QK1
.E4
1900-02
v.1-2

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

VOL. I.

Including Numbers I.-V.

1900-1901.



GLASGOW:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,
And to be purchased, either directly or through any Bookseller, from
OLIVER & BOYD, Edinburgh.

[*All rights reserved.*]

Dates of the several Numbers of this Volume.

Part I., pp. 1-24 for January, 1900.
Part II., pp. 25-40 for November, 1900.
Part III., pp. 41-134 for December, 1900.
Part IV., pp. 135-192 for August, 1901.
Part V., pp. 193-246 for December, 1901.

List of Contents to Vol. I., 1900-1901.

PAGE.

Prefatory Note.

The Royal Botanic Garden - - - - - - - i

List of Staff - - - - - - - - ii

Rules and Regulations - - - - - - iii

Historic Notice - - - - - - - - v

Features of the Garden. With Key Plan - - - ix

Teaching in the Garden - - - - - - xi

Life-History and Habits of Diaxenes dendrobii, Gahan. With Plates I. and II. By R. Stewart MacDougall, M.A., D.Sc. 1

Torsion of the Leaves in Picea, Abies, Tsuga, and Pseudotsuga. With Zincographs 1-10. By A. D. Richardson - - 13

List of Seeds collected in the Royal Botanic Garden, Edinburgh, during the year 1900 - - - - - - - 25

Observations on the Girth-increase of Trees in the Royal Botanic Garden, Edinburgh. By David Christison, M.D. 41

Life-History and Habits of Clerus formicarius, Linn., with 11-14. By R. Stewart MacDougall, M.A., D.Sc. - - 121

Life-History and Habits of Rhizophagus depressus, Fowler, with 15-17. By R. Stewart MacDougall, M.A., D.Sc. - 127

Enumeration of Visitors to the Royal Botanic Garden, Edinburgh, during the years 1889-1900 - - - - 134

The Cultivation of Fruit under Glass. By James Whytock - 135

Observations on the Girth-increase of Trees in the Royal Botanic Garden, Edinburgh. Part II.—Coniferæ. By David Christison, M.D. - - - - - - - 173

The Diameter-Increment of Trees. By A. W. Borthwick, B.Sc. 193

Hints on Propagating Mistletoe from the Berry. By William Paxton - - - - - - - - - 212

Notes on Museum-Methods in use at the Royal Botanic Garden, Edinburgh. With Plate III. By H. F. Tagg, F.L.S., Assistant in the Museum - - - - - - - 213

Title and List of Contents to Vol. I., 1900-1901.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

JANUARY 1900.

CONTENTS.

	Page
Prefatory Note.	
The Royal Botanic Garden - - - - - - - -	i
List of Staff - - - - - - - - -	ii
Rules and Regulations - - - - - - - -	iii
Historic Notice - - - - - - - - -	v
Features of the Garden. With Key Plan - - -	ix
Teaching in the Garden - - - - - - -	xi
Life-History and Habits of Diaxenes dendrobii, Gahan. With Plates I. and II. By R. Stewart MacDougall, M.A., D.Sc. - - - - - - - - -	1
Torsion of the Leaves in Picea, Abies, Tsuga, and Pseudotsuga. With Zincographs 1-10. By A. D. Richardson - - - - - - - - - -	13

GLASGOW:

PRINTED FOR HER MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT THE "CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

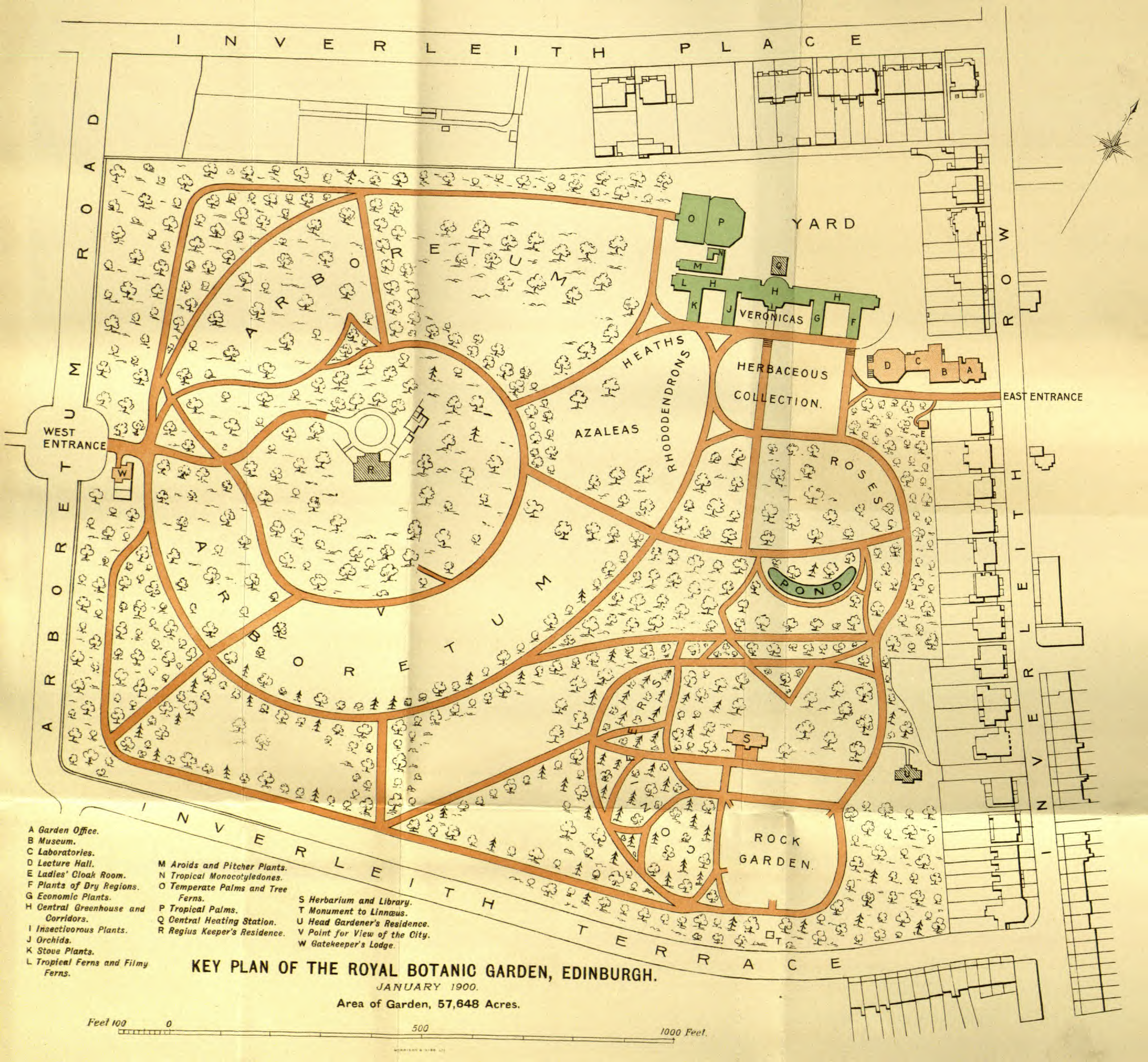
And to be purchased, either directly or through any Bookseller, from

JOHN MENZIES & CO., 12 HANOVER STREET, EDINBURGH, and

90 WEST NILE STREET, GLASGOW.

[PRICE NINEPENCE.]

[*All rights reserved.*]



KEY PLAN OF THE ROYAL BOTANIC GARDEN, EDINBURGH.

JANUARY 1900.

Area of Garden, 57,648 Acres.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

IT is proposed to issue from time to time, under the title of "NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH," reports upon the condition and progress of the Garden, records of scientific investigations carried on in the Garden, and notices of points of interest relating to plant-life which come under the observation of the Staff. To this first number there is prefixed a brief notice of the Botanic Garden itself.

The "NOTES" will be available in exchange for publications of kindred institutions, and will also be on sale to the public.

ISAAC BAYLEY BALFOUR,
Regius Keeper.

January, 1900.

THE ROYAL BOTANIC GARDEN, EDINBURGH.

THE Royal Botanic Garden, Edinburgh, is one of the three Gardens maintained by the State in the United Kingdom, the others being the Royal Gardens at Kew in England, and the Glasnevin Garden at Dublin in Ireland. It occupies an unequally-sided quadrilateral area of 57·648 acres (bounded upon all sides by public roads and dwelling-houses) on the North side of Edinburgh—about a mile from the shore of the Firth of Forth. Its highest point, at Inverleith House (**R**)—the official residence of the Regius Keeper of the Garden—towards the North-west, is 78 feet above sea-level, and thence the ground falls away on all sides. The lowest point—a depression 30 feet above sea-level, with an east and west trend through the middle of the Garden—is the site of an old bog, and the ground rises again to the south of the depression. The surface soil is generally alluvial sand resting on clay at considerable depth. In the lower part of the area the clay comes to the surface.

There are two entrances—one upon the east side from Inverleith Row into the Garden, the other upon the west side from Arboretum Road into the Arboretum. The Garden is open daily from 8 a.m. on Week-days and from 11 a.m. on Sundays until sunset. The Plant-Houses are open from 1 p.m. until 5.30 p.m., or until sunset if this be earlier. The Museum is open on Week-days from 10 a.m. until 6 p.m., on Sundays from 1 p.m. until 5.30 p.m. The Herbarium and Library are open on Week-days from 10 a.m. until 6 p.m., excepting on Saturday, when they are open until 1 p.m.

Staff of the Royal Botanic Garden, Edinburgh.

Regius Keeper, ...	Isaac Bayley Balfour, M.A., M.D., F.R.S.
Assistant in Museum, . .	Harry Frank Tagg, F.L.S.
Assistant in Herbarium, . . .	John Frederick Jeffrey.
Clerk, ...	Henry Hastings.
Head Gardener, ...	Adam Dewar Richardson.
Assistant Head Gardener, . . .	Robert Lewis Harrow.
Foreman of Herbaceous Department,	William Henry Waite.

RULES for the Royal Botanic Garden and Arboretum in connection with the Regulations prescribed by "The Parks Regulation Act, 1872."

---

1. No unauthorised Person may ride or drive in this Garden or in the Arboretum, and no Wheelbarrow, Truck, Bath-chair, Perambulator, Cycle, or other Vehicle or Machine, is allowed to enter, except with the written permission of the Keeper. Children under ten years of age are not admitted unless accompanied by a Parent or suitable Guardian.

2. No Horses, Cattle, Sheep, or Pigs are allowed to enter.

3. No Dogs are admitted.

4. No Bags, Baskets, or Parcels, no Flowers, and no implements for Games may be brought in; Artists and Photographers may not bring in their Apparatus without written permission from the Keeper.

NOTE.—*The foregoing Rules shall not apply to persons going to or leaving Inverleith House by the road leading from the Arboretum Road Gate to the House.*

5. Visitors are to enter and leave the Plant Houses by the Doors according to the Notices affixed thereon.

6. Smoking is not allowed in the Plant Houses.

7. No Person shall touch the Plants or Flowers.

8. Pic-nics and luncheon parties are not allowed.

9. No unauthorised Person shall Drill or practise Military Evolutions or use Arms or play any Game or Music, or practise Gymnastics, or sell or let any Commodity.

10. No unauthorised Public Address may be delivered in the Garden or Arboretum. No Performance or Representation either spoken or in dumb show shall be given in any part of the Garden or Arboretum, unless by permission of the Commissioners

of Her Majesty's Works and Public Buildings. No Person shall use any obscene, indecent, or blasphemous words, expressions, or gestures, or do any act calculated to provoke a breach of the Peace, in the course of, or in connexion with, any speech, address, performance, recitation, or representation. No money shall be solicited or collected in connexion with any performance, recitation, or representation, except by permission of the Commissioners of Her Majesty's Works and Public Buildings.

11. Large parties must be broken up to prevent crowding.

12. Climbing the Trees, Railings, or Fences is forbidden.

13. Birds' nesting, and taking, destroying, or injuring Birds or Animals are forbidden.

14. The distribution of Handbills, Advertisements, and other Papers by the Public is forbidden.

Dated the 4th day of August 1896.

Sealed with the Common Seal of the Commissioners of Her Majesty's Works and Public Buildings.

REGINALD B. BRETT,
Secretary.

(Seal)

Historic Notice.

In the year 1670 a portion of the Royal Garden around Holyrood House was occupied by two eminent Edinburgh physicians, Andrew Balfour and Robert Sibbald, for the making of a Physic Garden, and James Sutherland was appointed to the "Care of the Garden." This was the foundation of the Royal Botanic Garden of Edinburgh, which is therefore, after that of Oxford (founded in 1632), the oldest in Great Britain. The stocking of the Garden with plants was effected from the private Garden of Dr. Andrew Balfour, in which for some years he had been accumulating medicinal plants, and also in great measure from that at Livingston in West Lothian, the laird of which, Patrick Murray, was much interested in the growing of useful plants.

In 1676 the same physicians acquired from the Town Council of Edinburgh a lease of the Garden of Trinity Hospital and adjacent ground for the purpose of a Physic Garden in addition to the Garden already existing at Holyrood, and they appointed the same James Sutherland to be "Intendant" of this Garden. The site of this Garden, which for convenience of reference may be called the Town's Botanic Garden, was the ground lying between the base of that portion of the Calton Hill upon which the prison is built and the North Bridge, and it is now occupied by a portion of the Waverley Station of the North British Railway. The name Physic Garden attached to a street in the vicinity is a reminiscence of the existence of the Garden at this spot.

About 1702 another Botanic Garden was established in Edinburgh in the ground immediately adjacent to the College Buildings, apparently on the site of the present South College Street. This was the College Garden, and of it James Sutherland became also custodian.

Thus in the early years of the eighteenth century there were in Edinburgh no less than three distinct Botanic or Physic Gardens—one at Holyrood, the Royal Garden; one around Trinity Hospital, the Town's Garden; and one beside the College, the College Garden. All these were at first under the care of James Sutherland.

Sutherland from the first made use of the Royal Garden for giving "instruction in Botany to the Lieges," and received a royal warrant appointing him Botanist to the King in Scotland, and empowering him to "set up a Profession of Botany" in this Garden. When the Town's Garden was created the Town Council appointed him to lecture on Botany as Professor in the Town's College, now the University of Edinburgh. In 1683 he published his "Hortus Medicus Edinburgensis, or a Catalogue of the Plants in the Physical Garden at Edinburgh," from which and from other published notices of the Town's Garden we learn that between two and three thousand plants were in cultivation. There is no means of determining how these plants were distributed between the several Gardens at the date of publication of Sutherland's catalogue.

In 1706 Sutherland resigned the care of the Town's Garden and the College Garden as well as his Professorship in the University, but, remaining King's Botanist, he retained the care of the Royal Garden at Holyrood. Charles Preston was appointed his successor by the Town Council, and there were thus established rival Gardens and rival Professors of Botany in Edinburgh. Charles Preston died in 1712, and was succeeded in his offices by his brother George Preston. Neither of the Prestons had ever the care of the Royal Garden.

In 1715 Sutherland died, and his successor as King's Botanist, Keeper of the Royal Garden, and Regius Professor of Botany was William Arthur, who, however, for political reasons did not hold the offices long, and was succeeded in 1716 by Charles Alston.

In 1724 the College Garden, having fallen into disorder, was turned to other uses; and in 1729, George Preston having retired, the Town Council appointed, as his successor in the charge of the Town's Garden and as Professor of Botany in the University, Charles Alston, who as King's Botanist had already

the charge of the Royal Garden and was Regius Professor of Botany. Through him, after separation for a quarter of a century, the Royal Garden and the Town's Garden were again combined under one Keeper, and the Regius Professorship of Botany and the University Professorship were similarly united. They have so continued to the present time.

In 1763, the Royal Garden and the Town's Garden proving too small and otherwise unsatisfactory, John Hope, who had succeeded Alston in his offices in 1761, proposed a transference of the two to a more congenial site in which they could be combined. At first it was intended to secure ground to the south of George Watson's Hospital—the area upon which much of the present Royal Infirmary is built—but this not being possible, five acres of ground on the north side of Leith Walk, below the site now occupied by Haddington Place, were chosen. As Hope proposed to transfer the collections in the Royal Garden to the new Garden he was able to secure the support of the Treasury to his scheme, and the selected ground was leased in name of the Barons of Exchequer. At the same time the Town Council agreed to contribute £25 annually to the support of the Garden, this sum being the amount of rent expected from the letting of the old Town's Garden. The plants from both Gardens were transferred to the ground at Leith Walk, and from this date there has been only one Botanic Garden in Edinburgh.

The site thus secured for the Garden proved, however, only a temporary one. Daniel Rutherford, who in 1786 succeeded Hope in his offices, cast about him for a spot in which more ground would be available for the extension of the Garden; and eventually in 1815 nine and a half acres of the land lying to the east of Holyrood Palace, and forming the ground of Belleville or Clockmill, was fixed upon as a site in every way desirable; but Rutherford dying before completion of the arrangements for the transference of the Garden, his successor, Robert Graham, appointed in 1820, preferred the more open site of the Inverleith property which the Garden now occupies, and fourteen acres of the Field or Park of Inverleith, known as Broompark and Quacaple-sink, were purchased by the Barons of Exchequer from Mr. James Rocheid, its owner, in 1820, the lease of the Leith Walk

Ground being sold. By 1823 all the plants had been transferred to the new Garden.

In 1858, during the Keepership of John Hutton Balfour, who succeeded Graham in 1845, a further addition, by purchase from the proprietor of Inverleith, of a narrow belt of two and a half acres was made to the Garden on the west side; and in 1865, the Caledonian Horticultural Society having resigned to the Crown its lease of the ten acres of adjoining ground which it had occupied since 1824 as an experimental Garden, this ground was also made part of the Botanic Garden. Finally the present area of the Garden was completed in 1876, when the Town Council purchased from the Fettes Trustees twenty-seven and three-quarter acres of the Inverleith property on the west side of the Garden and transferred it to the Crown for the purpose of making an Arboretum in connection with the Garden; the Crown at the same time purchased Inverleith House and two and a half acres of additional ground.

In 1879, on Balfour's retirement, Alexander Dickson became Queen's Botanist, Regius Keeper and Professor, and held these appointments until his death in 1887. During his term of office the Arboretum was thrown open to the public.

Surrounded as it now is on all sides by public roads, no further extension of the Garden upon its present site can be made.

Features of the Garden.

