member, Jan.* 1886.
Mar. 1895. VRIES, Dr. H. DE, *Professor of Physiology in the University, Amsterdam.*
Dec. 1885. WARMING, Dr. EUGENE, For. F.L.S., *Professor of Botany in the University, and Director of the Botanic Garden, Copenhagen.*

RESIDENT AND NON-RESIDENT FELLOWS.

No distinguishing mark is placed before the name of Resident Fellows who contribute annually and receive Publications.
* *Indicates Resident Fellows who have compounded for Annual Contribution and receive Publications.*
† *Indicates Non-Resident Fellows who have compounded for Publications.*
‡ *Indicates Non-Resident Fellows who do not receive Publications.*

Date of Election.

Dec. 1888. *Aitchison, J. E. T., M.D., LL.D., C.I.E., F.R.S., *Mortlake.*
Jan. 1871. *Aitken, A. P., M.A., D.Sc., F.R.S.E., 57 *Great King Street*—PRESIDENT and FOREIGN SECRETARY.
Nov. 1884. †Alexander, J., *Florence House, Cinnamon Gardens, Colombo, Ceylon.*
June 1875. *Alison, Rev. G., *Kilbarchan, Paisley.*
April 1877. ‡Allan, Francis J., M.D., 1 *Dock Street, London, E.*
Dec. 1855. ‡Allman, G. J., F.R.SS. L. & E., F.L.S., *Athenæum Club, London.*
June 1852. ‡Anderson, John, M.D., F.L.S., 71 *Harrington Gardens, London, S.W.*
Dec. 1866. *Archibald, John, M.B., C.M., F.R.C.S.E., 2 *The Avenue, Beckenham, Kent.*
Dec. 1850. ‡Armitage, S. H., M.D., 39 *Grosvenor Street, Grosvenor Square, London, W.*
Dec. 1888. †Bailey, Colonel Fred., R.E., 6 *Drummond Place.*
May 1872. *Balfour, I. Bayley, Sc.D., M.D., F.R.S., F.L.S., F.G.S., *Queen's Botanist, Professor of Botany, and Keeper of the Royal Botanic Garden, Inverleith House.*—HONORARY CURATOR.
Dec. 1863. †Barnes, Henry, M.D., F.R.S.E., 6 *Portland Square, Carlisle.*
July 1880. ‡Barty, Rev. Thomas, M.A., *The Manse, Kirkcolm.*

Date of Election.

July 1848. *Bayley, George, W.S., 7 *Randolph Crescent.*
Feb. 1857. *Bell, John M., W.S., *East Morningside House.*
May 1891. *Berwick, Thomas, 56 *North Street, St. Andrews.*
April 1857. ‡Beveridge, James S., L.R.C.P. & S., 9 *Spring Gardens, London, S.W.*
Dec. 1879. *Bird, George, 31 *Inverleith Row.*
June 1850. ‡Birdwood, Sir George, M.D., *India Office.*
July 1870. *Black, James Gow, Sc.D., *Professor of Chemistry, University of Otago, New Zealand.*
May 1888. *Bonnar, William, 8 *Spence Street.*
Dec. 1886. *Bower, F. O., M.A., D.Sc., F.R.S., F.L.S., *Professor of Botany, University of Glasgow*, 45 *Kersland Street, Hillhead, Glasgow.*
Jan. 1871. *Boyd, W. B., *of Faldonside, Melrose.*
Feb. 1870. †Bramwell, John M., M.B., C.M., 2 *Henrietta Street, Cavendish Square, London.*
Feb. 1837. ‡Branfoot, J. H., M.D., *West Indies.*
April 1857. †Brown, George H. W., *Victoria, Vancouver Island.*
June 1840. †Brown, Isaac, *Brantholme, Kendal.*
Dec. 1890. Brown, Richard, C.A., 23 *St. Andrew Square.*—Treasurer.
Nov. 1882. †Brown, William, *Earlsmill, Darnaway, Forres.*
Mar. 1850. ‡Brown, William, M.D., *Cape of Good Hope.*
June 1893. Bryden, Mrs. J. M., *Linksfield, Aberlady.*
Dec. 1864. Buchan, Alexander, M.A., LL.D., F.R.S.E., *Sec. Scot. Met. Soc.*, 42 *Heriot Row.*
Dec. 1878. *Buchanan, James, *Oswald House, Oswald Road.*
April 1855. ‡Burnett, Charles John, *Aberdeen.*
May 1839. ‡Burslem, Willoughby Marshall, M.D., *Bournemouth, Hants.*
Feb. 1882. Caird, Francis M., M.B., C.M., 21 *Rutland Street.*
Dec. 1858. †Carruthers, William, F.R.S., F.L.S., *Central House, Central Hill, London, S.E.*
Feb. 1848. Christison, Sir Alexander, Bart., M.D., 40 *Moray Place.*
Mar. 1893. Christison, Lady, 40 *Moray Place.*
April 1848. Christison, David, M.D., 20 *Magdala Crescent.*
June 1873. *Clark, T. Bennet, *New Mills House, Balerno.*
Dec. 1854. ‡Clay, Robert H., M.D., 4 *Windsor Villas, Plymouth.*
Dec. 1856. †Cleland, John, M.D., F.R.S., *Professor of Anatomy, University of Glasgow.*
July 1896. Coldstream, Wm., B.A., B.Sc., *c/o Messrs. Coutts & Co.*, 59 *Strand, London;—Non-Resident Member, May* 1861.
April 1850. ‡Collingwood, Cuthbert, M.A., M.B., F.L.S., M.R.C.P., 69 *Great Russell Street, London, W.C.*
Dec. 1868. †Collins. James, *Lamb's Conduit Street, Holborn, London, W.C.*
April 1865. †Cooke, M. C., M.A., LL.D., 146 *Junction Road, London, N.*
Feb. 1870. †Cowan, Charles W., *Valleyfield, Penicuik.*
Dec. 1860. *Craig, Wm., M.D., C.M., F.R.C.S.E, F.R.S.E., 71 *Bruntsfield Place.*
Feb. 1874. †Crawford, William Caldwell, 1 *Lockharton Gardens, Slateford.*
Nov. 1881. Croom, J. Halliday, M.D., F.R.C.P.E., 25 *Charlotte Square.*
July 1871. *Davies, Arthur E., Ph.D., F.L.S., *Tweed Bank, West Savile Road.*
Feb. 1863. ‡Dawe, Thos. Courts, *St. Thomas, Launceston.*
April 1862. ‡Dawson, John, *Witchhill Cottage, Kinnoul, Perth.*
Dec. 1892. Day, T. Cuthbert, 36 *Hillside Crescent.*
Mar. 1841. ‡Dennistoun, John, *Greenock.*
Jan. 1869. ‡Dickinson, E. H., M.D, M.A., 162 *Bedford St. South, Liverpool.*
June 1848. ‡Dobie, W. M., M.D., *Chester.*
Jan. 1894. Dowell, Mrs. A., 13 *Palmerston Place.*
Jan. 1860. †Dresser, Christopher, Ph.D., F.L.S., *Wellesley Lodge, Sutton, Surrey.*
July 1869. *Drummond, W. P., 5 *Granton Road.*
Dec. 1859. †Duckworth, Sir Dyce, M.D., 11 *Grafton Street, Bond Street London, W.*
June 1851. ‡Duff, Alex. Groves, M.D., *New Zealand.*
Dec. 1865. *Duncanson, J. J. Kirk, M.D., C.M., F.R.S.E., 22 *Drumsheugh Gardens.*
Dec. 1870. Dunn, Malcolm, *The Palace Gardens, Dalkeith.*
Feb. 1871. ‡Dupuis, Nathan Fellowes, M.A., *Professor of Mathematics, Queen's College, Kingston, Canada.*

Date of Election.

Dec. 1869. †Duthie, J. F., B.A., F.L.S., *Superintendent of the Botanic Gardens, Saharunpore, N.-W.P., India.*
Feb. 1891. Edington, Alexander, M.B., C.M., *Cape of Good Hope.*
Nov. 1885. Elliot, G. F. Scott, M.A., B.Sc., F.L.S., *Newton, Dumfries.*
Jan. 1883. *Evans, Arthur H., M.A., 9 *Harvey Road, Cambridge.*
Mar. 1890. Ewart, J. Cossar, M.D., F.R.S.E., *Professor of Natural History, University.*
Dec. 1860. †Farquharson, Rev. James, D.D., *The Manse, Selkirk.*
Dec. 1858. †Fayrer, Sir Joseph, M.D., K.C.S.I., F.R.SS. L. & E., 53 *Wimpole Street, Cavendish Square, London.*
Feb. 1894. Ferguson, R. C. Munro, M.P., of *Raith and Novar, Kirkcaldy.*
April 1887. †Fingland, James, *Thornhill, Dumfries.*
June 1838. Fleming, Andrew, M.D., F.R.S.E., 3 *Napier Road.*
Nov. 1840. ‡Flower, Thomas Bruges, F.L.S., F.R.C.S., 9 *Beaufort Buildings, West Bath.*
Nov. 1861. †Foggo, R. G., *Invercauld Estates Office, Ballater, Aberdeenshire.*
July 1885. Foulis, James, M.D., F.R.C.P.E., 34 *Heriot Row.*
July 1860. †Fox, Charles H., M.D., 35 *Heriot Row.*
Feb. 1873. *France, Charles S., *South Africa.*
Nov. 1879. Fraser, Alexander, *Canonmills Lodge.*
June 1874. Fraser, Rev. James, M.A., D.D., *The Manse, Colvend, Dalbeattie.*
June 1836. ‡Fraser, James A., M.D., *Cape Town.*
July 1872. *Fraser, John, M.D., 19 *Strathearn Road.*
Dec. 1865. †Fraser, John, M.A., M.D., *Chapel Ash, Wolverhampton.*
Dec. 1855. *Fraser, Patrick Neill, *Rockville, Murrayfield.*
Mar. 1862. Fraser, Thomas R., M.D., F.R.S., *Professor of Materia Medica,* 13 *Drumsheugh Gardens.*
April 1848. ‡French, J. B., *Australia.*
Mar. 1871. *Gamble, James Sykes, M.A., F.L.S., *Conservator of Forests, Dehra Dún, North-West Provinces, India.*
Jan. 1866. *Gayner, Charles, M.D., F.R.S.E., *Oxford.*
Jan. 1881. Geddes, Patrick, F.R.S.E., *Professor of Botany, University College, Dundee,* 14 *Ramsay Gardens.*
May 1874. ‡Geikie, Sir Archibald, LL.D., F.R.SS. L. & E., *Director-General, H.M. Geological Survey,* 4 *Jermyn Street, London.*
Feb. 1895. Gibb, W. Oliphant, 21 *Royal Terrace.*
Jan. 1887. *Gibson, A. H., 5 *Crawfurd Road.*
Dec. 1836. ‡Gough, The Viscount George S., F.R.S., M.R.I.A., *Loughcutra Castle, Gort, Galway.*
Jan. 1889. *Grieve, James, *Pilrig Nurseries.*
Nov. 1893. †Grieve, J., M.D., F.R.S.E., 212 *St. Vincent Street, Glasgow.*
Dec. 1895. Grieve, Sommerville, 21 *Queen's Crescent.*
Feb. 1879. *Grieve, Symington, 11 *Lauder Road.*
Dec. 1892. *Gunn, Rev. George, M.A., *The Manse, Stitchel, Kelso.*
Mar. 1881. ‡Gunning, His Excellency Robert Halliday, M.A., M.D. Edin., 12 *Addison Crescent, Kensington, London.*
Feb. 1839. ‡Hamilton, John Buchanan, of *Leny and Bardovie.*
Dec. 1868. Hardie, Thomas, M.D., F.R.C.P.E., 10 *John's Place, Leith.*
April 1862. ‡Hay, G. W. R., M.D., *Bombay Army.*
May 1887. Hay, Henry, M.D., 7 *Brandon Street.*
June 1862. †Haynes, Stanley, Lewis, M.D., F.R.S., *Medhurst, Malvern, Worcestershire.*
Dec. 1860. ‡Hector, Sir James, K.C.M.G., M.D., F.R.SS. L. & E., F.L.S., *Wellington, New Zealand.*
Nov. 1894. Hepburn, Sir A. Buchan, *Smeaton Hepburn, Prestonkirk.*
Dec. 1847. ‡Hewetson, Henry, *West Park House, Falsgrave, Scarborough.*
April 1886. Hill, J. R., *Secretary, Pharmaceutical Society, York Place.*
Dec. 1854. ‡Hill, W. R., M.D., J.P., *Lymington, Hants.*
May 1867. *Hog, Thomas Alex., of *Newliston, Kirkliston.*
Feb. 1878. †Holmes, E. M., F.L.S., F.R.H.S., *Curator of Museum, Phar. Soc. of Great Britain, Ruthven, Sevenoaks, Kent.*
Nov. 1884. †Holt, G. A., 139 *Strangeways, Manchester.*
Dec. 1863. ‡Hossack, B. H., *Craigiefield, Kirkwall.*
Nov. 1873. ‡Hume, Thomas, M.B., C.M., *Madras.*
Dec. 1890. Hunter, George, M.D., F.R.C.S.E., M.R.C.P.E., 33 *Palmerston Pl.*
Jan. 1860. ‡Hunter, Rev. Robert, M.A., LL.D., F.G.S., *Forest Retreat, Staples Road, Loughton, Essex.*
June 1893. Hunter, Robert James, 24 *Craigmillar Park.*