The method through which the Garden was built up by successive additions resulted in an absence of combination between its several parts, in great measure a consequence of want of adequate funds to make the necessary alterations in the grounds. During the past decade, in which the Garden has been wholly under the administration of the Commissioners of H.M. Works, the bringing about of this combination has been in progress. The work is not yet completed, and the Plan of the Garden which is attached to this sketch shows the area of the Garden as it is laid out at this date—January, 1900. Future editions will show further changes as the work of reconstruction proceeds.

From its foundation the Botanic Garden has been devoted to the teaching of Botany, and its usefulness in this respect has determined the laying out of its area.

Herbaceous Garden.—A considerable space is occupied by a collection of herbaceous plants arranged for study in natural orders after the "Genera Plantarum" of Bentham and Hooker.

Rock Garden.—There is an extensive rockwork upon which alpine and rarer herbaceous plants are cultivated.

Arboretum.—The whole of the western area of the Garden will be eventually utilised as an Arboretum of trees and shrubs, with the exception of the Conifers, which are now placed in the ground adjacent to the Rock Garden.

The **Plant-Houses** are still in process of reconstruction. So far as they have been rearranged at the present time they consist of a long range to the north of the herbaceous collection, composed of a Central Green-house, from the sides of which two Corridors run east and west (**H**). In the Entrance Porch to the Central Green-house is a collection of Insectivorous Plants (**I**). From the Eastern Corridor two houses project to the south—one occupied by Plants of Dry Regions (**F**), the other containing

Economic Plants of both Tropical and Temperate Regions (**G**). The House terminating the Eastern end of this Corridor is one of the old and decayed plant-houses, to which visitors are not admitted pending its reconstruction. To the south side of the Western Corridor are attached two houses—one for Orchids (**J**) and one for Plants of Tropical and Warm Regions (**K**). The house at the western end of the Corridor is one of the old plant-houses, and is temporarily, and until reconstruction, filled with Tropical Ferns (**L**), and opening from it is a small house for Filmy Ferns. Behind the western end of the Front Range there is a Temperate House for Palms, Tree-Ferns, and Coniferæ (**O**), and a Palm-House (**P**). Between these and the Front Range at its western end is a suite of houses (now nearing completion) which will be devoted to Monocotyledonous Plants of Tropical and Warm Regions, specially Aroids, Scitamineæ, Bromeliads, Liliaceæ, and Amaryllidaceæ; Pitcher Plants are also provided for in one of these houses (**M, N**). The central Heating Station (**Q**) for the Plant-houses lies behind the Front Range.

Adjoining the Entrance from Inverleith Row is a group of buildings including the **Office of the Garden** (**A**), the **Museum** (**B**), the **Laboratories** (**C**), and the **Lecture Hall** (**D**).

The **Museum** contains a series of exhibits illustrating the form and life-history of plants, and these are arranged so as to facilitate their use in teaching.

Herbarium and Library.—In the southern portion of the Garden is the Herbarium and Library (**S**). It contains a fair representation of the Floras of the world, and the herbarium of plants belonging to the University of Edinburgh is deposited here.

The **Ladies' Cloak-Room** is on the left hand of the path leading into the Garden from the Entrance from Inverleith Row (**E**).

From the higher ground of the Arboretum—at the point marked **V** on the plan—a fine panoramic view of the City of Edinburgh, flanked on the east by Arthur's Seat, and on the west by the Pentland Hills, is obtained.

Teaching in the Garden.

Special instruction in the sciences underlying the practice of Horticulture and Forestry is provided for the Staff of the Garden. The course of instruction is spread over three years, and consists of lectures upon, and practical instruction in, the sciences taught. A Reading-room and Library is also provided for members of the Staff going through the course. Young Gardeners or Foresters desiring admission to the Staff and the course of instruction should make application to the Regius Keeper.

The Regius Keeper from time to time gives lectures which are open to the Public. The Laboratories are open to any one desirous of undertaking Botanical Research.

In recent years a School of Rural Economy has been established in Edinburgh, and a considerable part of the botanical teaching in connection with it is carried on in the Garden.

For a century and a half the offices of Regius Keeper of the Botanic Garden and Professor of Botany in the University of Edinburgh having been held by the same person, it has become the custom that the students of the University come to the Garden for instruction in Botany.

The Life-History and Habits of Diaxenes dendrobii, Gahan, with Notes on Prevention and Remedy.

BY

R. STEWART MACDOUGALL, M.A., D.Sc.

With Plates I. and II.

It is safe to say that scarcely a year passes in which our country does not receive from other countries accidental additions to its insect fauna, these additions being either individuals of an already native species whose numbers are thus swelled, or perhaps quite new species. Such insects as aphides or scale-insects, which feed externally, may be introduced on nursery-stock or fruits, to which they are securely anchored by a proboscis. Apart from these, many insects pass a part or much of their life in the various stages of egg, larva, pupa, or adult, under the bark of trees, or in the wood itself, or sunk in the tissue of smaller plants; hence driftwood and imported timber and plants are fertile sources of the new insect additions above mentioned.

In my notes of the last two years, I have mention, as taken from driftwood, of living adults of such destructive forms as *Hylesinus piniperda*, *Pissodes notatus*, and *Bostrichus stenographus;* also of the living pupæ (the beetle being afterwards bred out) of *Lamia ædilis*, the Timberman, a coleopterous insect not common in our country. Again, a few months ago, in a piece of timber imported from America, I found on examination a living specimen of *Goes tigrina*, a North American longicorn beetle.

Notes, R.B.G., Edin., No. 1, 1900.]

Whether such new species on issuing continue to live and gain a footing will depend on climatic and other reasons.

Our purpose at present, however, is not to discuss the possibility of the acclimatisation of such insects as live in the open, but rather to emphasise the likelihood of damage and loss consequent on the presence of new injurious species of insects introduced with such plants as orchids, which are protected under glass and kept in a temperature resembling that of their native habitat—such surroundings favouring the chance of the parasitic insect obtaining a foothold.

One such imported orchid-pest—unfortunately now only too well known in our orchid-houses—is a species of *Xyleborus* which is injurious to the genus *Dendrobium*. More than once I have had the attacked pseudo-bulbs sent to me with the insect *in situ*, in all stages of development, the last case being one of an attack on *Dendrobium eburneum* from an orchid-house at Pitlochry, Perthshire, the plants having been supplied by a dealer in the middle of England.

Another such pest (also coleopterous) is *Baridium aterrimus*, a native of the Straits Settlements. I have received it along with damaged orchids from Penang, where it is especially harmful to *Cypripedium* and *Saccolabium*. There is at least one record of the presence of Baridium in England, a specimen having been determined by Mr. Waterhouse of the British Museum. This specimen was taken at Torquay on a species of *Phalænopsis*.

A third pest whose capacity for destructive work makes it much to be feared is *Diaxenes dendrobii*, the subject of this notice. Through the courtesy of Mr. Waterhouse, I am informed that since 1894 at least eight specimens of D. dendrobii have been sent to the British Museum from different parts of England and Scotland for determination.

Late in December, 1896, I was asked to visit an orchid-house in Midlothian where a number of the plants had been ruined by some agency or other, insects being suspected. Attracted by discoloured patches on the pseudo-bulbs of some of the plants, I cut these open, and in each case found the larva of a longicorn beetle.

The larvæ were of all sizes from very tiny up to evidently

full-grown ones. Some of these last I carried away with me, and at the Royal Botanic Garden, Edinburgh, bred out the imagines (six in number), these proving to be, as suspected, *Diaxenes dendrobii*. The adult beetles issued on

March 2nd, 1897.		March 15th, 1897.	
„ 6th,	„	„ 18th,	„
„ 8th,	„	„ 20th,	„

With the six beetles thus won, I proceeded to work out the details of the round of life of the pest in one of the glass-houses at the Royal Botanic Garden.

POSITION OF DIAXENES AMONG THE COLEOPTERA.

The beetle is a longicorn belonging to the family Lamiidæ and the sub-family Apomecyninæ. The genus *Diaxenes* was founded in 1884, the type being a beetle found in a Chelsea nursery on *Dendrobium Plalænopsis;* this beetle was named *Diaxenes taylorii, W.* The only other species of the genus is our pest.

DESCRIPTION OF IMAGO.

I quote in full the description given in the "Annals and Magazine of Natural History" for 1894:—

"Strongly and rather closely punctured, with the punctures partly concealed by the close pubescence, this is mostly of a fulvous-brown or drab colour, but there are darker brown areas on some of the interspaces between the whitish lines; the pronotum bears three white lines—one median and one towards each side, the two latter converging anteriorly. Each elytron has about six lines of a slightly yellowish tint, of which one lies along the outer margin; the second sets out just below the shoulder and is continued in a nearly straight direction along the side of the elytron; the third proceeds from the upper part of the shoulder and joins the second a little before the apex; the next two lines are dorsal in position, they are sub-parallel to one another in the anterior fourth of the elytron, behind which they rather abruptly converge, after again diverging slightly they converge to join one another about the beginning of the apical fourth, whence they are continued as a single line up to the outer angle of the oblique apical truncature: the sixth is a very short line passing back from the base. In addition to these six lines, an ashy-grey streak may be seen along the suture, with a

rather faint and broken white line limiting it on the outer side. The body underneath has a drab pubescence with dark brown areas. The prosternum and mesosternum and the lower part of the sides of the prothorax are almost black in colour. The legs and antennæ are covered with a nearly uniform drab-coloured pubescence, but in some examples the intermediate joints of the antennæ are more or less dark brown towards the tip. The front of the head is also, in some examples, of a dark brown or nearly black colour, but this is partly due to the rubbing away of the pubescence."

The darkening in colour is occasionally very marked. One of the females used in my experiment was after a few months quite black all along the dorsal surface. The specimen from which the above description was taken measured 16¾ mm., and this is an average size. One imago I possess measures 17 mm., but I find a number smaller—thus, 14 mm., 12 mm., and one specimen is just 10 mm., but this small size was due, I think, to the poorness of the food on which the larvæ had to subsist.

DISTRIBUTION.

It was suspected, and indeed stated, that the natural home of *Diaxenes dendrobii* was Burmah, and during the year I had an opportunity of proving it. In the month of March, at an orchid sale in London, a number of plants of *Dendrobium nobile* were bought for the Royal Botanic Garden. These plants were imported for the sale from Burmah. When they reached the Botanic Garden, before being added to the collection, they were examined carefully, and in some of the pseudo-bulbs larvæ were got which were bred up to the pupa stage, the resulting imagines being of *Diaxenes dendrobii*.

THE EGG.

The egg is like a very tiny sausage, rounded off towards the ends. It measures 3½ mm. in length, and is 1 mm. broad at its widest part.

There is a well-marked areolation on the thick shell, giving to the egg examined under the microscope a honeycomb-appearance. The pattern is hexagonal and pentagonal, but this becomes modified at the ends of the egg. In colour the egg showed a pale whitish-green tinge as it lay in the tissue of the pseudo-bulb.

THE LARVA.

The larva is a legless grub, convex on both dorsal and ventral surfaces. It is jawed, and has a chitinised head. Very short antennæ may be seen on careful examination. Here and there over the body are bristles. The larva is to begin with whitish in colour, but later, and especially about the time of making its cocoon, yellowish. The stigmata along each side are well marked. It measures from 20 mm. to 22 mm.

THE PUPA.

A general knowledge of the form of the pupa will be obtained from the figures, where it will be noted how the femur and tibia of the first two pairs of legs form a sort of knee which projects slightly above the edge of the dorsal surface. The long antennæ pass back, held at the edge of the dorsal surface by the two "knees" of the first and second pair of legs. Half-way down the body of the pupa the antennæ curl round between the second and third pair of legs and, crossing the ends of the wings, run forward on the ventral surface to the tarsi of the front pair of legs. Measurements of different pupæ gave from as small as 11 mm. up to 16mm.

LIFE-HISTORY AND HABITS.

The beetles rest during the day, sometimes at the base of the plant, with their heads, it may be, buried in the moss of the pot in which the plant is growing; sometimes on the under surface of a leaf; but the favourite place was between two almost touching pseudo-bulbs. Now and again we got them moving on the plant in the daytime, but typically they are night-feeders. Often, after dark, on going into a glass-house with a lantern, I found them browsing on the leaves or pseudo-bulbs with extended waving antennæ.

The beetles are very sluggish, remaining in the same place for long. Even a gentle prodding failed to make them move much, but never failed in drawing from the beetles a curious scraping sound like the creaking of a saddle or the noise made in cutting a cork. The sound was produced by the beetles rubbing the

front part of the mesothorax against the hind part of the prothorax. With reference to this noise—not an unusual one among the longicorn beetles—the gardener in charge of an orchid-house where *Diaxenes* was captured informed me that, not liking to take the beetle in his hand, he had picked it off "with a small pair of tongs, on which the poor creature began squeaking."

I was much struck by their protective colouration. When resting on a withered root, or on the moss of the pot, or near a withered bulb where only the whitish-grey fibres remained, it was almost impossible for a stranger to pick out the beetle, so accurately did the colour of the beetle—especially on account of the longitudinal light lines down its back—harmonise with these surroundings.

The death-feigning instinct of the imagines was also very noticeable.

The adult beetles eat greedily and are very destructive. They feed upon and destroy :—

(1) *The Pseudo-Bulbs.* Out of these they gnaw large pieces. If the pseudo-bulb be a small one it may be entirely eaten away; specially would the beetles take the youngest growth. If the pseudo-bulbs were long and narrowish they would be gnawed at one place till the weight of the upper part would break the pseudo-bulb in two. This was the case, for example, where a species of *Phajus* with a single pseudo-bulb was used as food.

(2) *The Leaves.* These were not bitten from the edge; but the surface, either upper or lower, would be gnawed until holes appeared. If the leaves were very tough—as in the case of *Lælia anceps*—a hole might not result, but the scraped surface remained to testify to the work of the feeding beetles. Often a leaf would be bitten and gradually thinned away near its place of attachment to the pseudo-bulb, and the leaf, becoming top-heavy, bent over and broke or hung down.

(3) *The Rhizome.* Sometimes the exposed part of the rhizome would also be eaten away.

(4) *The Roots.* Several times in the course of the experiment fairly thick roots were bitten through; but a commoner damage to the root was the gnawing away of the external parts into the central cylinder (as shown in one of the figures).

The effect of all the above destruction was evidenced by the

poorness of the plant. Pseudo-bulbs that normally would have borne three flowers only produced one, and sometimes none at all. The young pseudo-bulbs, following attack on the plant, were only half the size compared with the growth made in a previous year.

The females after copulation lay their eggs in the pseudo-bulbs, often at the apex from where a leaf springs. I believe, from the amount of food a larva eats, that, unless the pseudo-bulb be a very large one, only one egg will be laid in a pseudo-bulb. I certainly found two eggs laid in the pseudo-bulb of a *Coelogyne cristata*, and also two in one pseudo-bulb of a *Coelogyne flaccida*, but this I feel sure was due to the beetles not having a sufficiently large number of plants to lay on. In both of these cases I had to remove one larva and place it in another pseudo-bulb.

The eggs hatch in less than a fortnight, and the grubs feed greedily. They bore a tunnel down the pseudo-bulb from the place of hatching, the surrounding tissue browns, and soon all down one side of the pseudo-bulb the decayed brown-blotched channel invites the attention of the observer to the destructive work of the enclosed larva. All the soft parts are then mined away, so that nothing is left of the pseudo-bulb save the outer epidermal rind and the strands of fibro-vascular bundles which run longitudinally down the hollowed-out pseudo-bulb from end to end like strands of fine string.

The larvæ wriggle about very actively if laid on the ground or held in the hand, while in their tunnels they move as easily and as readily backwards as forwards.

If the pseudo-bulb has been too small and has not afforded enough food to the larva, the latter immediately proceeds to mine through the rhizome until it reaches another sound pseudo-bulb, into which it enters. One such larva that did not find enough to satisfy it in one *Coelogyne cristata* pseudo-bulb tunnelled through $3\frac{1}{2}$ cm. of rhizome and up into another, which it completely gutted. This method of leaving one pseudo-bulb and entering another was often observed during the experiment. I may add that larvæ removed from their tunnels and placed by themselves alongside a broken-off pseudo-bulb were quite able to make an entrance. On an infested plant the pseudo-bulbs may

show all stages from still healthy not yet attacked ones to others beginning to brown and to others more than half brown, up to the perfectly withered and blotched pseudo-bulb which gives to the slightest pressure.

The full-fed larva makes a cocoon by weaving together the fibres of the hollowed pseudo-bulb. The larvæ do not immediately pupate on the formation of the cocoon, but lie as larvæ on it may be for a lengthened period. One such larva, watched through a little chink cut in the cocoon, lay for twenty-three days before pupating, but others lay very much longer. In one experiment where the plant was *Odontoglossum citrosmum*, the larva had made its cocoon by December 17th, 1897, and the imago did not issue till April 24th, 1898. I did not wish to disturb this cocoon, and therefore cannot add the date of the change to the pupal condition.

Once the larva becomes a pupa, the pupal stage lasts on an average twenty-four or twenty-five days. Here is a Table showing some of the times, where the changes were watched through a chink purposely made in the cocoon :—

Pupa.	Beetle issued.
October 11, . . .	November 4.
January 27, . . .	February 26.
February 6, . . .	March 2.

The escaping imago bites a little round hole in the cocoon and walks out, or, if the pseudo-bulb be unbroken, through pseudo-bulb as well.

Development from egg to imago can take place in three and a half to four months, but may take much longer. Thus, in a *Coelogyne cristata* the beetles had an opportunity of egg-laying from June 10th to July 27th, and I had issue of imagos on October 11th, October 18th, and the beginning of November. If a long time be spent in the cocoon before the larva pupates the above developmental period will correspondingly be lengthenend out ; the character of the food and the temperature will also each have an effect.

The following Table shows some of the results as regards variation in length of the life cycle :—

Plant.	Time during which Beetles had opportunity to lay Eggs.	Time of Issue of New Brood.
Coelogyne cristata.	June 10—July 27, 1897.	October 11, 1897. October 18, 1897. Beginning of Nov.
Coelogyne flaccida.	July 27—Aug. 9, 1897.	April 7, 1898.
Odontoglossum citrosmum.	July 27—Aug. 24, 1897.	April 24, 1898. May 2, 1898.

It may be interesting to note how long my six imagines lived.

Issuing as imagines between March 2nd and March 20th, 1897—

The 1st died on April 8th, 1897.
„ 2nd „ May 28th, „
„ 3rd „ July 5th, „
„ 4th „ October 5th, „
„ 5th „ „ „ „
„ 6th „ Nov. 18th, „

Although *Diaxenes dendrobii* is called the "dendrobe-orchid beetle," I am sorry to add that it does not content itself with infesting the *Dendrobium nobile* from Burmah. I have not found any orchid with marked pseudo-bulbs refused as food. In the following orchids my six insects bred, the feeding larvæ quite ruining the plants:—

Lælia anceps.
Coelogyne cristata.
Coelogyne flaccida.
Odontoglossum citrosmum.