Date of Election.

Jan. 1851. ‡Hutchinson, Robert F., M.D., *Bengal.*
Dec. 1847. ‡Ivory, Francis J., *Australia.*
Jan. 1855. ‡Jepson, O., M.D., *Enfield, Newlands Park, Sydenham.*
Feb. 1891. ‡Jamieson, Thomas, *Lecturer on Agriculture, University, Aberdeen.*
May 1877. *Johnston, Henry Halcro, B.Sc., M.D., C.M., F.L.S., *Surgeon-Major, Army Medical Staff, Orphir House, Kirkwall.*
April 1858. ‡Johnston, John Wilson, M.D., F.R.S.E., *Surgeon Lieut.-Colonel, Benmore, 30 Bidston Road, Oxton, Cheshire.*
Nov. 1869. ‡Kannemeyer, Daniel R., L.R.C.S.E., *Burghersdrop, Cape Colony.*
Nov. 1877. Kerr, John Graham, *Christ's College, Cambridge.*
Mar. 1841. ‡Kerr, Robert, *Greenock.*
Jan. 1854. ‡Kirk, Sir John, K.C.B., M.D., F.R.S., F.L.S., *British Consul, Zanzibar.*
Jan. 1874. *Kirk, Robert, M.B., C.M., *Bathgate.*
Feb. 1888. ‡Learmonth, W., *Fleetview, Gatehouse of Fleet.*
June 1874. *Leitch, John, M.B., C.M., *Silloth.*
Feb. 1878. ‡Lennox, David, M.D., F.C.S., 144 *Nethergate, Dundee.*
April 1883. Lindsay, Robt., *Windsor House, Ferry Rd.;—Associate, July* 1879.
Mar. 1874. ‡Lister, Sir Joseph, Bart., F.R.SS. L. & E., *Professor of Clinical Surgery*, 12 *Park Crescent, Portland Place, London, N.W.*
Jan. 1869. †Livesay, William, M.B., C.M., *Sudbury, Derby.*
June 1889. *London, William, 14 *Belgrave Crescent.*
Feb. 1863. †Lowe, George May, M.D., C.M., *Lincoln.*
Jan. 1854. †Lowe, John, M.D., 4 *Gloucester Place, Portman Sq., London, W.*
May 1838. ‡Lowe, William Henry, M.D., *Woodcote, Wimbledon.*
Dec. 1890. Lowson, J. Melvin, M.A., B.Sc., *University Tutorial College,* 32 *Red Lion Square, London, W.C.*
Jan. 1855. *Macadam, Stevenson, Ph.D., F.R.S.E., *Surgeon's Hall.*
May 1881. Macadam, W. Ivison, F.C.S., F.I.C., F.R.S.E., *Lecturer on Chemistry, Surgeon's Hall.*
Feb. 1892. M'Alpine, A. N., B.Sc. Lond., 87 *Stenmore Road, Glasgow.*
July 1836. ‡Macaulay, James, M.D., 25 *Carleton Road, Maida Vale, London, N.W.*
Mar. 1862. ‡Macdonald, John, M.D., F.L.S., *Gothie House, Walton-on-Thames.*
Jan. 1895. Macdougall, R. Stewart, M.A., B.Sc., 9 *Brougham Street.*
Jan. 1881. †Macfarlane, John M., Sc.D., F.R.S.E., *Professor of Botany, University of Philadelphia, U.S.A.*
Feb. 1886. M'Glashen, D., 79 *Morningside Park.*
Feb. 1863. ‡Macgregor, Rev. Patrick, M.A., *Logie-Almond Manse, Perthshire.*
June 1880. *M'Intosh, W. C., M.D., LL.D., F.R.SS. L. & E., F.L.S., *Professor of Natural History, St. Andrews.*
Jan. 1889. Mackenzie, A., *Warriston Nurseries.*
May 1862. ‡Mackenzie, Stephen C., M.D., *Professor of Hygiene, Calcutta.*
Nov. 1836. Maclagan, Sir Andrew Douglas, M.D., P.R.S.E., *Professor of Medical Jurisprudence,* 28 *Heriot Row.* — Honorary Secretary.
April 1857. ‡Maclagan, General Robert, P.R.S.E., 4 *West Cromwell Road, South Kensington, London, S.W.*
April 1880. ‡M'Laren, John, jun., 15 *Mill Street, Perth.*
June 1850. M'Laren, Hon. Lord, 46 *Moray Place.*
Feb. 1882. M'Murtrie, Rev. John, M.A., D.D., 5 *Inverleith Place.*
Dec. 1887. Mann, Gustav, M.D., *The Museum, Oxford.*
Dec. 1872. †Maw, George, F.L.S., F.G.S., *Benthall, Kenley, Surrey.*
May 1867. *Maxwell, Wellwood H., *of Munches, Dalbeattie.*
Nov. 1849. ‡Melville, A. G., *Emeritus Professor of Nat. Hist., Galway.*
April 1837. ‡Melville, Henry Reed, M.D., *St. Vincent.*
Feb. 1890. *Millar, R. C., C.A., 8 *Broughton Place.*
Mar. 1883. Milne, Alex., 32 *Hanover Street.*
Nov. 1875. *Milne, John Kolbe, *Kevock Tower, Lasswade.*
Jan. 1894. Mooney, Dr. J. J., 35 *Stratford Road, Manchester.*
Dec. 1888. Morris, Rev. A. B., F.L.S., 18 *Eildon Street.*
July 1878. †Muirhead, George, F.R.S.E., *Mains of Haddo, Aberdeen.*
Dec. 1889. ‡Murray, J. Russel, *Port-of-Spain, Trinidad.*
May 1884. Murray, William, 48 *Mayfield Road.*
Nov. 1848. ‡Nevins, John Birkbeck, M.D., 3 *Abercromby Square, Liverpool.*
Dec. 1878. *Norman, Commander Francis M., R.N., *Cheviot House, Berwick-on-Tweed.*
July 1889. Normand, P. Hill, *Whitehill, Aberdour, Fifeshire.*

Date of Election.

May 1873. Ogilvie, William M'Dougall, *Royal Bank, Lochee, Dundee.*
June 1890. Oliver, John S., 12 *Greenhill Park.*
Feb. 1863. *Panton, George A., F.R.S.E., 73 *Westfield Road, Edgbaston, Birmingham.*
May 1867. †Paterson Alexander, M.D., *Fernfield, Bridge of Allan.*
Trans. Dec. 1858. ‡Paterson, R., M.D., *Napier Road;—Wernerian, Dec.* 1836.
Mar. 1880. ‡Paton, James, F.L.S., *Industrial Museum, Kelvingrove, Glasgow.*
April 1883. *Paul, Rev. David, M.A., LL.D., *Carridale, Fountainhall Road.*
Nov. 1839. ‡Paul, James, M.D., *Jamaica.*
July 1889. *Paxton, W., *Orchardton, Fountainhall Road.*
April 1880. Peach, B. N., F.R.S.E., F.G.S., *Scot. Geol. Survey Office,* 86 *Findhorn Place.*
Nov. 1840. ‡Perry, William Groves, *Australia.*
Mar. 1874. ‡Pettigrew, J. B., M.D., LL.D., F.R.SS. L. and E., *Professor of Medicine, St. Andrews.*
April 1887. Peyton, Rev. W. W., *Broughty Ferry.*
Jan. 1838. ‡Pires, D'Albuquerque, Le Chevalier, *Brazil.*
Dec. 1874. ‡Playfair, D. T., M.B., C.M., *Heathfield, Bromley, Kent.*
May 1883. ‡Playfair, Rev. Patrick M., *Glencairn Manse, Thornhill.*
July 1836. ‡Pollexfen, Rev. John Hutton, M.A., *Middleton Tyas Vicarage, Richmond, Yorkshire.*
July 1894. Porteous, Alex., *Croftweet, Crieff.*
April 1877. ‡Porteous, George M., *Firknowe, Juniper Green.*
July 1871. ‡Post, G. E., M.D., *Beyrout.*
Nov. 1873. *Potts, George H., *of Fettes Mount, Lasswade.*
June 1891. †Prain, David, M.D., F.L.S., F.R.S.E., *Royal Botanic Garden, Calcutta.*
Dec. 1849. ‡Priestley, Sir W. O., M.D., 17 *Hertford Street, Mayfair, London*
‡Prior, R. C. Alexander, M.D., F.L.S., 48 *York Terrace, Regent's Park, London, and Halse House, Taunton.*
June 1893. ‡Pullar, Sir Robert, J.P., F.R.S.E., *Tayside, Perth.*
Dec. 1858. †Ramsbotham, S. H., M.D., *Leeds.*
July 1884. *Rattray, John, M.A., B.Sc., F.R.S.E., *Dunkeld.*
Jan. 1878. ‡Reid, Jas. R., C.M.G., *Bengal Civil Service.*
April 1877. ‡Riddell, William R., B.A., B.Sc., 109 *St. George's Street, Toronto, Ontario, Canada.*
Dec. 1869. *Robertson, A. Milne, M.B., C.M., *Gonville House, Roehampton Park, London, S.W.*
Dec. 1890. Robertson, Robert A., M.A., B.Sc., *Lecturer on Botany, St. Andrews, Rattray, Perthshire.*
April 1864. Rutherford, William, M.D., F.R.SS. L. and E., *Professor of Physiology,* 14 *Douglas Crescent.*
Dec. 1864. †Rylands, Thomas Glazebrook, F.L.S., *Highfields, Thelwall, near Warrington.*
July 1882. *Sanderson, William, *Talbot House, Ferry Road.*
Mar. 1869. *Scot-Skirving, Robert, *of Camptown,* 29 *Drummond Place.*
April 1881. ‡Scott, Daniel, *Wood Manager, Darnaway Castle, Forres.*
Dec. 1840. ‡Scott, John, *Greenock.*
Dec. 1887. Scott, J. S., L.S.A., 69 *Clowes Street, West Gorton, Manchester.*
Dec. 1891. *Semple, Andrew, M.D., F.R.C.S.E., *Deputy Surgeon-General,* 10 *Forres Street.*
May 1836. ‡Shapter, Thomas, M.D., *Sudbury, Derby.*
Dec. 1869. ‡Shaw, John Edward, M.B., 23 *Caledonian Place, Clifton, Bristol.*
Jan. 1851. *Sibbald, John, M.D., F.R.S.E., 18 *Great King Street.*