The orchid-house where I obtained my original material was quite ruined by the insect, and I took young or old larvæ from the following orchids :—

Dendrobium Farmerii.
„ *Griffithianum.*
„ *thyrsiflorum.*
„ *formosum.*
Lælia anceps (several varieties).
Cattleya Mossiæ.
„ *Trianæ.*

The day temperature of the orchid-house referred to was never below 60 degs. F., and the night temperature never below 55 degs. F. The temperature of the house where my experiment took place was higher than this.

Besides the species named above as plants in which my beetles bred, the following other orchids were used as food :—

Dendrobium nobile.	*Cattleya* sp.
,, *cariniferum.*	*Phajus* sp.
,, *Wardianum.*	*Oncidium* sp.

PREVENTIVE AND REMEDIAL MEASURES.

Unfortunately in connection with this pest, there seems to be every possible combination against the plant and in favour of *Diaxenes dendrobii* :—

The beetle breeds in a number of genera.

Many genera can be used as food.

The beetles, owing to their colour and their being night feeders, escape notice.

The length of development from egg to imago is not excessive.

The imagines have a fairly long life.

From what I have seen of the work of this beetle, I have no hesitation in saying that *Diaxenes dendrobii* is the very worst of orchid-pests, and yet, with reasonable care, successful war can be waged against it.

1. Let all imported plants before being added to a collection be carefully gone over. Any brown discoloured pseudo-bulbs should be suspected and examined for the larva. Perfectly sound pseudo-bulbs have a firm feel to the fingers ; infested pseudo-bulbs "give" a little on being pressed.
2. Owners or cultivators of orchids should keep a careful look-out for the work of the imago. Its damage is not to be mistaken for any other—how characteristic it is the figures show. Any found beetles should be destroyed. They must be searched for, however, after nightfall with a lamp or lantern.
3. That the larva has got to work may be known by a gradual discolouration down one side of the pseudo-

bulb; this will spread over the whole. The enclosed grub must be cut out, or, if the pseudo-bulb is far gone, let it be cut off bodily and the whole destroyed.

BIBLIOGRAPHY.

Woodward, in Gardeners' Chronicle, 1883, mentions receipt of a larva taken from an orchid. It was dead and could not be identified, but I am satisfied the insect was a species of *Diaxenes.*

Gahan, C. J. Description of a new longicorn beetle of the genus *Diaxenes*, in Ann. Mag. Nat. Hist., Ser. 6, xiii (1894), p. 520.

Donge, E. Exhibited a larva and imago of the insect taken from the conservatory of a horticulturist in Paris. See Ann. Soc. Entom. France, lxiii (1894), also, Bull. Soc. Entom. France, 1895, p. vii.

Xamben, Capt. Supplies notes on larval habits and upon metamorphosis in Ann. Soc. Entom. France, lxiv (1895), also in Bull. Soc. Entom. France, 1895, p. ccxlix.

EXPLANATION OF THE FIGURES

in Plates I. and II.

Illustrating Dr. Stewart Macdougall's paper on *Diaxenes dendrobii*, Gahan.

Fig. 1.—Imago from life. Natural size.
„ 2.—Egg from side. Greatly magnified.
„ 3.—End view of egg-shell, showing characteristic areolation. Greatly magnified.
„ 4.—Full-grown larva. Slightly magnified.
„ 5.—Pupa removed from cocoon, ventral surface. Twice natural size.
„ 6.—Pupa removed from cocoon, dorsal surface. Twice natural size.
„ 7.—Pseudo-bulb of *Dendrobium* with larva (not full grown) that has been mining, as shown by the dark discoloured tissue. Natural size.
„ 8.—Cocoon enclosing larva, in hollowed-out pseudo-bulb of *Coelogyne cristata.* Natural size.
„ 9.—Cocoon showing escape-hole, in pseudo-bulb of *Dendrobium.* Slightly reduced.
„ 10.—Three beetles seen on plant of *Dendrobium cariniferum.* Slightly reduced.
„ 11.—Adult beetle on *Dendrobium cariniferum.* Magnified.
„ 12.—Under-surface of leaf of *Lælia anceps* gnawed by imago. Two-thirds natural size.
„ 13.—*Coelogyne cristata*, showing leaves characteristically injured by imago. Half natural size.
„ 14.—*Cattleya*, showing pseudo-bulbs and roots gnawed by imago. Natural size.



Fig. 1



Fig. 4.



Fig. 2.



Fig. 5.



Fig. 6.

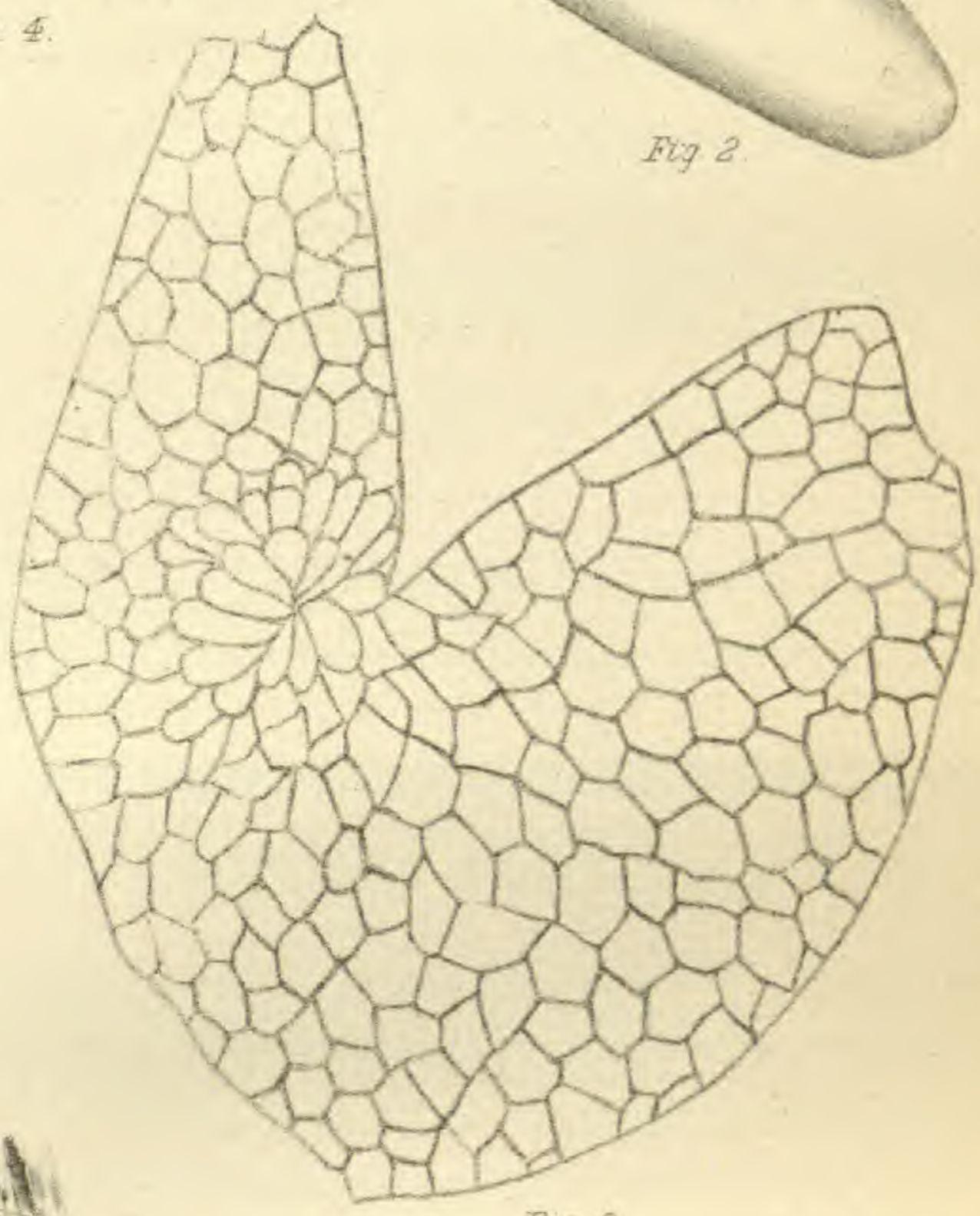


Fig. 3.

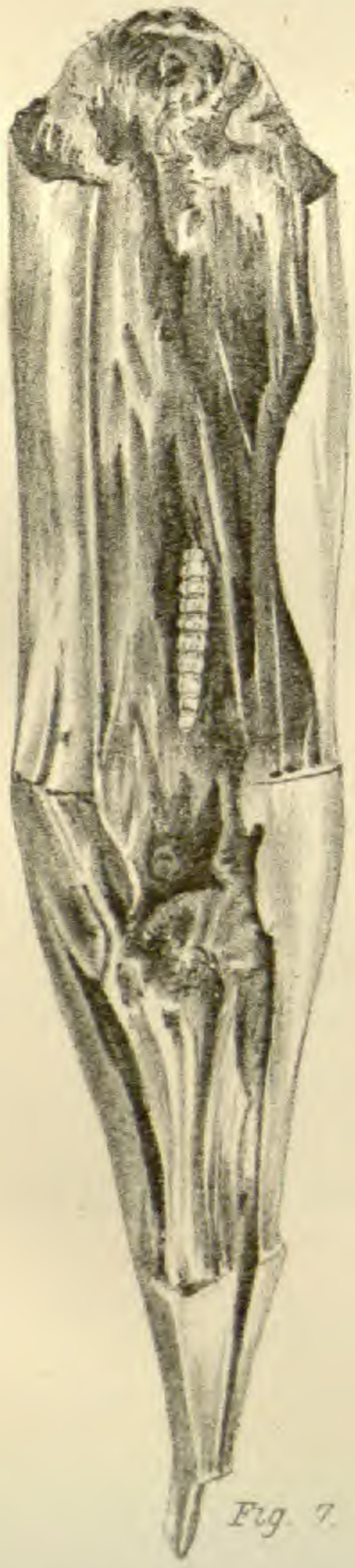


Fig. 7.

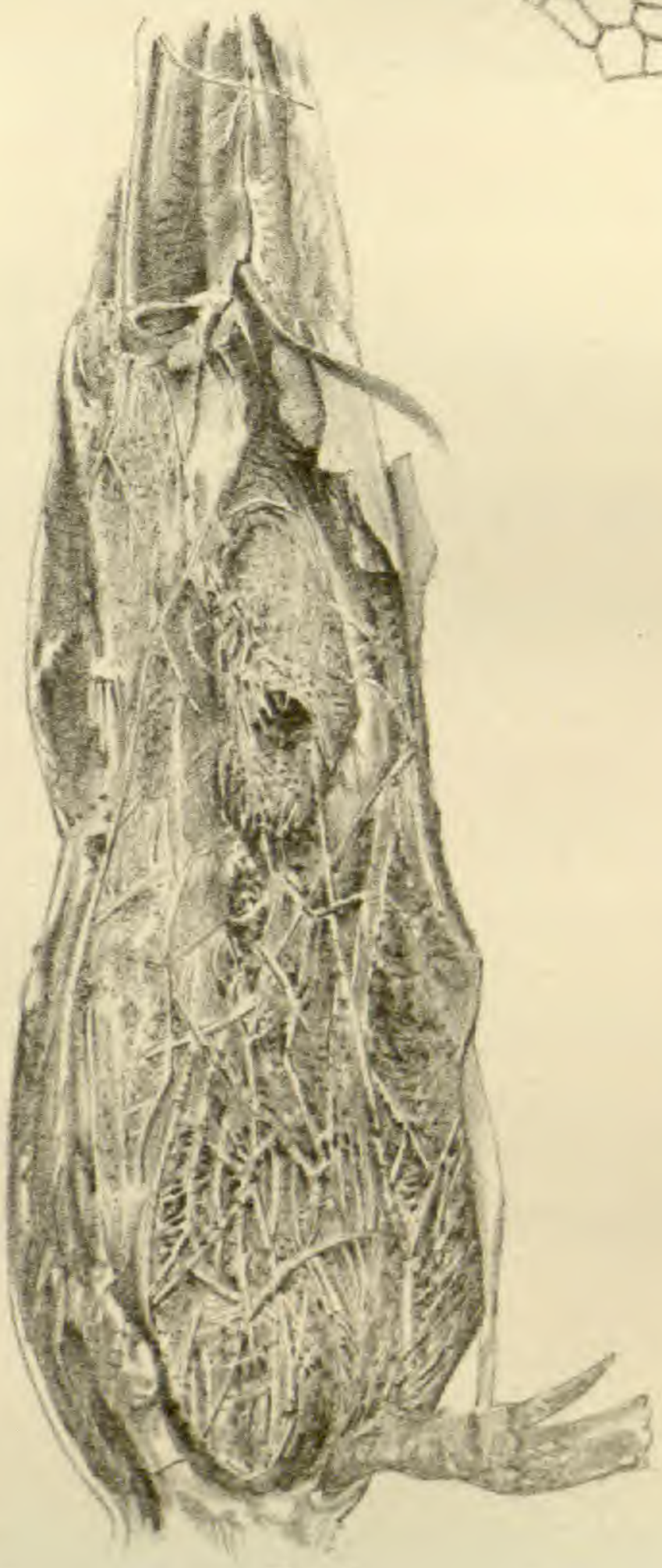


Fig. 9.



Fig. 10.

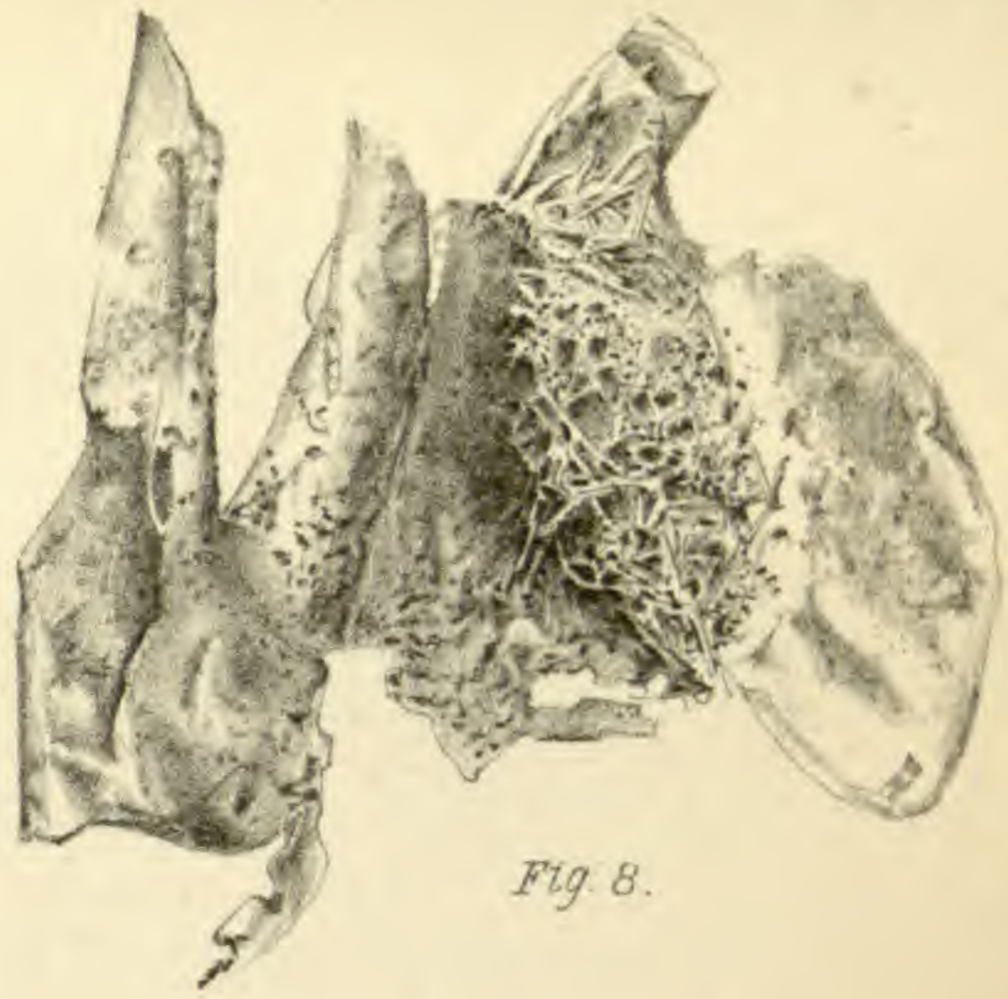


Fig. 8.

Fig. 14.

Fig. 11.

Fig. 13.

Fig. 12.

On the twisting of the leaves on their bases on the horizontal shoots of the flat-leaved Spruces (PICEA § OMORICA) as contrasted with the same phenomenon in the flat-leaved Silver Firs (ABIES), the flat-leaved Hemlock Firs (TSUGA), and the Douglas Fir (PSEUDOTSUGA).

BY

A. D. RICHARDSON.

With Zincographs 1—10.

In the flat-leaved spruces, in which the stomatic leaf-surface is morphologically the upper one, and which constitute Willkomm's section *Omorica* of the genus *Picea*, the twisting of the leaves on their bases on the horizontal (plagiotropous) shoots, in order to direct their stomatic surfaces downwards, differs from that which obtains in flat-leaved silver and hemlock firs, and in the Douglas fir, in all of which the stomatic leaf-surface is morphologically the under one, in being reversed in direction, and, as a result of this reversion in direction, in the order of succession in which the leaves twist on their bases from the position in the median plane of the shoot at which no twisting takes place to that at which the maximum is reached being also reversed.

In a flat-leaved spruce, a leaf arising in the median plane upon the upper side of a horizontal shoot does not twist on its base, but bends forward and becomes nearly parallel in direction with the shoot, so that its stomatic (upper) surface is directed downwards. A leaf arising in the median plane upon the under side of a horizontal shoot, on the other hand, twists on its base through 180 degrees in order to direct its stomatic (upper)

[Notes, R.B.G., Edin., No. 1, 1900.]

surface downwards, and, by a swing movement at its base, which is independent of the twisting movement, it moves upwards so that it usually lies in a more or less horizontal plane; and it also moves outwards to a position nearly at a right angle to the direction of the shoot. In the leaves arising from the shoot on either side of the median plane, more or less twisting takes place at the base of each, according to its position on the axis, in order to direct its stomatic (upper) surface downwards, the amount through which each twists (assuming the direction of the shoot to be quite horizontal, and the median plane of the leaf after twisting to be truly vertical) being equal to the angular divergence of its point of insertion from that of a leaf inserted in the median plane in which no twisting takes place—in other words, the twisting commences in the leaves adjacent to those in the median plane upon the upper side of the shoot and increases as successive leaves are passed through from above downwards. By a swing movement at the base, the leaves lying on either side of the median plane move upwards or downwards, according to their positions on the axis, so that they arrange themselves in a series of superposed more or less horizontal planes lying between those of the uppermost and undermost leaves of the shoot; and they also move outwards into positions more or less divergent in direction from that of the axis, according to their positions thereon, the divergence increasing as successive leaves are passed through from above downwards from a few degrees in those adjacent to the leaves in the median plane upon the upper side of the shoot to nearly a right angle in those adjacent to the leaves in the median plane upon the under side of it.

In flat-leaved silver firs, and in the Douglas fir, on the other hand, in which the stomatic leaf-surface is morphologically the under one, a leaf arising in the median plane upon the upper side of a horizontal shoot twists on its base through 180 degrees in order to direct its stomatic (under) surface downwards, while a leaf arising in the median plane upon the under side of a horizontal shoot does not twist, but moves upwards by a swing movement at its base, so that it usually lies in a more or less horizontal plane; and it also moves outwards into a position nearly at a right angle to the direction of the shoot. As is the

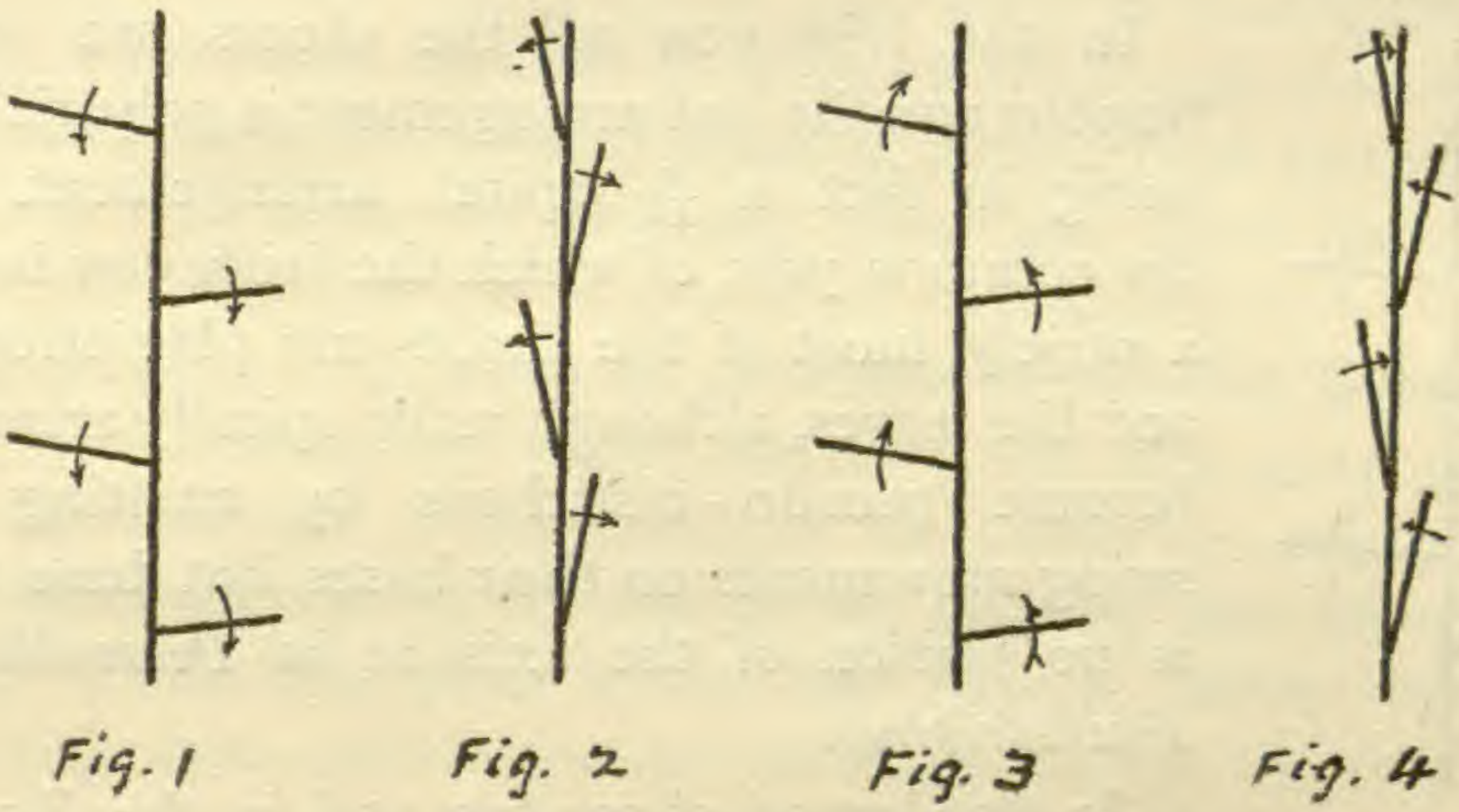
case in the flat-leaved spruces, the leaves arising from the shoot on either side of the median plane twist more or less on their bases according to their positions on the axis, the amount through which each twists being equal to the angular divergence of its point of insertion from that of a leaf inserted in the median plane in which no twisting takes place; but, contrary to what takes place in the case of the spruces, the twisting here commences in the leaves adjacent to those in the median plane upon the under side of the shoot and increases as successive leaves are passed through in an upward direction. These leaves also move upwards or downwards, according to their positions on the axis, by a swing movement at the base, into more or less horizontal positions, as in the case of the leaves corresponding with them in position on the horizontal shoots of the flat-leaved spruces, and they also move outwards into positions more or less divergent in direction from that of the shoot; but this movement, unlike that which occurs in similarly situated leaves in the flat-leaved spruces, varies in different species of flat-leaved silver firs. In species such as *Abies grandis* and *A. Lowiana* all the leaves on the horizontal shoots move outwards into positions nearly at right angles to the direction of the axis, so that a "pectinate" arrangement is produced; but in other species such as *A. amabilis* and *A. Nordmanniana* the leaves on the upper sides of the horizontal shoots assume a disposition having a somewhat superficial resemblance to that of the leaves of the flat-leaved spruces, inasmuch as the uppermost leaves, in addition to twisting on their bases, often bend forward, so that they lie almost parallel in direction with the shoot, while those adjacent to them on either side move outwards into positions more or less divergent in direction from that of the axis, the divergence increasing as successive leaves are passed through in a downward direction to, in some instances, nearly a right angle in those adjacent to the leaves in the median plane upon the under side of it.[1]

[1] These species are taken as representing perhaps the two extremes of leaf-arrangement in the flat-leaved silver firs—*A. grandis*, Lindl., and *A. Lowiana*, Murray, on the one hand being very pronouncedly "pectinate," while *A. amabilis*, Forbes, and *A. Nordmanniana*, Spach, are more or less what may be termed "spruce-like." Between these extremes lie a number of species which are more or less intermediate, such as *A. pectinata*, DC., *A. balsamea*, Mill., *A. sibirica*, Ledeb., *A. Veitchii*, Lindl., and others.

In some flat-leaved hemlock firs, such as *Tsuga Sieboldii*, the arrangement of the leaves on the horizontal shoots is essentially the same as that which obtains in flat-leaved silver firs and in the Douglas fir; but in such species as *Tsuga canadensis* and *Ts. Mertensiana*, and one or two others, a slight divergence occurs. In the leaves inserted in the median plane upon the upper side of the shoot, which are generally smaller than the others, no twisting on the base takes place. These leaves behave in precisely the same way as do those in a corresponding position on the horizontal shoots of the flat-leaved spruces, but with this difference, that whereas in the spruces the stomata, being on the upper side of the leaf, become directed downwards when it bends forward in the direction of the apex of the shoot, in these hemlock firs, owing to their being on the under side of the leaf, they become directed upwards.

In the flat-leaved spruces, then, in consequence of the stomata being located on the upper leaf-surface, the arrangement of the leaves on the horizontal shoots is quite distinct from that in flat-leaved silver and hemlock firs, and in the Douglas fir. In these latter the mode of twisting of the leaves on their bases is identical with that observable in a plagiotropous shoot of such a plant as the common yew, or in fact of any broad-leaved plant such as *Diervilla* or *Philadelphus*—that is to say, the direction, as seen from above, in which the leaves twist on their bases on a horizontal shoot, when they come to occupy positions nearly at right angles to its axis, is away from the apex of the shoot, or when nearly parallel with it the direction of twisting is away from the median plane on the upper side of the shoot. In Figs. 1 and 2 horizontal shoots of this sort are represented diagrammatically as seen from above. The centre line represents the axis, the lateral lines the leaves, and the curved arrows show the direction in which the leaves twist on their bases. Fig. 1 illustrates the arrangement of the leaves on the horizontal shoots in such flat-leaved silver firs as *A. grandis* and *A. Lowiana*, and also the arrangement on the under side of the shoot in such flat-leaved species as *A. amabilis* and *A. Nordmanniana*, while Fig. 2 illustrates the arrangement on the upper side of the shoot in species such as the last named. In the case of a flat-leaved spruce, on the other hand, the direction in which the leaves

twist is, when viewed from above, either towards the apex of the shoot, as represented in Fig. 3, which illustrates the



Figs. 1 and 2. Directions of twisting and movement in silver fir.
Figs. 3 and 4. Directions of twisting and movement in spruce.

arrangement of the leaves on the under side of the shoot, or towards the median plane on the upper side of the shoot, as represented in Fig. 4, which illustrates the arrangement on the upper side of the shoot.

In plagiotropous shoots in which the stomatic leaf-surface is morphologically the under one, and where the leaf-arrangement is normally not a truly distichous but a polystichous one, a pseudo-distichous arrangement is frequently brought about either by twisting and other movements of the leaves on their bases, or by torsion of the axis itself. In *Diervilla* and *Philadelphus* the leaves are opposite and decussate on the orthotropous shoots, but they all lie in one horizontal plane on the plagiotropous shoots, with their stomatic surfaces directed downwards. In these cases the pseudo-distichous arrangement on the plagiotropous shoots is brought about by torsion of the axis alternately to right and left between the nodes, so as to bring all the points of insertion of the leaves into nearly the same plane, and at the same time each leaf twists at its base through 90 degrees and brings its surface into a horizontal position, so that they all lie in the same horizontal plane. This arrangement is illustrated diagrammatically in Fig. 5, which represents a plagiotropous shoot of this sort as viewed from above.



Fig. 5

Direction of twisting of shoot and leaves in *Diervilla*.

The curved arrows on the central axis indicate the direction in which it twists in each successive internode.

In the Irish yew all the shoots are orthotropous and the leaf-arrangement is polystichous, being in fact a $\frac{5}{13}$ spiral arrangement. In the common yew, of which the Irish yew is only a variety, most of the shoots are plagiotropous, and the leaves, although really spirally arranged, become pseudo-distichous by twisting and swing movements on their bases, but here there is no torsion of the axis as in *Diervilla* and *Philadelphus*.

In flat-leaved silver firs, and in the Douglas fir, there is a pseudo-distichous arrangement of the leaves on the horizontal shoots which, as before mentioned, is identical with that which occurs in common yew. In such species as *Abies grandis* asnd *A. Lowiana* this pseudo-distichous arrangement of the leaves is brought about independently of the twisting of the leaves on their bases by the way in which they move outwards on either side of the shoot into positions nearly at right angles to the direction of its axis. In species like *A. amabilis* and *A. Nordmanniana* the pseudo-distichous arrangement is often masked by the upper leaves assuming directions parallel with, or only slightly divergent from, that of the axis. But, as the direction in which the leaves twist on their bases on the upper side of the shoot is away from the median plane, as viewed from above, their stomatic (under) surfaces turn outwards from each other in opposite directions, to either side of the shoot, so that there is a parting or shedding of the leaves along the median plane on the upper side; and as there is also a parting or shedding of the leaves by the swing movement already referred to along the median plane on the under side of the shoot, a pseudo-distichous arrangement is the result. The resemblance between the arrangement on the upper sides of the horizontal shoots here and that of the flat-leaved spruces is therefore entirely superficial. In a flat-leaved spruce, on the other hand,

a pseudo-distichous arrangement is impossible. The leaves in the median plane upon the upper side of a horizontal shoot do not twist on their bases, nor do they move to either side of the shoot, while those adjacent to them on either side twist towards, not away from, the median plane, as viewed from above, so that there is no parting or shedding along the upper side of the shoot, and therefore no pseudo-distichous arrangement.[1]

Figures 6-10 will serve to illustrate the various points dealt with in the preceding pages, and they will also serve to show how the positions of the tissues of the leaves are affected from a morphological point of view by the twisting and other movements which take place at the leaf base, a matter in regard to which some misconception seems to exist in the descriptive accounts of some of the flat-leaved species of *Picea*.

Fig. 6 represents diagrammatically on a ground plan the positions assumed by the leaves in an erect (orthotropous) shoot of a flat-leaved silver or hemlock fir, or of the Douglas fir, while Fig. 8 represents the same thing in a flat-leaved spruce. In the figures the axis of the shoot occupies the centre, and the leaves are arranged in a circle surrounding it, the spiral arrangement being disregarded in order not to introduce complications. The number of leaves (twelve) fixed upon is purely arbitrary, the even number being adopted in order to avoid fractions of a degree. The leaves are numbered consecutively, and the angular divergence from zero (leaf 1) is indicated on the outside of each leaf. The various tissue-groups of the leaf are indicated thus: —X = xylem; P = phloem; R.C. = resin-canals; S.S. = stomatic surface.

A glance at Figs. 6 and 8 will show that they differ in one particular only—namely, the position of the stomatic surface of the leaf. In Fig. 6 it is in the normal position on the phloem-side of the leaf, but in Fig. 8 it is on the xylem-side and faces the axis of the shoot.

[1] The arrangement of the leaves on the horizontal shoots of spruces (flat-leaved and other) is frequently incorrectly described as pseudo-distichous. Dr. Engelmann, in Watson's Flora of California, II. p. 121, describes the leaves of *Picea* as "spirally arranged all round the branchlets or (by a twist of the base) somewhat 2-ranked," and other authorities variously refer to them as being "2-ranked," "2-rowed," or "pseudo-distichous."