Nov. 1836. ‡Sidney, M. J. F., *Cowpen, Morpeth.*
Jan. 1887. Simson, W. B., *The Elms, Broughty Ferry.*
Jan. 1840. ‡Slack, Robert, M.D., *Holywalk, Leamington.*
Feb. 1891. *Smith, J. Pentland, M.A., B.Sc., 3 *Mansfield Place, Paisley.*
Mar. 1891. Smith, William G., B.Sc., *Royal Botanic Garden.*
Feb. 1886. †Somerville, Alexander, B.Sc., F.L.S., 4 *Bute Mansions, Hillhead, Glasgow.*
Jan. 1890. *Somerville, William, Œc.D., B.Sc., F.R.S.E., *Professor of Agriculture, Durham College of Science, Newcastle-on-Tyne.*
July 1853. ‡Southwell, Thomas, F.Z.S., *Earlham Road, Norwich.*
Dec. 1854. ‡Spasshatt, Samuel P., M.D., *Armidale, New South Wales.*
June 1874. Sprague, Thomas Bond, M.A., LL.D., F.R.S.E., 29 *Buckingham Terrace.*

Date of Election,

June 1893. Sprague, Mrs. T. B., 29 *Buckingham Terrace.*
Nov. 1883. †Stabler, George, *Levens, Milnthorpe, Westmoreland.*
July 1867. ‡Steel, Gavin, *of Carphin, Lanarkshire.*
Feb. 1841. ‡Steele, Robert, *Greenock.*
Jan. 1837. ‡Stevens, Rev. Charles Abbott, M.A., *Port Slade Vicarage. Shoreham, Sussex.*
Feb. 1871. ‡Stewart, Samuel A., *The Museum, College Square North, Belfast.*
Dec. 1892. Stewart, Robert, S.S.C., 7 *East Claremont Street.*
July 1895. Stockman, Dr. Ralph, 12 *Hope Street.*
Jan. 1893. Struthers, John, M.D., LL.D., *Emeritus Professor of Anatomy,* 24 *Buckingham Terrace.*
July 1884. Stuart, Charles, M.D., *Chirnside.*
Dec. 1869. Syme, David, 1 *George IV. Bridge,*
July 1853. *Taylor, Andrew, 11 *Lutton Place*
Dec. 1837. ‡Taylor, R. H., M.D., 1 *Percy Street, Liverpool.*
Dec. 1887. Terras, J. A., B.Sc., 40 *Findhorn Place.*—ASSISTANT SECRETARY.
May 1894. Thompson, A., *The Grove, Trinity.*
April 1846. †Townsend, F., M.A., F.L.S., *Mem. Bot. Soc. Fr., Honington Hall, Shipston-on-Stour.*
May 1888. *Trail, J. W. H., M.A., M.D., F.L.S., *Professor of Botany, Aberdeen.*
Dec. 1888. Turnbull. Robert, B.Sc., 9 *Dean Terrace.*
Mar. 1836. ‡Tyacke, N., M.D., *Westgate, Chichester.*
Nov. 1888. Ure, George, *Camphill Lodge, Broughty Ferry.*
July 1886. †Waddell, Alexander, *of Pallace, Jedburgh.*
Dec. 1893. Waite, Percival C., 13 *Nile Grove.*
Dec. 1861. *Walker, Arthur A., *Chislehurst, Putney Common, London, S.W.*
Jan. 1856. ‡Walker, V. E., *Arno's Grove, Southgate, Middlesex.*
Mar. 1836. ‡Wallich, George Charles, M.D., *Kensington, London, W.*
July 1884. Watson, William, M.D., *Waverley House, Slateford.*
May 1885. ‡Webster, A. D.. *Holwood Park, Keston, Beckenham.*
May 1837. ‡White, Alfred, F.L.S., *West Drayton.*
Mar. 1893. †Wilkinson, W. H., F.L.S., F.R.M.S., *Rockville, Manor Hill, Sutton Coldfield, Birmingham.*
Mar. 1837. ‡Wilks, G. A. F., M.D., *Stanburgh, Torquay.*
Dec. 1890. *Wilson. John H., D.Sc., F.R.S.E , *Yorkshire College, Leeds;—Associate, Nov.* 1886.
April 1880. Wilson, Dr Andrew, F.R.S.E., F.L.S., 110 *Gilmore Place.*
May 1873. ‡Wright, R. Ramsay, M A., B.Sc., *Professor of Natural History, University, Toronto.*
May 1863 †Yellowlees, David, M.D., LL.D., *Gartnavel Asylum, Glasgow.*