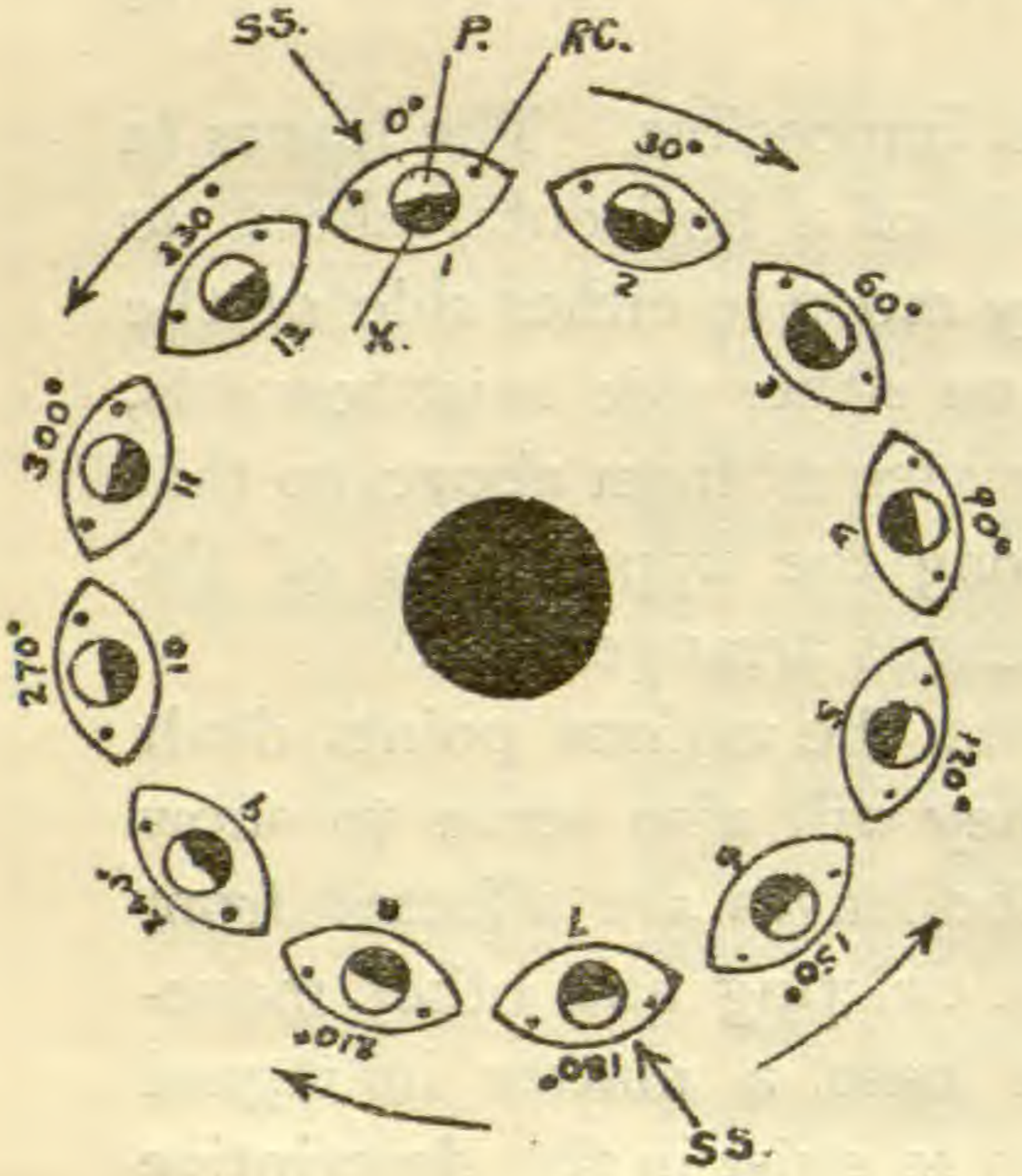


FIG. 6

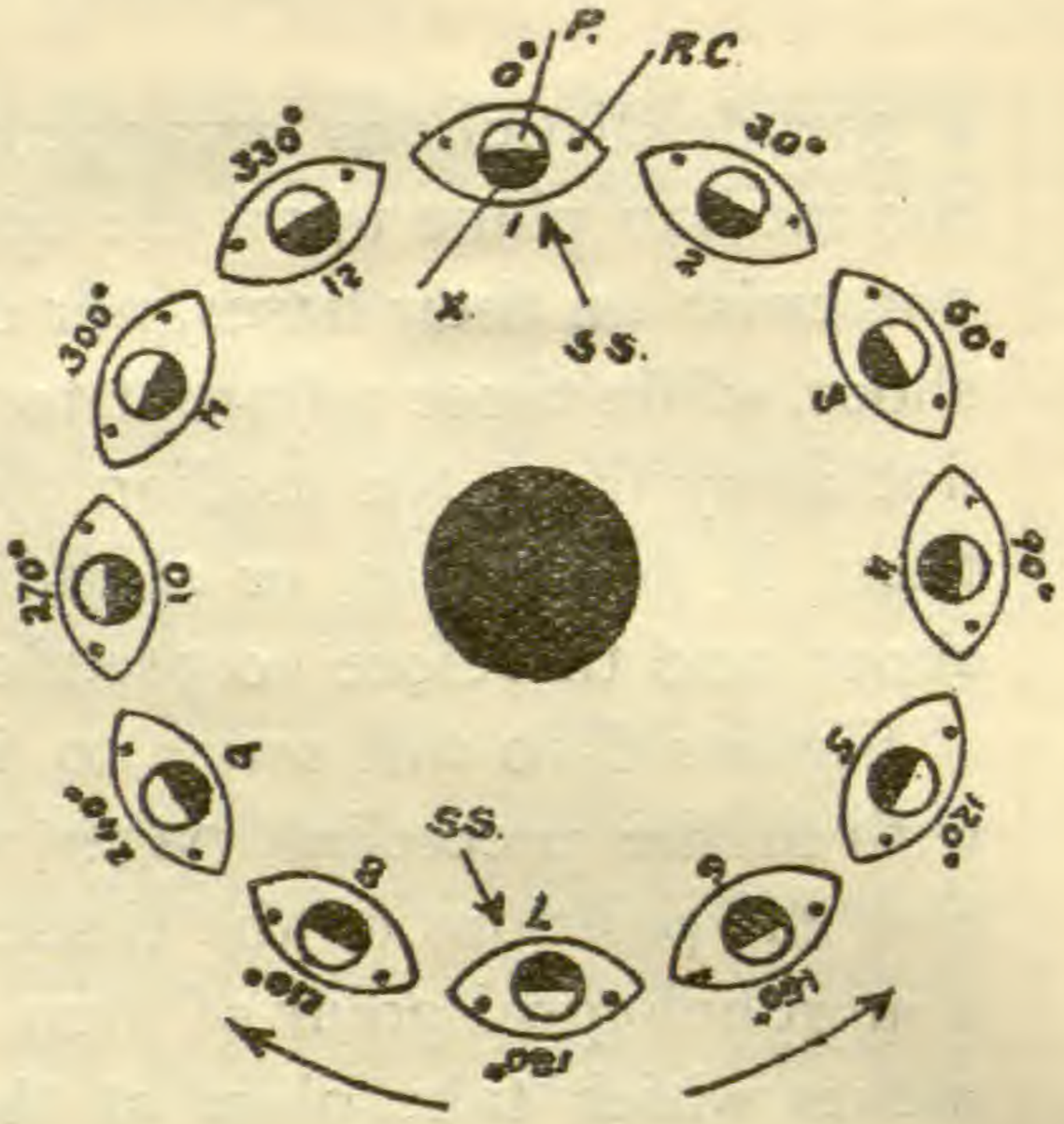
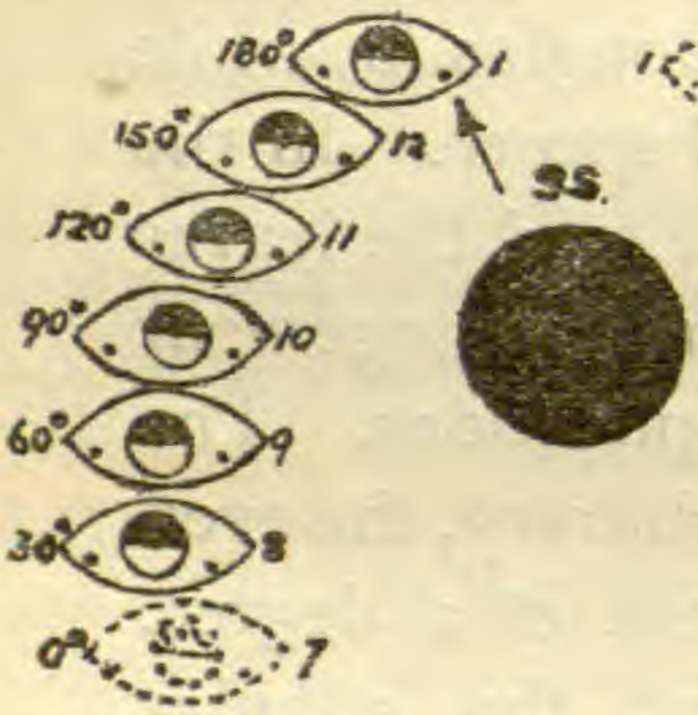


FIG. 8



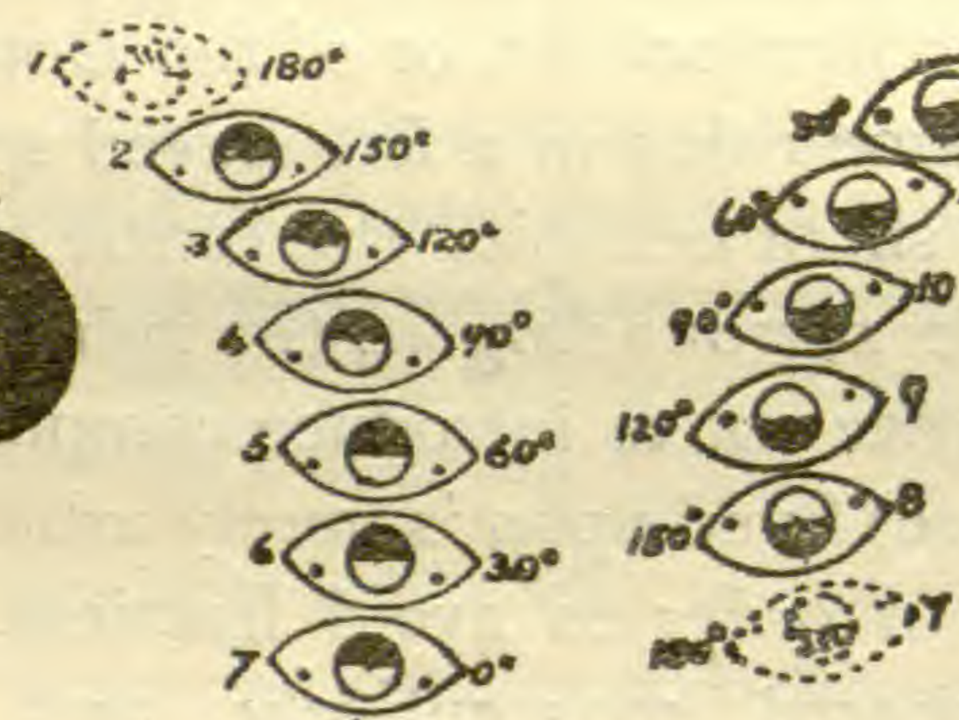


FIG. 7

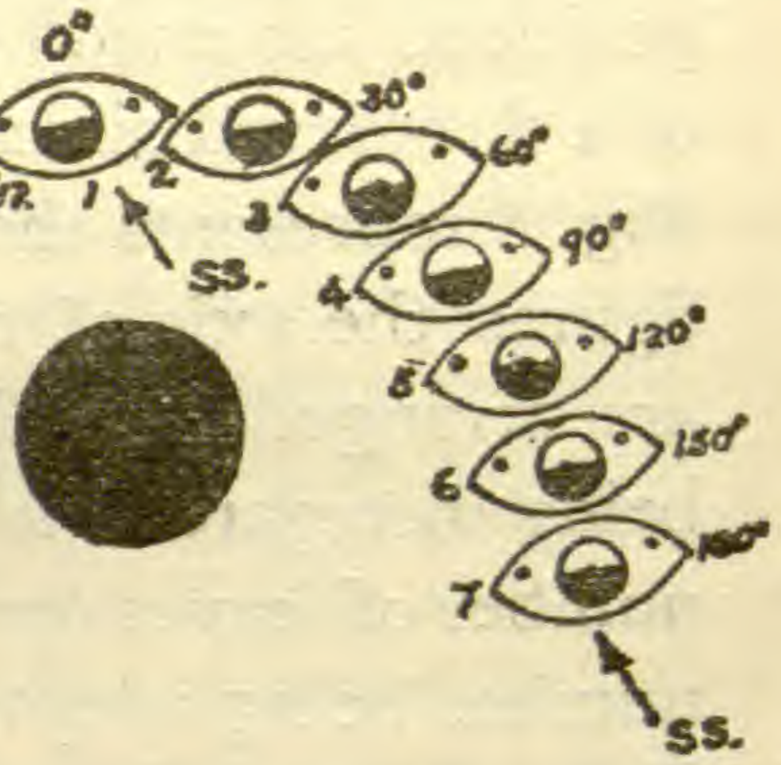


FIG. 9

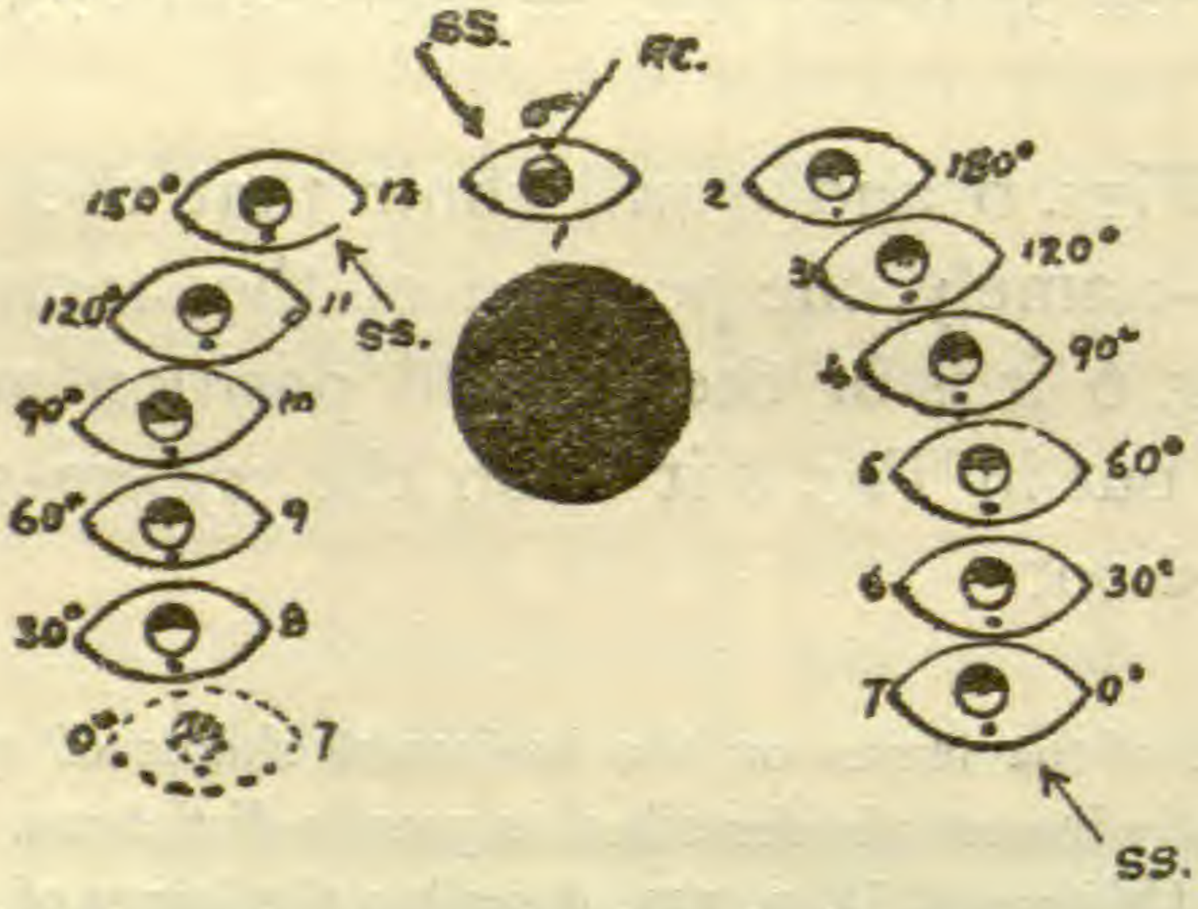


FIG. 10

Figs. 6 and 7. Arrangements in flat-leaved silver fir, *Tsuga Sieboldi*, and Douglas fir.
Figs. 8 and 9. Arrangements in flat-leaved spruce.
Fig. 10. Arrangement in *Tsuga canadensis*, *Ts. Mertensiana*, and others.

Fig. 7 represents the positions assumed by the leaves in flat-leaved silver firs, in some hemlock firs, and in the Douglas fir when such a shoot as that represented in Fig. 6 becomes horizontal. The leaves corresponding to those in Fig. 6 are indicated by corresponding numbers, and the degree-numbers indicate the angles through which the leaves twist on their bases, as well as their angular divergences from the leaf in which no twisting takes place.

In Fig. 7, leaf 7, which is in the median plane upon the under side of the shoot, is the one in which no twisting takes place, but, by the swing movement on its base already referred to, it moves upwards and outwards to the position indicated in the figure. As, however, its point of insertion is in the median plane of the axis, it may move either to the right or to the left. In leaf 1, which is in the median plane upon the upper side of the shoot, on the other hand, the maximum amount of twisting at the base takes place, and owing to its being in the median plane of the shoot, it may, like leaf 7, move either to the right or to the left. In those lying between 1 and 7, on either side of the median plane of the shoot, the amount of twisting which each undergoes is equal to the angular divergence of its point of insertion from that in which no twisting takes place, as indicated in the figure. For example, the points of insertion of leaves 4 and 10 are each divergent 90 degrees from that of leaf 1, and this is equal to the angle through which each twists in order to bring its median plane into a vertical position.

The curved arrows above and beneath Fig. 6 indicate the direction in which the leaves shed away from the median plane of the axis, on the upper side by twisting, and on the under side by a swing movement at the base, when a shoot such as this becomes horizontal as in Fig. 7.

Figure 9 represents the positions assumed by the leaves in a flat-leaved spruce when a shoot such as that represented in Fig. 8 becomes horizontal, and the leaf-numbers and degree-numbers have the same significance as those in Fig. 7. Leaf 1 in Fig. 9 is that in which no twisting takes place, and it retains precisely the same position in relation to the axis as does the corresponding leaf in Fig. 8. In leaf 7, on the other hand, the maximum amount of twisting on the base takes place, and in addition

to this twisting there is the swing movement at the base, by which the leaf moves upwards and outwards into the position indicated in the figure; and, as the point of insertion of this leaf is in the median plane upon the under side of the shoot, it may move either to the right or to the left. In the leaves lying between 1 and 7, on either side of the median plane of the shoot, the same rule as to twisting obtains as that which governs the twisting in Fig. 7, but here the order of succession in which the leaves twist is reversed in direction as compared with that illustrated in Fig. 7.

The curved arrows beneath Fig. 8 indicate the direction in which the leaves shed away from the median plane of the axis when a shoot such as this becomes horizontal as in Fig. 9; but the shedding of the leaves along the median plane on the under side of the shoot is not here due to a swing movement at the base only, as in Fig. 7, but to a combination of both a twisting and a swing movement. Both these movements, in fact, culminate in the leaves in the median plane on the under side of the shoot in a flat-leaved spruce; whereas in a flat-leaved silver, in some hemlock firs, or in the Douglas fir, the twisting movement culminates in the leaves in the median plane on the upper side of the shoot, while the swing movement culminates in those in the median plane on the under side.

Fig. 10 represents, in the same way as in Figs. 7 and 9, the positions assumed by the leaves on a horizontal shoot of a hemlock fir such as *Tsuga canadensis*, or *T. Mertensiana*, as described on p. 16. The leaves inserted in the median plane upon the upper side of the shoot show no twisting at the base, but, bending forward in the direction of the apex of the shoot, they occupy positions similar to that of leaf 1 in Fig. 10, in which the stomatic (under) surface is directed upwards, whereas in all the other leaves of the shoot it is directed downwards as in the flat-leaved silver firs, and in the Douglas fir.[1]

[1] In a paper entitled a "Review of some Points in the Comparative Morphology, Anatomy, and Life-History of the Coniferæ," published in the "Journal of the Linnean Society, Botany, Vol. xxvii, Dr. Masters refers to the leaf-arrangement in these plants as follows (p. 247):—"Another instance of variation in the arrangement of "leaves is often seen in *Abies Nordmanniana*, *A. Pichta*, *A. amabilis*, as also in "*Tsuga canadensis*, &c. The leaves on the lateral and more or less horizontally "spreading branches, though polystichous, in reality arrange themselves in three rows,

The effect of this twisting of the leaves on their bases on the horizontal shoots of the firs and spruces referred to results in but a slight deviation from the normal condition of the internal leaf-structure, and this only in the flat-leaved spruces. In the flat-leaved silver and hemlock firs, and in the Douglas fir, there is no departure from the normal condition, and the arrangement of the internal tissues of the leaf is precisely the same both in leaves of the leader shoots (where no twisting takes place) and in leaves of the horizontal shoots; but in the flat-leaved spruces, owing to the stomata being located on the morphologically upper leaf-surface, and to the consequent inversion of the leaves on the horizontal shoots as compared with those on the leader (erect) shoots, or with those on both the erect and horizontal shoots of a flat-leaved silver fir, or the Douglas fir, the positions of the various leaf-tissues are completely reversed, so that the phloem is towards the non-stomatic, actually upper (but really morphologically under) side, and the xylem towards the stomatic under (but really morphologically upper) side, while the resin-canals occupy their normal positions on the phloem side of the leaf. The only anatomical change which results from this abnormal (inverted) position of the leaves on the horizontal shoots of these flat-leaved spruces is the formation of palisade cells in the non-stomatic upper (but really morphologically under) side of the leaf in two or three of the species; and no doubt it is the abnormal position of these cells on the same side of the leaf as the resin-canals (which always belong to the under side of the leaf[1]) that has led to the little

"one on either side of the branch (in which case the leaves are nearly at a right "angle to the branch), and one in the median plane of the upper surface (in which "case the leaves are appressed along the branch parallel to its main axis). The "median leaves are usually smaller than the lateral ones."

It is quite true, as Dr. Masters says, that in hemlock firs like *Tsuga canadensis* the leaves are really arranged in three groups, but such a description is incorrect when applied to any of the flat-leaved silver firs, as has been shown in this paper.

[1] In connection with this it may be pointed out here that the figures of the transverse sections of the leaves of *Picea Alcockiana* and *P. Glehnii* of the "Gardeners' Chronicle" (Vol. xiii, N.S., pp. 212 and 301) and of the "Journal of the Linnean Society" (Botany, Vol. xviii, pp. 509 and 513) are, judging from the positions of these resin-canals, evidently inverted, as is also apparently that of *P. Breweriana* of the "Gardeners' Chronicle" (Vol. xxv, N.S., p. 497). In the two first-mentioned species no twisting takes place at the bases of the leaves on the horizontal shoots, so

confusion which exists in the descriptive accounts of some of these species.

In conclusion, it may be pointed out that in the silver firs (*Abies*) and in the hemlock firs (*Tsuga*) species occur in which the leaves are not distinctly flattened, and where, as in the true spruces (*Picea* § *Eupicea*), the stomata are more or less evenly distributed over the four faces of the leaf. This occurs in such species as *Abies Pinsapo*, *A. nobilis*, *A. magnifica*, and others, amongst silver firs, and in *Tsuga Hookeriana* of gardens amongst hemlock firs. In such cases there is, of course, as in the case of spruces, no pseudo-distichous arrangement.

that the resin-canals are always in the actually, as well as the morphologically, under part of the leaf. About *P. Breweriana*, a species of which I have not seen specimens, I am unable to express an opinion as to whether the leaves twist on the horizontal shoots or not. Beissner ("Handbuch der Nadelholzkunde," p. 350) places it amongst the true spruces (*Eupicea* of Willkomm), in which no twisting of the leaf base occurs; but Professor Sargent says ("Silva of North America," Vol. xii, p. 52) "it most resembles in leaf structure and in the form of its cone-scales the flat-leaved *P. Omorica* of the Balkan Peninsula." Judging from the figures alone (both of the "Gardeners' Chronicle" and of the "Silva") it would appear that the stomata are confined to one leaf-surface only, and, from the position in which the canals are shown, no doubt this is the upper one, as in the other flat-leaved species. I therefore incline to Professor Sargent's opinion that it is more closely allied to the flat-leaved species than to the true spruces.

Forwarded 18.2.01.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

NOVEMBER 1900.

CONTENTS.

Page.

List of Seeds collected in the Royal Botanic Garden, Edinburgh, during the Year 1900, - - - 25

GLASGOW:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT THE "CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,
And to be purchased, either directly or through any Bookseller, from
JOHN MENZIES & CO., Rose Street, Edinburgh, and
90 West Nile Street, Glasgow.

[PRICE NINEPENCE.]

[*All rights reserved.*]

List of Seeds Collected in the Royal Botanic Garden, Edinburgh, during the Year 1900.

The following is a list of plants cultivated in the Royal Botanic Garden, Edinburgh, from which ripened seeds have been collected during the year 1900. The quantity of seed obtained from some of the species is of limited amount. The seeds are available for exchange, but they are not for sale:—

HERBACEOUS PLANTS.

Acantholimon
glumaceum, *Boiss.*

Achillea
Jaborneggi ×, *Halacsy.*

Aciphylla
squarrosa, *Forst.*

Aconitum
Anthora, *Linn.*

Actæa
alba, *Mill.*
spicata, *Linn.*

Adenophora
stylosa, *Fisch.*

Æthionema
cappadocicum, *Spreng.*
cordatum, *Boiss.*

Agrimonia
Eupatoria, *Linn.*

Alonsoa
caulialata, *Ruiz* et *Pav.*

Alstrœmeria
chilensis, *Lem.*

Alyssum
calycinum, *Linn.*
creticum, *Linn.*
libycum, *Coss.*
Moehlendorfianum, *Hort.*
montanum, *Linn.*
saxatile, *Linn.*

Androsace
elongata, *Linn.*, var. nana.
filiformis, *Retz.*
lactea, *Linn.*
maxima, *Linn.*

Anemone
alpina, *Linn.*
— var. sulphurea.
Halleri, *All.*
obtusiloba, *D. Don.*
polyanthes, *D. Don.*
pratensis, *Linn.*
rivularis, *Buch.-Ham.*
sulphurea, *Linn.*
sylvestris, *Linn.*

Anthericum
Liliago, *Linn.*
— var. algeriense.

Aquilegia
Bertolonii, *Schott.*
formosa, *Fisch.*

Arabis
albida, *Stev.*
Allionii, *DC.*
alpina, *Linn.*
— var. anachoretica, *Port.*
blepharophylla, *Hook.* et *Arn.*
Breweri, *S. Wats.*
lucida, *Linn. fil.*

Arenaria
austriaca, *Jacq.*

Arum
maculatum, *Linn.*
palæstinum, *Boiss.*

Asarum
canadense, *Linn.*
caudatum, *Lindl.*
europæum, *Linn.*
grandiflorum, *Klotzsch.*

Aster
alpinus, *Linn.*
— var. altaicus.
— var. ruber.

Astilbe
chinensis, *Franch.* et *Sav.*
Thunbergii, *Miq.*

Astragalus
danicus, *Retz.*
Glyciphyllus, *Linn.*

Astrantia
carniolica, *Wulf.*
major, *Linn.*

Athamanta
Matthioli, *Wulf.*

Aubrietia
deltoidea, *DC.*, var. Columnæ (*Guss.*).

Avena
sterilis, *Linn.*

Barbarea
arcuata, *Reichb.*
præcox, *R. Br.*
vulgaris, *R. Br.*

Bottionea
thysanthoides, *Colla.*

Brassica
Cheiranthos, *Vill.*

Bryonia
dioica, *Jacq.*

Bulbinella
Hookeri, *Benth.* et *Hook. fil.*

Calochortus
venustus, *Benth.* var. citrinus.
— var. Eldorado.
— var. oculatus.
— var. pictus.

Camelina
sativa, *Crantz.*
sylvestris, *Wallr.*

Campanula
barbata, *Linn.*
glomerata, *Linn.*
Hendersoni, *Hort.*
lactiflora, *Bieb.*
latifolia, *Linn.*, var. macrantha (*Fisch.*)
linifolia, *Scop.*
persicifolia, *Linn.*
— var. alba.
— var. Backhousei.
— var. grandiflora.
rapunculoides, *Linn.*
rotundifolia, *Linn.*
— var. alba.
Trachelium, *Linn.*, var. aggregata.
— var. flore pleno.

Cardamine
bulbiflora, *R. Br.*

Carlina
corymbosa, *Linn.*

Cerastium
perfoliatum, *Linn.*

Chærophyllum
aromaticum, *Linn.*

Cheiranthus
Cheiri, *Linn.*

Chelidonium
majus, *Linn.*
— var. laciniatum (*Mill.*).

Chrysanthemum
anserinæfolium, *Hausskn.* et *Born.*
ceratophylloides, *All.*
maximum, *Ramond.*

Cochlearia
officinalis, *Linn.*

Codonopsis
rotundifolia, *Royle.*

Collomia
grandiflora, *Dougl.*

Coronilla
elegans, *Panc.*

Corydalis
glauca, *Pursh.*

Delphinium
crassicaule, *Ledeb.*
elatum, *Linn.*, var. glabra.
grandiflorum, *Linn.*
hybridum, *Steph.*
speciosum, *Bieb.*, var. turkestanicum.
truncatum, *Hort.*
velutinum, *Bertol.*

Dianthus
cæsius, *Sm.*
calocephalus, *Boiss.*
chinensis, *Linn.*
deltoides, *Linn.*
glacialis, *Haenke.*, var. gelidus.
Hellwigii ×, *Borb.*
mœsiacus, *Vis.* et *Panc.*
superbus, *Linn.*

Dictamnus
albus, *Linn.*

Digitalis
ambigua, *Murr.*
lutea, *Linn.*
purpurea, *Linn.*

Draba

arabisans, *Michx.*
aurea, *Vahl.*
carinthiaca, *Hoppe*, var. Traunsteineri (*Hoppe*).
fladnizensis, *Wulf.*
hispida, *Willd.*
incana, *Linn.*
—var. hebecarpa.
Kotschyi, *Stur.*
lactea, *Adams.*
longirostra, *Schott, Nym.* et *Kotschy.*
rupestris, *R. Br.*
siliquosa, *Bieb.*

Epilobium

angustifolium, *Linn.*
Hectori, *Hausskn.*
luteum, *Pursh.*
parviflorum, *Schreb.*
rosmarinifolium, *Haenke.*

Erigeron

glabellus, *Nutt.*
macranthus, *Nutt.*
multiradiatus, *Benth.* et *Hook. fil.*
Roylei, *DC.*
speciosus, *DC.*

Erinus

alpinus, *Linn.*

Erodium

curvifolium, *Boiss.* et *Reut.*
ciconium, *Willd.*

Eryngium

cæruleum, *Bieb.*

Erysimum

thyrsoideum, *Boiss.*

Eschscholzia

californica, *Cham.*
—var. alba.

Eupatorium

cannabinum, *Linn.*

Fritillaria

aurea, *Schott.*
camtschatcensis, *Ker-Gawl*

Funkia

Sieboldiana, *Hook.*

Gaillardia

aristata, *Pursh.*, var. grandiflora, *Hort.*

Gentiana

asclepiadea, *Linn.*
punctata, *Linn.*
Saponaria, *Linn.*
verna, *Linn.*

Geranium

asphodeloides, *Burm. fil.*
cinereum, *Cav.*
Endressi, *Gay.*
sanguineum, *Linn.*
—var. lancastriense (*Mill.*).
—var. roseum.
sibiricum, *Linn.*
subcaulescens, *L'Herit.*

Gerbera

nivea, *Sch. Bip.*

Geum

montanum, *Linn.*
nutans, *Hort. Par.*
parviflorum, *Commers.*
pyrenaicum, *Mill.*
rubellum, *Fisch.* et *Mey*

Globularia
trichosantha, *Fisch.* et *Mey.*

Gypsophila
acutifolia, *Fisch.*
dubia, *Willd.*

Helleborus
antiquorum, *A. Br.*, var. roseus.
colchicus, *Regel.*

Hesperis
matronalis, *Linn.*

Heuchera
bracteata, *Ser.*
Drummondii, *Hort.*
macrophylla, *Lodd.*
sanguinea, *Engelm.*

Hieracium
argenteum, *Fries.*
iricum, *Fries.*
rigidum, *Hartm.*
scoticum, *Hort.*
tridentatum, *Fries.*
villosum, *Jacq.*

Homogyne
alpina, *Cass.*

Hyacinthus
romanus, *Linn.*

Hypericum
pulchrum, *Linn.*
Richeri, *Vill.*, var. Burseri (*Spach*).

Iberis
intermedia, *Guersent.*
semperflorens, *Linn.*
sempervirens, *Linn.*
—var. superba.
umbellata, *Linn.*

Impatiens
Noli-tangere, *Linn.*

Incarvillea
Delavayi, *Bureau* et *Franch.*

Inula
ensifolia, *Linn.*
Helenium, *Linn.*

Iris
sibirica, *Linn.*
—var. alba.
—var. flexuosa.
tenax, *Dougl.*

Isatis
tinctoria, *Linn.*

Jasione
montana, *Linn.*

Kniphofia
Tuckii, *Baker.*

Lactuca
muralis, *E. Mey.*

Lathyrus
canescens, *Gren.* et *Godr.*
macrorrhizus, *Wimm.*
magellanicus, *Lam.*
montanus, *Bernh.*

Leontopodium
alpinum, *Cass.*

Lepidium
Menziesii, *DC.*

Leucojum
vernum, *Linn.*, var. carpaticum (*Herb.*).

Ligusticum
scoticum, *Linn.*

Lilium
Washingtonianum, *Kellogg*, var. purpureum.

Linaria
maroccana, *Hook. fil.*

Lindelofia
spectabilis, *Lehm.*

Linum
alpinum, *Linn.*
perenne, *Linn.*

Lotus
corniculatus, *Linn.*

Lunaria
annua, *Linn.*

Lupinus
micranthus, *Dougl.*
rivularis, *Dougl.*

Lychnis
divaricata, *Reichb.*
Flos-jovis, *Desr.*
Githago, *Scop.*
pyrenaica, *Berger.*
Viscaria, *Linn.*
— var. splendens.

Malva
Alcea, *Linn.*
borealis, *Wallm.*
crispa, *Linn.*

Mandragora
officinarum, *Linn.*

Meconopsis
cambrica, *Vig.*
Wallichii, *Hook.*
— var. fusco-purpurea.

Medicago
truncatula, *Gaertn.*

Melilotus
elegans, *Salzm.*

Mesembryanthemum
pomeridianum, *Linn.*

Mitella
pentandra, *Hook.*

Morina
longifolia, *Wall.*

Muscari
Argæi, *Hort.*
armeniacum, *Leichtlin.*
botryoides, *Mill.*
Maweanum, *Baker.*
moschatum, *Willd.*

Ochthodium
ægypticum, *DC.*

Œnothera
biennis, *Linn.*

Onobrychis
sativa, *Lam.*

Ononis
arvensis, *Linn.*

Orchis
mascula, *Linn.*

Oxytropis
glabra, *DC.*
lapponica, *Gaud.*
strobilacea, *Bunge.*

Papaver
alpinum, *Linn.*
Heldreichii, *Boiss.*
nudicaule, *Linn.*, var. miniatum.
pilosum, *Sibth.* et *Sm.*
somniferum, *Linn.*

Paradisea
Liliastrum, *Bertol.*

Pedicularis
palustris, *Linn.*
— var. alba.

Pentstemon
confertus, *Dougl.*
deustus, *Dougl.*
diffusus, *Dougl.*
glaucus, *R. Grah.*, var. stenopetalus.
ovatus, *Dougl.*

Phlomis
setigera, *Falc.*

Phyteuma
orbiculare, *Linn.*
Scheuchzeri, *All.*
Sieberi, *Spreng.*
spicatum, *Linn.*

Picrorhiza
Kurroa, *Royle.*

Pisum
sativum, *Linn.*

Plantago
Raoulii, *Decne.*

Platycodon
grandiflorum, *A. DC.*, var. Mariesii.

Podopyllum
Emodi, *Wall.*

Polemonium
cæruleum, *Linn.*
— var. album.
— var. monstrosum.
himalayanum, *Baker.*

Polygonum
viviparum, *Linn.*

Potentilla
alchemilloides, *Lapeyr.*
alpestris, *Hall. fil.*
malacophylla, *Borb.*
Menziesii ×, *Paxt.*
Sibbaldia, *Hall. fil.*

Poterium
canadense, *A. Gray.*
muricatum, *Spach.*
officinale, *A. Gray.*

Primula
Auricula, *Linn.*, var. monacensis.
calycina, *Duby*
capitata, *Hook.*
carniolica, *Jacq.*
elatior, *Hill*, var. carpatica (*Fuss.*).
farinosa, *Linn.*
frondosa, *Janka.*
involucrata, *Wall.*, var. Munroi.
sikkimensis, *Hook.*
viscosa, *Vill.*, var. decora, *Sims.*
— var. nivalis, *Hort.*

Prunella
grandiflora, *Jacq.*
vulgaris, *Linn.*
— var. alba.

Pyrola

media, *Sw.*
rotundifolia, *Linn.*

Ramondia

pyrenaica, *Rich.*
serbica, *Panč.*
— var. Nathaliæ (*Panč.* et *Petrov.*)

Ranunculus

acris, *Linn.*
bulbosus, *Linn.*, var. fasciatus.
Chius, *DC.*

Reseda

complicata, *Bory.*
Luteola, *Linn.*

Rheum

Rhaponticum, *Linn.*

Sanicula

europæa, *Linn.*

Saxifraga

Aizoon, *Linn.*, var. balcana, *Hort.*
— carinthiaca (*Schott*).
— Malyi (*Schott, Nym.* et *Kotschy*).
— minima.
— notata (*Schott, Nym.* et *Kotschy*).
— pectinata (*Schott*).
— punctata.
— rosularis, *Schl.*
— Sturmiana (*Schott, Nym.* et *Kotschy*).
aspera, *Linn.*
bronchialis, *Linn.*
— var. cherlerioides (*D. Don*).
Bucklandi, *Hort.*, var. major.
Burseriana, *Linn.*, var. multiflora.
crustata, *Vest*, var. hybrida.
decipiens, *Ehrh.*
— var. palmata (*Panč.*).
exarata, *Vill.*
granulata, *Linn.*
Hostii, *Tausch.*
— var. altissima (*Kern.*).
— var. elatior (*Mert.* et *Koch*).
hypnoides, *Linn.*
intacta, *Willd.*
— var. farinosa.
leucanthemifolia, *Michx.*
lingulata, *Bell*, var. australis (*Moric.*).
longifolia, *Lapeyr.*
mutata, *Linn.*
oppositifolia, *Linn.*
— var. alba.
paradoxa, *Sternb.*
pedatifida, *Ehrh.*
Portæ ×, *Engl.*
pseudo-sancta, *Janka.*
retusa, *Gouan*, var. bryoides.
— maritima.
rotundifolia, *Linn.*
sancta, *Griseb.*
stellaris, *Linn.*
tenella, *Wulf.*
tyrolensis, *Kern.*
umbrosa, *Linn.*, var. Ogilveana *Hort.*
— var. serratifolia (*Mackay*).

Scabiosa

caucasica, *Bieb.*
— var. alba.

Scilla
bifolia, *Linn.*, var. præcox.
festalis, *Salisb.*
— var. alba.
hispanica, *Mill.*,var. grandiflora.
patula, *DC.*
— var. major.

Scrophularia
nodosa, *Linn.*

Scutellaria
alpina, *Linn.*

Sedum
album, *Linn.*
Anacampseros, *Linn.*
asiaticum, *Spreng.*
stoloniferum, *S. T. Gmel.*

Sempervivum
arvernense, *Lecoq* et *Lamotte.*
glaucum, *Tenore.*
Pomellii, *Lamotte.*
Schottii, *Baker*, var. acuminatum (*Schott*).