CORRESPONDING MEMBERS.

Jan. 1878. Areschoug, Dr. F. W. C., *Professor of Botany in the University, and Director of the Botanic Garden, Lund.*
Jan. 1878. Ascherson, Dr. P., *Royal Herbarium, Berlin.*
April 1877. Blytt. Axel, *Professor of Botany in the University, and Conservator of the Botanical Museum, Christiania.*
Dec. 1881. Bohneusieg, Dr. G. C. W., *Conservator of the Library of the Museum Leyler, Haarlem.*
Dec. 1854. Brandis, Sir Dietrich, Ph.D., F.L.S., *Ex-Inspector-General of Indian Forests, Professor of Forestry in the University. Bonn.*
Mar. 1895. Brefeld, Dr. O., *Professor of Botany in the University, and Director of the Botanic Garden, Munster.*
Mar. 1881. Caminhoá, Dr. Joaquim Monterio, *Professor of Botany and Zoology, Rio Janeiro.*
Jan. 1866. Candolle, Casimir de, *Geneva.*
July 1879. Cheeseman, T. F., F.L.S., F.Z.S., *Curator of the Museum, Auckland, New Zealand.*
July 1879. Cleave, Rev. W. O., LL.D., *College House, St Helier, Jersey.*
May 1865. Clos, Dominique, M.D., Corresp. de l'Institut, *Professor of Botany in the Faculty of Sciences, and Director of the Botanic Garden, Toulouse.*
Dec. 1868. Crépin, François, *Director of the Royal Botanic Garden, Brussels.*
Jan. 1878. Eeden, F. W. Van, *Director of the Colonial Museum, Haarlem.*
Mar. 1895. Elving, Dr. F.. *Privat-Docent der Universitat, Helsinfors.*
Feb. 1893. Errera, Leo, *Professor of Botany in the University, Brussels.*

Date of Election.

Mar. 1895. Franchet, A., *Attaché à l'Herbier Museum d'Histoire Naturelle, Paris.*

Jan. 1878. Garcke, Dr. A., *Professor of Botany in the University, and First Assistant in the Royal Botanic Museum, Berlin.*

April 1844. Gottsche, Dr. K. M., *Altona, Schleswig-Holstein.*

Mar. 1895. Guignard, L., *Professor of Botany, Paris; President of the Botanical Society of France.*

Jan. 1886. Haberlandt, Dr. G., *Professor of Botany in the University, and Director of the Botanic Garden, Graz.*

Dec. 1887. Hansen, Dr. E. C., *Director of the Physiological Department of the Carlsberg Laboratory, Copenhagen.*

Feb. 1876. Heldreich, Dr. Theodore de, *Director of the Botanic Garden, Athens.*

May 1891. Henry, Augustine, M.D., *Imperial Customs Service, China.*

April 1887. Horne, John, F.L.S., *Ex-Director of the Royal Botanic Garden, Mauritius.*

Jan. 1886. Janczewski, Dr. Ed. Ritter von, *Professor of Plant Anatomy and Physiology in the University, Cracow.*

July 1853. Jolis, Dr. Auguste le, *Cherbourg.*

Mar. 1878. Juranyi, Dr. L., *Professor of Botany in the University, and Director of the Botanic Garden, Buda Pest, Hungary.*

Jan. 1886. Kerner, Dr. Anton J. Ritter von Merilaun, *Professor of Botany in the University, and Director of the Botanic Garden, Vienna.*

Jan. 1886. Leichtlin, Max, *Baden-Baden.*

Jan. 1886. Luerssen, Dr. Ch., *Professor of Botany in the University, and Director of the Botanic Garden, Königsberg.*

Jan. 1873. Millardet, A., *Professor of Botany in the Faculty of Sciences, Bordeaux.*

Jan. 1878. Moore, Charles, F.L.S., *Director of the Botanic Garden, Sydney, New South Wales.*

Jan. 1866. Naudin, Dr. C., For. F.L.S., Membre de l'Institut, *Director of the Laboratory, Villa Thuret, Antibes.*

Jan. 1878. Nyman, Charles Frider, *Stockholm*

Jan. 1878. Oudemans, Dr. C. A. J. A., *Professor of Botany in the University, and Director of the Botanic Garden, Amsterdam.*

Jan. 1872. Phillipi, Dr. R. A., *Professor of Botany in the University of Santiago, Chili.*