Sidalcea
candida, *A. Gray.*
malvæflora, *A. Gray.*

Silene
alpestris, *Jacq.*
Armeria, *Linn.*
caucasica, *Boiss.*
colorata, *Poir.*
Cucubalus, *Wibel.*
Drummondii, *Hook.*
italica, *Pers.*
muscipula, *Linn.*
nicæënsis, *All.*
quadridentata, *Pers.*
rhynchocarpa, *Boiss.*
Saxifraga, *Linn.*
Schafta, *Gmel.*
Sendtneri, *Boiss.*
Thorei, *Duf.*
vallesia, *Linn.*
verecunda, *S. Wats.*

Silphium
terebinthinaceum, *Jacq.*

Sisymbrium
Thalianum, *J. Gay.*

Sisyrinchium
angustifolium, *Mill.*

Smilacina
racemosa, *Desf.*

Sobolewskya
clavata, *Fenzl*, var. cilicica.

Solanum
Dulcamara, *Linn.*, var. alba.

Solidago
elongata, *Nutt.*
multiradiata, *Ait.*, var. scopulorum.
Virgaurea, *Linn.*

Spergula
arvensis, *Linn.*

Spiræa
astilboides, *Carr.*
Filipendula, *Linn.*
Ulmaria, *Linn.*

Synthyris
reniformis, *Benth.*

Thalictrum
angustifolium, *Linn.*
calabricum, *Spreng.*

Thalictrum—*continued.*
glaucum, *Desf.*
minus, *Linn.*
simplex, *Linn.*

Thermopsis
fabacea, *DC.*
montana, *Nutt.*

Thlaspi
arvense, *Linn.*

Tofieldia
calyculata, *Wahlenb.*

Trifolium
agrarium, *Linn.*
alpinum, *Linn.*
pannonicum, *Jacq.*
striatum, *Linn.*

Trillium
erythrocarpum, *Curt.*
grandiflorum, *Salisb.*
ovatum, *Pursh.*
stylosum, *Nutt.*

Tritonia
rosea, *Klatt.*

Trollius
altaicus, *C. A. Mey.*
asiaticus, *Linn.*, var. giganteus.
europæus, *Linn.*
— var. pumilus albus.
patulus, *Salisb.*, var. albus.

Tunica
stricta, *Fisch.* et *Mey.*
velutina, *Fisch.* et *Mey.*

Typha
angustifolia, *Linn.*
latifolia, *Linn.*

Veronica
fruticulosa, *Linn.*
Guthriana ×, *Hort.*
longifolia, *Linn.*
Lyallii, *Hook. fil.*
satureioides, *Vis.*
saxatilis, *Scop.*

Vicia
Cracca, *Linn.*
sylvatica, *Linn.*
unijuga, *A. Braun.*
villosa, *Roth.*

Viola
canadensis, *Linn.*, var. alba.
cornuta, *Linn.*
macedonica, *Boiss.* et *Heldr.*
odorata, *Linn.*, var. lutea.
persicifolia, *Roth.*
polychroma, *Kern.*
primulæfolia, *Linn.*
sylvestris, *Lam.*

Waldsteinia
trifolia, *Koch.*

Wulfenia
carinthiaca, *Jacq.*

TREES AND SHRUBS.

Acer
Pseudo-platanus, *Linn.*

Alnus
cordifolia, *Ten.*
glutinosa, *Medic.*
incana, *Medic.*

Amelanchier
canadensis, *Torr. et Gray.*

Arctostaphylos
Uva-ursi, *Spreng.*

Berberis
angulosa, *Wall.*
Aquifolium, *Pursh.*

Betula
alba, *Linn.*
— var. pendula, *Hort.*

Caragana
arborescens, *Lam.*

Clematis
Vitalba, *Linn.*

Colutea
istria, *Mill.*

Cornus
alba, *Linn.*

Cotoneaster
frigida, *Wall.*
horizontalis, *Decne*
microphylla, *Wall.*
Simonsii, *Baker.*

Cratægus
mollis, *Scheele.*
Oxyacantha, *Linn.*
— var. pendula, *Lodd.*

Cytisus
nigricans, *Linn.*
scoparius, *Link.*
— var. Andreanus.

Daphne
Mezereum, *Linn.*
— var. album.

Dryas
octopetala, *Linn.*

Genista
sagittalis, *Linn.*

Helianthemum
ægyptiacum, *Mill.*
ledifolium, *Mill.*
umbellatum, *Mill.*
vulgare, *Gaertn.*
— var. mutabile.
— var. roseum.
— var. venustum.

Ilex
Aquifolium, *Linn.*
— var. aurea angustifolia.
— var. camelliæfolia.
— var. flavescens.
— var. fructu luteo.
— var. Hodginsii.
—var. maderensis.

Laburnum
alpinum, *J. S. Presl.*
vulgare, *J. S. Presl.*

Ledum
latifolium, *Ait.*
palustre, *Linn.*

Nuttallia
cerasiformis, *Torr. et Gray.*

Olearia
Haastii, *Hook. fil.*

Pernettya
mucronata, *Gaudich.*

Prunus
Avium, *Linn.*

Pyrus
Aria, *Linn.*
Aucuparia, *Gaertn.*
nivalis, *Jacq.*
rotundifolia, *Bechst.*

Quercus
Cerris, *Linn.*
pedunculata, *Ehrh.*
sessiliflora, *Salisb.*

Rhamnus
catharticus, *Linn.*
Frangula, *Linn.*

Rhododendron
catawbiense, *Michx.*
caucasicum, *Pall.*
ferrugineum, *Linn.*
— var. album, *Sweet.*
flavum, *G. Don.*
hirsutum, *Linn.*

Rhododendron—*continued.*
hirsutum, var. album.
— var. variegatum.
ponticum, *Linn.*

Rhodotypos
kerrioides, *Sieb. et Zucc.*

Rosa
rugosa, *Thunb.*
— var. alba.

Sambucus
canadensis, *Linn.*
nigra, *Linn.*
— var. fructu albo.

Skimmia
Fortunei, *Mast.*

Symphoricarpus
racemosus, *Michx.*

Taxus
baccata, *Linn.*
— var. Dovastoni, *Carr.*
— var. fastigiata, *Loud.*

Thymus
Chamædrys, *Fries*, var. comosus (*Heuff.*).

Tilia
vulgaris, *Hayne.*

Veronica
anomala, *Armstr.*
Bidwillii, *Hook. fil.*
Colensoi, *Hook. fil.*, var. glauca.
monticola, *Armstr.*
pinguifolia, *Hook. fil.*
vernicosa, *Hook. fil.*, var. pur purea.

Viburnum
Lantana, *Linn.*
Opulus, *Linn.*

PLANTS UNDER GLASS.

Acokanthera
spectabile, *Hook. fil.*

Actinostemma
biglandulosum, *Hemsl.*

Ardisia
crenata, *Roxb*

Aristolochia
brasiliensis, *Mart.*
fimbriata, *Cham.*

Asparagus
scandens, *Thumb.*

Begonia
coccinea, *Hook.*
Dregei, *Otto et Dietr.*
Knowsleyana, *Hort.*
manicata, *Cels.*
nitida, *Dry.*
Verschaffeltii, *Hort.*

Billardiera
longiflora, *Labill.*

Billbergia
pallidiflora, *Liebm.*

Bomarea
multiflora, *Mirb.*

Brachychilum
Horsfieldii, *Baker.*

Brodiæa
lactea, *S. Wats.*

Camellia
theifera, *Griff.*

Cassia
corymbosa, *Lam.*

Chlorophytum
orchidastrum, *Lindl.*

Clethra
arborea, *Ait.*

Cobæa
scandens, *Cav.*

Coffea
arabica, *Linn.*

Costus
igneus, *N. E. Br.*

Cotyledon
Desmetiana, *Hemsl.*

Crossandra
undulæfolia, *Salisb.*

Cyclanthera
explodens, *Naud.*

Darlingtonia
californica, *Torr.*

Dracæna
phrynioides, *Hook. fil*

Drosophyllum
lusitanicum, *Link.*

Drosera
capensis, *Linn.*
filiformis, *Rafin.*
peltata, *Sm.*
rotundifolia, *Linn.*
spathulata, *Labill.*

Eucalyptus
ficifolia, *F. Muell.*
urnigera, *Hook. fil.*

Ficus
diversifolia, *Blume.*

Fuchsia
procumbens, *R. Cunn.*

Gazania
pygmæa, *Sond.*

Genista
monosperma, *Lam.*

Gossypium
arboreum, *Linn.*
herbaceum, *Linn.*
neglectum, *Tod.*

Heeria
rosea, *Triana.*

Hedychium
Gardnerianum, *Rosc.*

Hibiscus
esculentus, *Linn.*
lunariifolius, *Willd.*
Manihot, *Linn.*
pedunculatus, *Linn.*

Humea
elegans, *Sm.*

Hydrolea
spinosa, *Linn.*

Kalanchoe
crenata, *Haw.*
thyrsiflora, *Harv.*

Kennedya
prostrata, *R. Br.*

Lycopersicum
Humboldtii, *Dun.*
racemigerum, *Lange.*

Maurandia
Barclayana, *Lindl.*

Melothria
cucumerina, *Naud.*

Mesembryanthemum
blandum, *Haw.*
curviflorum, *Haw.*
elegans, *Jacq.*
micans, *Linn.*
polyanthon, *Haw.*
roseum, *Willd.*

Mimosa
marginata, *Lindl.*
pudica, *Linn.*

Mimulus
glutinosus, *Wendl.*

Momordica
Charantia, *Linn.*
cochinchinensis, *Spreng.*

Musschia
Wollastoni, *Lowe.*

Myrtus
communis, *Linn.*
Luma, *Barn.*
Ugni, *Mol.*

Nephthytis
liberica, *N. E. Br.*

Nicotiana
sylvestris.

Ochna
Kirkii, *Oliv.*
mossambicensis, *Klotzsch.*

Ornithogalum
lacteum, *Jacq.*

Orthosanthus
multiflorus, *Sweet.*

Oryza
sativa, *Linn.*

Oxypetalum
cæruleum, *Decne.*

Passiflora
edulis, *Sims.*
quadrangularis, *Linn.*

Pelargonium
ternatum, *Linn.*

Pentas
carnea, *Benth.*, var. kermesina, *Hort.*

Phyllanthus
montanus, *Sw.*

Pinguicula
lusitanica, *Linn.*

Polyalthia
suberosa, *Benth.* et *Hook. fil.*

Primula
floribunda, *Wall.*
mollis, *Nutt.*
verticillata, *Forsk.*

Psychotria
micrantha, *Hiern.*

Ricinus
communis, *Linn.*

Rivina
humilis, *Linn.*

Sarracenia
illustrata, *Hort.*

Senecio
macroglossus, *DC.*

Solanum
Seaforthianum, *Andrews.*

Tacsonia
mixta, *Juss.*

Tetranema
mexicana, *Benth.*

Tillandsia
splendens, *Brongn.*

Torenia
flava, *Buch.-Ham.*
Fournieri, *Linden.*

Turnera
ulmifolia, *Linn.*

Villamilla
octandra, *Hook. fil.*

Vitis
heterophylla, *Thunb.*, var. humulifolia, *Hort.*

NOTES

FROM THE

ROYAL BOTANIC GARDEN, EDINBURGH.

DECEMBER 1900.

CONTENTS.

	Page.
Observations on the Girth-Increase of Trees in the Royal Botanic Garden, Edinburgh. By David Christison, M.D., - - - - - - - - - - - -	41
Life-History and Habits of Clerus formicarius, Linn., with 11-14. By R. Stewart MacDougall, M.A., D.Sc., -	121
Life-History and Habits of Rhizophagus depressus, Fowler, with 15-17. By R. Stewart MacDougall, M.A., D.Sc.,	127
Enumeration of Visitors to the Royal Botanic Garden, Edinburgh, during the years 1889-1900, - - - - -	134

GLASGOW:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,
And to be purchased, either directly or through any Bookseller, from
OLIVER & BOYD, EDINBURGH.

[PRICE NINEPENCE.]

[*All rights reserved.*]

Observations on the Girth-increase of Trees in the Royal Botanic Garden, Edinburgh, for Twenty Years, 1878-1897.

BY

DAVID CHRISTISON, M.D.

PART I.—DECIDUOUS TREES.

THE late Sir Robert Christison, when nearly four score years of age, began in 1875 a series of girth-measurements of trees on scientific principles in order to ascertain their annual girth-increase, and was, I believe, the first to do so. The observations for the first three years were initiatory upon a few trees only, but in 1878 systematic observations were begun on a much larger number. In a series of papers read to the Botanical Society of Edinburgh in 1878, 1879, 1880, and 1881, he explained his methods, gave the results of his observations, and showed the practical uses to which such observations could be put. One of these,—the rather elaborate computation of the age of trees from a series of girth-measurements in a particular tree and in others of the same species at different sizes,—has been superseded by the process of extracting borings on which the annual rings can be counted, and for practical purposes the same ready method is applicable in determining the present rate of growth of a stem; but for this purpose it is necessary to take the average of several borings in the circumference of the tree, and girth-measurements probably yield more precise results in determining, not only annual increments, but more particularly the finer rates for months or even shorter periods. It must always be remembered, however, that such measurements show

simply the increase in girth, and cannot discriminate between the amount due to deposit of wood on the one hand, or to changes in the bark or cambium on the other. In this respect borings have the advantage, but as to the bark I may state generally that except in very old trees there seems to be little loss in mass, or even by gradual attrition—so little as to be inappreciable in a single year. Thus, even in old rough-barked trees, my painted distinguishing numbers often show little trace of wearing in ten or twelve years, although distorted and rendered illegible from the gradual widening and splitting of the bark. Notable exceptions among the species are the true Plane tree and the Yew, whose tendency to shed their bark is so manifest.

Sir Robert Christison at first aimed at no finer division of his tape than tenths of an inch, and confined himself to annual observations, but very soon, with practice and improved tapes, he measured to the twentieth of an inch and took monthly observations. Since his death in 1882, I have continued to measure his original trees, but as many of them, even from the first, were old or prematurely old, it was evidently desirable to experiment on younger specimens, not only because the results would be probably more reliable, but in order to ascertain the increments of the species over a greater range of age. Accordingly, in 1887, I selected some thirty-five young deciduous trees, from six to twenty inches in girth, chiefly situated in the South and East shelter belts of the Arboretum, and a similar number of young Pinaceæ in the Botanic Garden, taking two of each species when possible, so that in case of one failing the other might preserve the continuity of observations in the species. With the exception of a few that were cut down from death or degeneracy, all of this second set were observed annually till the end of the period, and monthly from 1887 to 1891. The deciduous specimens generally throve well, considering that they had been put in without preparation of the naturally poor sandy soil, before the Arboretum was handed over to the authorities of the Garden, but they were almost all transplanted after 1891, and thus the continuity of observations was interrupted. The Pinaceæ, again, throve so badly as greatly to mar the value of the results in them.

To compensate for this interruption in the deciduous group, I selected in 1892 a fresh set of twenty young trees, each of a different species, almost all growing in the North and West borders of the Arboretum, subject to the same objection of want of preparation of the ground before planting as the former set, but favoured by a rather better soil. Once more, however, the continuity of observation was interrupted, in 1896, by a close pruning of branches and roots, in preparation for transplantation, which at once reduced the aggregate girth-increase by nearly one-half. As to the Evergreens, discouraged as I was by the comparative failure of the first set, I made no effort to increase their number, although the observations on the original set were continued.

The introduction of Chesterman's steel tapes insured an accuracy of measurement unattainable in the original experiments, and enabled me to initiate new inquiries, such as the determination, within narrow limits, of the seasonal beginning of girth-increase in the different species, the weekly rate of growth, the relation of girth-increase to the development of the leaves and twigs, &c.; and the various results were communicated to the Royal Society of Edinburgh in 1883, and to the Botanical Society in 1887, '88, '89, and '92. In the present Report I shall confine myself to the annual and monthly results,—and in the deciduous trees only,—bringing them down to 1897, which completes a period of twenty years. The observations for 1892–97, both annually and monthly, and the annual observations of the original set for the second decade, which have not yet been published, will be given in detail, but only the general results for the first decade are reproduced from my former papers. In these papers were incorporated observations made on trees at Craigiehall, near Cramond, but these have long been discontinued, and the results will only be incidentally used here. Thus, the present Paper becomes peculiarly a record of the life-history, as indicated by girth-increase, of a considerable number of deciduous trees in the Botanic Garden and Arboretum, over periods of from six to twenty years.

Doubts have been expressed as to the possibility of measuring the girth of trees to the twentieth of an inch with accuracy, and unquestionably in stems of great size, and in all stems of irregular

form or with very rough bark, an error of the twentieth or even the tenth of an inch may be caused by the slightest shifting of the tape. But such trees should be rejected, at least for fine or frequent observation, and if we select young cylindrical stems with smooth bark, or even when it is rough, provided the roughness be regular and free from excrescences, it is possible, by adopting careful methods, and with practice, to attain a wonderful degree of accuracy. I have frequently checked an observation on such trees by repeating it three times, using a fine millimetre tape, and found a variation of not so much as half a millimetre. The method adopted by me is fully explained under the next head.

GENERAL EXPLANATIONS.

1. METHOD OF TAKING OBSERVATIONS.—The measured point, generally five feet above ground, is marked in white paint by several short horizontal lines round the stem. A short perpendicular line at one of them that occupies the most prominent position marks the spot where the measurement begins.

Chesterman's steel tapes are used, one, graduated to twentieths of an inch, for ordinary observations, and another, of more slender make, graduated to millimetres, for finer work. In both, the ordinary ring is replaced by a square, slightly wider than the tape, and included in the graduation.

In small stems the tape is held in position at the fixed starting point with the nail of the forefinger of the left hand, and the tape is passed round the stem with the right hand, and brought fairly over the square, which can be accurately done, as the square is wider than the tape. The amount is then read off at the outer edge of the square. For larger stems the process is the same, except that, to allow the observer to go round the tree, the square is kept in place by a "brog," which must be removed, the square being kept in position with the nail of the forefinger, in order that the measurement may be read off accurately.

2. THE GIRTH OF A TREE usually signifies its circumference at five feet from the ground, or, in a short stem, at its narrowest point. But five feet was the height aimed at for observation whenever it was practicable.

3. HEIGHT OF MEASUREMENTS.—When trees were too young to be measured at five feet, a convenient point was chosen two or three feet from the ground, and as the trees grew and became fit, the point was raised to the five-feet level. I do not think the results were in any way invalidated by this necessary compromise.

4. SUMMING-UP OF TABLES.—The entries in the Tables of increments due to years in which trees were temporarily ineligible, from the effects of transplantation or pruning, are printed in *italics*, and such entries are not included in the summing of the lines and columns.