Dec. 1868. Radlkofer, Dr. L., *Professor of Botany in the University, Munich.*

Mar. 1881. Rodrigues, Joas Barboza, *Director of the Botanic Garden, Rio Janeiro.*

Dec. 1858. Rostan, Dr. Edouard, *San Germano di Pinerolo, Piedmont.*

Feb. 1876. Sodiro, Luis, *Professor of Botany in the University, Quito, Ecuador.*

Mar. 1895. Stahl, Dr. E., *Professor of Botany in the University, and Director of the Botanic Garden, Jena.*

Nov. 1888. Sully, W. C., *Cape Town.*

Dec. 1870. Suringar, W. F. R., *Professor of Botany, and Director of the Botanic Garden, Leyden.*

May 1876. Terracciano, Dr. Nicolao, *Director of the Royal Gardens, Caserta, near Naples.*

Nov. 1888. Tyson, W., *Forest Department, Cape Town.*

Mar. 1895. Vochting, Dr. H., *Professor of Botany in the University, and Director of the Botanic Garden, Tübingen.*

Dec. 1887. Wildpret, H., *Director of the Botanic Garden, Orotava.*

Dec. 1870. Willkomm, Dr. Maurice, *Professor of Botany and Director of the Botanic Garden, Prague, Bohemia.*

ASSOCIATES.

Dec 1861. Bell, William, *New Zealand.*

Mar. 1886. Bennett, A., F.L.S., 107 *High Street, Croydon.*

Mar. 1848. Boyle, David, *Boxhill Post Office, Nunwading, South Bourk, Melbourne.*

Feb. 1876. Campbell, A., 62 *Marchmont Road, Edinburgh.*

Mar. 1878. Campbell, John, *Ledaig, Argyllshire.*

Feb. 1871. Evans, William, 18A *Morningside Park.*

Dec. 1885. Greig, James, *Woodville, Dollar.*

Dec. 1850. Howie, Charles, *St. Andrews.*

Date of Election.
Dec. 1873. Jaffray, Andrew T., *Darjeeling.*
April 1847. Laing, J., *Seed Merchant, Foresthill, London.*
Mar. 1886. Landsborough, Rev. D., *Kilmarnock.*
June 1891. M'Andrew, James, *New Galloway, Kirkcudbrightshire.*
Feb. 1890. M'Intosh, Charles, *Dunkeld.*
Dec 1868. Munro, Robertson, *Glasgow.*
Mar. 1840. Pamplin, William, A.L.S., *Llanderfel, Corwen, Merionethshire.*
Dec. 1883. Richardson, Adam D., *Royal Botanic Garden.*
June 1891. Shaw, James, *Tynron, Dumfriesshire.*
May 1868. Shaw, William, *Gunsgreen, Eyemouth.*
Mar. 1886. Traill, G. W., 3 *George Street.*

LADY ASSOCIATE.

Nov. 1886. Ormerod, Miss E. A., *Dunster Lodge, Isleworth.*

LADY MEMBERS.

June 1893. Aitken, Mrs. A. P., 57 *Great King Street.*
April 1893. Balfour, Mrs. Bayley, *Inverleith House.*
Jan. 1894. Madden, Miss Elizabeth.
Jan. 1894. Pearson, Miss C. C., 27 *Royal Terrace.*
June 1893. Sanderson, Mrs. W., *Talbot House, Ferry Road.*

THE SOCIETY EXCHANGES PUBLICATIONS WITH—

AMERICA.

CANADA.

Halifax, . . Department of Agriculture.
Nova Scotian Institute of Natural Science.
Montreal, . . Geological and Natural History Survey of Canada.
Natural History Society.
Toronto, . . Canadian Institute.

COSTA RICA.

San Jose, . . Istituto Nacional.

UNITED STATES.

Ames, Iowa, . Agricultural College.
Auburn, Ala., . Agricultural and Mechanical College.
Austin, Texas, Agricultural and Mechanical College
Boston, Mass., Society of Natural History.
Massachusetts Horticultural Society.
Cambridge, Mass., Harvard University.
Chicago, Ill., . University of Chicago.
Cincinnati, Iowa, Society of Natural History.
Colorado Springs, Colo., Colorado College.
Davenport, . . Academy of Natural Sciences.
Ithaca, N.Y., . Cornell University.
Lancaster, Pa., Franklin and Marshall College.
Manhattan, Kansas, State Agricultural College.

Minneapolis, Minn.,	Geological and Botanical Survey of Minnesota.
Mississippi,	Agricultural College.
New Brunswick, N.J.,	Agricultural College.
New Haven, Conn.,	Academy of Arts and Sciences.
New York,	American Museum of Natural History.
	Columbia College.
	New York Academy of Sciences.
	Torrey Botanical Club.
Philadelphia,	Academy of Natural Sciences.
	University of Pennsylvania.
Rochester, N.Y.,	Rochester Academy of Sciences.
St. Louis, Missouri,	Botanic Garden.
Sacramento, Calif.,	University of California.
San Francisco, Calif.,	California Academy of Sciences.
Topeka, Kansas,	Academy of Science.
Trenton, N.J.,	Natural History Society.
Washington,	United States Geological Survey.
	Smithsonian Institution.
	United States Department of Agriculture—Division of Botany; Division of Entomology; Division of Forestry; Division of Microscopy; Division of Pomology; Division of Vegetable Pathology; Office of Experiment Stations.

South America.

Monte Video,	Museo Nacional de Monte Video.

WEST INDIES.

Jamaica,	Botanical Department.
Trinidad,	Royal Botanic Garden.

AFRICA.

Cape Colony,	Botanical Department.
Natal,	Botanic Garden.

ASIA.

Calcutta,	Botanic Garden.
Straits Settlements,	Gardens and Forest Department.

AUSTRALASIA.

New South Wales.

Sydney,	Botanical Department.
	Royal Society of New South Wales.

New Zealand.

Wellington.	Colonial Museum and Geological Survey.
	New Zealand Institute.

Queensland.

Brisbane.	Royal Society of Queensland.
	Department of Agriculture, Brisbane.

Tasmania.

Hobart, . . .	Royal Society of Tasmania.

Victoria.

Melbourne, . .	Botanical Department.
	Royal Society of Victoria.

EUROPE.

Austria.

Cracow, . .	Academia Umiejetnósci.
Graz, . . .	Naturwissenschaftlicher Verein für Steiermark.
Vienna, . . .	Kaiserlich-Königliches Naturhistorisches Hofmuseum.
	Kaiserlich-Königliche zoologisch-botanische Gessellschaft.
	Naturwissenschaftlicher Verien der Universität.

Belgium.

Brussels, . .	Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique.
	Federation des Sociétés d'Horticulture de Belgique.
	Société Royale de Botanique de Belgique.
Ghent, . . .	Editor of *Botanische Jaarboek*.

Denmark.

Copenhagen, .	Botaniske Forening.

France.

Amiens, . . .	Société Linnéenne du Nord de la France.
Cherbourg, . .	Société Nationale des Sciences Naturelles et Mathematiques.
Lille, . . .	Institut Colonial de Marseille.
Lyons, . . .	Société Botanique.
Marseille, . .	Faculté des Sciences de Marseille.
Paris, . . .	Société Botanique de France.
	Société Linnéenne de Paris.
Toulouse, . .	Société Française de Botanique.

Germany.

Berlin, . . .	Botanischer Verein für die Provinz Brandenburg und die angrenzenden Länder.
Bonn, . . .	Naturhistorischer Verein der preussischen Rheinlande. Westfalens, und der Regierung-Bezirks Osnabruck.
	Niederrheinische Gesellschaft für Natur-und Heilkunde.
Braunschweig, .	Verein für Naturwissenschaft.
Bremen, . . .	Naturwissenschaftlicher Verein.
Breslau, . . .	Schlesische Gesellschaft für vaterlandische Cultur.
Erlangen, . .	Physikalisch-medicinische Societät.
Frankfort-am-Oder,	Naturwissenschaftlicher Verein des Regierungsbezirks.
Giessen, . . .	Oberhessische Gesellschaft für Natur- und Heilkunde.
Halle, . . .	Kaiserliche leopoldino-carolinische deutsche Akademie der Naturforscher.
Kiel, ...	Naturwissenschaftlicher Verein für Schleswig-Holstein.
Königsberg, .	Physikalisch-oekonomische Gesellschaft.
Munich, . . .	Baierische Gesellschaft.

Great Britain and Ireland.

Alnwick, . .	Berwickshire Naturalists' Club.
Belfast, . . .	Natural History and Philosophical Society.
	Belfast Naturalists' Field Club.

Bristol, . . . Bristol Naturalists' Society.
Buckhurst Hill, Essex Field Club.
Dublin, . . . Royal Dublin Society.
Dumfries. . . Dumfriesshire and Galloway Natural History and Antiquarian Society.
Edinburgh, . . Royal Scottish Arboricultural Society.
Royal College of Physicians.
Edinburgh Geological Society.
Royal Society of Edinburgh.
Royal Physical Society.
Royal Scottish Geographical Society.
Royal Scottish Society of Arts.
Glasgow, . . Natural History Society.
Philosophical Society.
Hertford. . . Hertfordshire Natural History Society and Field Club.
Leeds, . . . Yorkshire Naturalists' Union.
London. . . Editor of *Gardeners' Chronicle*.
Linnean Society.
Editor of *Nature*.
Pharmaceutical Society of Great Britain.
Quekett Microscopical Club.
Royal Gardens, Kew.
The Royal Society.
Royal Horticultural Society.
Royal Microscopical Society.
Manchester, . Manchester Literary and Philosophical Society.
Newcastle-upon-Tyne, Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, and the Tyneside Naturalists' Field Club.
Norwich, . . Norfolk and Norwich Naturalists' Society.
Perth, . . . Perthshire Society of Natural Science.
Plymouth, . . Plymouth Institution.

HOLLAND.

Amsterdam. . Koninklijke Akademie van Wettenschappen.
Haarlem, . . Musée Teyler.
Nederlandische Maatschappij ter Bevordering van Nijverheid.
Luxembourg. . Société Botanique du Grand-duché de Luxembourg.

ITALY.

Rome, . . . Reale Istituto Botanico.

PORTUGAL.

Lisbon, . . . Academia real das Sciencies.

RUSSIA.

Helsingfors. . Societas pro Fauna et Flora Fennica.
Kieff, . . . Société des Naturalistes.
Moscow, . . Société impériale des Naturalistes.
St. Petersburg, Hortus botanicus imperialis.

SCANDINAVIA.

Lund, . . . Universitas Lundensis.
Stockholm. . Kongl. Svenska Vetenskaps Akademien.
Sveriges Offentliga Bibliotek.
Upsala. . . Societas Regia Scientiarum.

SWITZERLAND.

Berne, . . . Naturforschende Gesellschaft.
Geneva. . . Herbier Boissier.

INDEX.