5. SCALE USED FOR MEASUREMENTS.—All measurements are in inches and decimal parts of an inch unless otherwise stated.

I. ANNUAL RESULTS.

Following the plan formerly adopted, I take first the results for the species separately, and then the collective results. To preserve the convenience of division into decennial and quinquennial periods, I have omitted from the Tables the first year's observations on the second set of trees, but they will be available in the text, and will be fully given in the monthly division of the subject.

The chief results derived from the annual observations are—

1. The annual rate of girth-increase in the species at different ages;

2. The seasonal range in the species separately; and

3. The same in the aggregate.

The seasonal variations ought to be considered in connection with meteorology, but an inquiry of this kind is complicated by the variety of influences that come into play, such as the ripening of the wood, the formation of the buds, low temperatures of the air or earth, the protective or destructive effects of snow, sudden thawing, excessively low temperature, excess or defect of rain or humidity, &c., besides the effects of position in sheltering or exposing different trees to these weather influences. To have done justice to all these points would have taken far more time than I had at my command. I have been content therefore to

deal only with instances in which the cause of a marked depression was not far to seek. None such occurred in the second decade, but the first was signalised at the outset by an unprecedented series of three most unfavourable seasons, chiefly owing to exceedingly low winter temperatures, which reduced the aggregate increment by nearly one-half, and affected some trees for years afterwards, if not permanently. The disastrous effects on girth-increase of these seasons have been described in former papers by my father* and myself,† and will be only incidentally mentioned now.

A. General History of the Species Separately.

In place of taking the species in scientific sequence, it was deemed preferable to deal with them in the order of the reliability of the observations, whether depending on the larger number of observations, or on the better thriving of the species in the soil of the Garden. A certain preference has also been given to the importance of the species as forest trees.

Each Table is drawn up so as to show—

(1) The following results in the original adult or old trees of 1878:—*a.* The average increase in girth for the first decade for each tree under observation. *b.* The annual increase in detail for the second decade. *c.* Its total amounts and its average annual rate. *d.* The girth of each tree at the end of the decade in 1897.

(2) The same details, as far as they go, in the second decade for the younger trees selected in 1887 and 1892, given at the foot of the Tables.

* *On the Exact Measurement of Trees*, Part 4. Trans. Bot. Soc. Ed., 1880.

† *Op. cit.*, 1880-89, p. 397. The Depression in Girth-Increase of 1879, 1880, and 1881; *et passim.*

FAGUS SYLVATICA.

No. in List.	Av. Annual Rate, 1st Decade.	Annual Increments. 1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Rate.	Girth, Oct. 1897.
7	1·03	·75	·80	·95	·90	1·20	1·10	·85	·60	·90	·80	8·85	·88	89·60
8	0·99	·80	·95	·95	·90	·90	·90	·90	·90	1.10	·90	9·20	·92	79·50
14	0·48	·40	·35	·20	·25	·30	·25	·45	·30	·25	·30	3·05	·30	83·70
38	0·43	·30	·25	·25	·25	·40	·25	·45	·25	·40	·25	3·05	·30	67·75
		2·25	2·35	2·35	2·30	2·80	2·50	2·75	2·05	2·65	2·25			
97	..	1·15	1·30	1·50	1·30	Died after Transplantation.						5·25	1·31	15·55
98	..	1·00	1·10	1·45	1·35	1·55	Do.					6·45	1·29	14·55
20	..	..	..	..	..	..	1·70	1·45	·20	*·60**	*·55*	4·35	1·45	20·95

* See Explanation of Figures, page 44.

I have placed this species first, because the Beech here, as in Scotland at large, thrives better perhaps than any other of our forest trees.

The two first in the Table, handsome and healthy looking trees, stand free in the low ground where the original Botanic Garden bordered the former Horticultural Garden. Reckoning in round numbers, they have increased in girth, No. 7 from six feet to seven and a half feet, No. 8 from five feet to six and a half feet, in twenty years, and the annual rate in each has been ·95. But the rates in the first decade were 1·03 and ·99, and in the second ·88 and ·92 respectively, showing an appreciable decline, which, however, was not steady, for if we take the total increments for the two trees in quinquennial periods they come out—9·70, 10·35, 8·95, 8·95. The inferiority of the first to the second quinquennial period is explicable by the depressing effect of the low temperatures in 1879, 1880, and 1881, which, although they affected this species less than any other, still left their mark upon it for three years. Thus, the united increase of Nos. 7, 8 was 2·40 in 1878 and only 1·75, 1·55, and 1·75 in the three following years. The marked decline in the third quinquennium from 10·35 to 8·95 cannot be explained unless on the theory that the trees had passed the maximum of their growing power, but the rate underwent no further fall in the fourth quinquennium.

The *annual range* in these two trees differed remarkably. In No. 7 it was ·60 to 1·20, in No. 8 ·80 to 1·20. But the extremes do not show the difference sufficiently. If we take, for example, the seven years 1889-95, the range in No. 7 was ·60 to 1·20, and in No. 8 only ·90 to ·95. It is difficult to understand this difference in two trees of much the same size, growing at the same rate, and within fifteen yards of each other, unless it may be due to No. 7 standing quite free, whereas No. 8, although not pressed upon, has trees and shrubs near it, and is more closely sheltered.

Nos. 14, 38 were much the same size respectively as Nos. 7 and 8 when they were all first measured in 1878, but have fallen behind in the race, their rates in the first decade having been only ·48 and ·36, and in the second being reduced in both to 0·30, the average for the twenty years being 0·39 and 0·36, or considerably less than half that of Nos. 7 and 8. This may be accounted for by their position, on the South of Inverleith House, on a high site and probably in inferior soil. They are tall and handsome enough, but have not the fine heads of the other two. The variations in their history have been much the same as in Nos. 7 and 8, the results for their quinquennial periods being 4·80, 4·55, 3·10, 3·25, showing the same fall as in the other two in the third period, not progressing in the fourth.

The *annual range* in No. 14 was ·25 to ·65, and in No. 38 ·15 to ·60.

Taking the four trees together, the range in the first decade was considerably greater than in the second, owing to the disturbing influence of the low temperatures in 1879, 1880, and 1881. In the first decade it was 1·95 to 3·60 and in the second it was only 2·05 to 2·80.

The career of the young beeches, Nos. 97 and 98, was unfortunately soon cut short by death after transplantation, and that of No. 20 temporarily interfered with by pruning, but the *average annual rate* of the three, 1·34, was considerably above that of the best of the older trees. Their *range* in the twelve available records was 1·00 to 1·70.

QUERCUS ROBUR.

No. in List.	Girth at first.	Annual Increments.										Total Incr.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
1	5·50	·40	·40	·65	·75	·70	·45	·50	*·10*	*·15*	·60	4·45	·56	10·15
2	8·00	·20	·30	·65	·80	·90	·90	·50	·45	*·5*	*·10*	4·70	·59	11·70
70	7·95	·50	·75	·95	1·05	1·20	1·00	·75	1·05	·80	dead.	8·05	·89	13·90
72	6·40	·20	·40	·80	·55	1·15	1·05	1·00	·40	·60	do.	6·15	·68	11·55
10	11·60	..	..	..	..	..	·75	·65	·35	*·20*	*·25*	1·75	·58	13·85

The native Oak does not show to much advantage in the Edinburgh district, and the specimen put under observation in the Garden in the first decade, and that only from 1880 (not in the Table), was a short-stemmed spreading tree, on the west slope from Inverleith House, that had lost many branches and become misshapen. It was by a long way the patriarch of the oaks in the Garden, having attained the respectable girth of eight feet. It increased in nineteen years from 95 to 99 inches in girth, or at the annual rate of ·22, more than, from its appearance, I should have expected, but it is not desirable to give the details, as from the small increments and the rough bark they are not reliable.

The four young trees Nos. 1, 2, 70, and 72, placed under observation in 1888, and No. 10, begun in 1893, yielded annual rates varying from ·56 to ·89, the average of the whole being ·66; but if we leave out the three first years when they were very young, and the last three, when those that were still eligible had, for some unknown reason, begun to fail, the average rises to ·84, and the annual rate of No. 70, the quickest grower, in its six best years, 1890–95, was exactly one inch.

The best of those is probably a poor rate compared with what might be expected in young oaks under more favourable circumstances, for even near Edinburgh, at Craigiehall, a tree, ten feet in girth at the beginning of the first decade, yielded a rate of 0·69 for ten years.

The aggregate increases of the four first on the list for the seven available years 1888–94 were 1·30, 1·85, 3·05, 3·15, 3·95,

3·40, 2·75. These figures probably represent a natural rise from extreme youth in the first two years to an equilibrium for the next four years, but there seems to have been a depression in the seventh year, followed by the death of two of the trees.

The *range* is very high, as might be expected from the erratic history, and cannot be regarded as normal. Even in No. 70 it was ·50 to 1·20, or taking the six steadiest years ·75 to 1·20.

OTHER SPECIES OF QUERCUS.

QUERCUS CONFERTA.

No. in List.	Annual Av., 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
40	1·65	1·05	1·20	1·35	1·25	1·70	1·80	*·90*	*1·30*	*·50*	*·60*	8·35	1·39	51·80
54	1·70	1·30	1·75	2·05	1·50	1·75	2·30	*1·05*	*1·25*	*·65*	*·0*	10·65	1·77	43·35
55	1·57	1·30	1·55	1·65	1·30	1·70	2·10	*·75*	*1·25*	*·65*	*·5*	9·60	1·60	39·05
		3·65	4·50	5·05	4·05	5·15	6·20	*2·70*	*3·80*	*1·80*	*·65*			

The Hungary Oak is much more at home in the Botanic Garden than its native cousin, at least in early youth; indeed, with the exception of the Willow, it has proved the quickest growing species of all that were under observation. Unfortunately for my purposes, owing to a liberal pruning to promote upward growth, the results became unavailable for the last four years of the second decade, but in the first decade the rates of the three trees were 1·65, 1·70, and 1·57, and in the third quinquennium with the one available year of the fourth they were 1·39, 1·77, and 1·60, the respective girths attained being four feet four inches, three feet seven inches, and three feet three inches. Of the 44 recorded measurements not one fell to an inch, the lowest being 1·05, while two inches and upwards was reached five times, the highest being 2·30. The great and progressive depression caused by pruning has been such that, while in 1893 the aggregate increase was 6·20, in 1897, four years afterwards, it was only ·65, yet the trees look healthy and well clothed, with the exception of No. 40, which for a year or two before the pruning had looked rather scraggy.

The aggregate annual increments for fourteen years were 3·60, 5·15, 5·25, 5·40, 5·05, 4·85, 4·65, 5·30, 3·65, 4·50, 5·05, 4·05, 5·15, 6·20. They were generally therefore pretty steady, but two marked depressions occurred. The first, in the year of the first record, 1880, when the fall, to 3·60, was probably due to the severe previous winter; the second, 3·65, was in 1888, from some unknown cause. The highest record, 6·20, was in 1893, the year before the changes produced by pruning.

The range in the trees individually was from 1·05 to 1·85 in No. 40, 1·10 to 2·30 in No. 54, and 1·10 to 2·10 in No. 55, but excluding the two years of marked depression the figures are 1·20 to 1·85, 1·60 to 2·30, and 1·20 to 2·10.

QUERCUS CERRIS.

No. in List.	Annual Av., 1st Decade.	ANNUAL INCREMENTS.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
43	·57	·50	·30	·70	·60	·70	·65	·60	·50	·70	·55	5·80	·58	53·50
63	..	·70	·45	·65	·50	·70	·85	·70	·55	·80	·60	6·50	·65	67·15
15	..	..	..	..	..	..	·70	·65	·70	·65	·65	3·35	·67	10·00
		1·20	·75	1·35	1·10	1·40	2·20	1·95	1·75	2·15	1·80			

The Turkish Oak, although it grows at a much less rate than the last, is another species that thrives much better in the Garden than the native tree, and that to a considerable size; indeed, there are few handsomer trees than No. 63 growing free in the centre of the Garden, and now upwards of five feet and a half in girth. The other tree, No. 43, is also tall and handsome, but, although only four and a half feet in girth, is growing at a somewhat slower rate than No. 63, perhaps because it is in the East border and has not the freedom of its brother. The rate of No. 43 in the first decade was ·57, and in the second it was even a trifle higher. No. 63 in the first quinquennium of the second decade had a rate of 0·60, and in the second 0·70, so that it seems to be increasing rather than diminishing in vigour. The very young No. 15, in the North border of the Arboretum, measuring only six and a half inches in girth, when put under observation

in 1893, had much the same rate, ·67, in the second quinquennium of the second decade.

In the aggregate returns the only traceable depression was in 1889, when the two trees then available grew only ·75. Deducting this year, the growth was pretty steady, the extremes in the last five years, when all three were available, being 1·80 and 2·20.

The *range* of No. 43 for the two decades was ·30 to ·70, but removing two depressed years,—1881, when the tree suffered from the low temperatures of the winter, and 1889,—the range was only ·50 to ·70. With deduction of 1889, that of No. 63 in the second decade was also ·50 to ·70, and that of No. 15 in the fourth quinquennium was only ·65 to ·70.

The species appears to thrive even better in the vicinity of Edinburgh. Thus, a fine specimen at Craigiehall, when nearly seven feet in girth in 1890, had been growing at the rate of ·89 for eleven years; and a very fine healthy tree at Cramond House, measured by Sir Robert Christison in 1878, girthed no less than 12 feet 8 inches at the narrowest part of the stem, five feet above ground.

QUERCUS PALUSTRIS.*

* Erroneously called *Q. rubra* in former papers, from a mistake in the label on the tree.

No. in List.	Annual Av., 1st Decade.	Annual Increments. 1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth at last.
44	·45	·40	·30	·50	·35	·45	·40	·55	·40	·35	·25	3·95	·39	39·20

This species does not seem to do so well; at least the largest in the Garden, No. 44, now only three and a quarter feet in girth, grew at the low rates in the first decade of ·45 and in the second of ·39. It was noted since 1880 as having a shabby look, with many dead twigs.

QUERCUS RUBRA.

No. in List.	Annual Av., 1st Decade.	Annual Increments. 1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth at last.
61	..	..	..	·90	1·00	1·15	1·50	1·25	·55	·50	·35	5·90	1·18	12·35

This American Oak, on the other hand, seems to excel the native species in its rate. At least the young No. 61, after fully recovering from transplantation, averaged 1·18 for five years, when it became temporarily ineligible from re-transplantation.

QUERCUS ILEX.

No. in List.	Annual Av., 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
45	·28	·45	·40	·60	·55	·55	·70	·15	·20	·0	·	3·55	·36	47·55
46	·23	·40	·40	·45	·30	·25	·45	·15	·25	·25	·5	2·95	·29	34·05
16	..	·55	·80	·85	·50	·60	·65	·15	·25	·45	·35	5·15	·51	9·85

In my paper of 1888 it is remarked that no species suffered more from the three severeseasons than the Evergreen Oak. The largest in the Garden, upwards of six feet in girth, lost two years' growth of twigs, recovered its foliage slowly and imperfectly, some large limbs requiring to be cut off, and has quite lost its handsome, shapely form. Nos. 45, 46 did not suffer so badly, but their girth-increase was reduced to a mere nothing in 1880 and 1881. Afterwards they rallied somewhat till 1894, when they suddenly failed and almost ceased to grow. No. 45 seems now to be dying. It is remarkable that the infant specimen, No. 16, in the oak grove of the Arboretum, suffered a serious diminution in girth-increase in the same year, so that it would seem that all three had been then subjected to some common evil influence. The rate of No. 16 in the first quinquennium was no less than ·66, although it was a mere infant, girthing only 4·65 inches at fifteen inches above ground, when measured at the beginning of the period. In the first year of the second quinquennium it maintained this average, but in 1894 the rate fell to ·15, and there has been no full recovery since, so that the rate for the second quinquennium has been only ·37, or little more than half that of the first. At the same time, the tree has never looked ill, and it is now a remarkably thriving and vigorous looking specimen.

ACER PSEUDOPLATANUS.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
13	0·26	·25	·20	·25	·30	·30	·25	·25	·30	·10	·25	2·45	·24	136·50
28	·35	·20	·20	·30	·10	·35	·25	·15	·15	·35	·15	2·20	·22	64·25
71	..	·85	1·05	1·40	1·20	1·40	1·30	1·30	1·00	1·00	*·0*	10·50	1·17	19·90
74	..	·70	1·10	1·55	1·40	1·55	1·40	1·45	1·55	*·15*	*·30*	10·70	1·34	19·25
67	..	..	..	·50	·40	·65	·75	·95	·70	1·05	·85	5·85	·73	11·40
16	..	..	..	..	..	..	1·20	1·40	1·20	..	*·15*	*·5*	3·80	1·27	16·10

The Sycamore grows fairly well near Edinburgh, although it is rarely seen in the city gardens, and the largest trees in the Arboretum are of this species. Trees at several ages were tested. No. 67, only about a foot in girth in 1897, had grown at the rate of ·73 for eight years; Nos. 16, 71, and 74, girthing one foot four to one foot eight inches in 1897, had grown, the first for three, the second for nine, and the third for eight years, at the rates of 1·26, 1·17, and 1·34, or on an average 1·26. These younger trees were only under observation in the second decade.

No. 28, now five feet four inches in girth, was chosen in 1878 as a handsome and thriving tree in a plantation belt opposite the Palm House, but, although it continued to look well, its rate all along has been surprisingly low; only ·35 in the first decade and ·22 in the second, or not much above a quarter of an inch annually for twenty years.

The veteran, No. 13, chosen by Sir Robert in 1878, perhaps because it was the largest tree of any kind in the Garden, although even then past its best, is still presentable, and girths nearly eleven and a half feet. Its rough and scaling bark renders it unreliable for single years, but the average rate for the first decade was ·26 and for the second ·24, showing no very perceptible decline, and scarcely less, on the whole, than that of No. 28, which has just half its girth.

The range of No. 67, the youngest specimen, was great, ·50 to 1·05, but that is, no doubt, because it was only growing out of

infancy. Deducting the year 1888, which appears to have been unusually unfavourable to Nos. 71 and 74, the range of these two and of No. 16 in eighteen records was moderate, 1·00 to 1·55.

ACER CAMPESTRIS.

This young Maple, No. 12, at the N.-W. corner of the Arboretum, has only been under observation since 1892, and its increments have been 1·60, 1·30, 0·85, 1·55, 1·00, and ·90, giving an average of 1·20, the girth being now twenty inches. Since 1896 the tree has not looked so healthy as at first, possibly the result of pruning, although it was not excessive. The increase has been very erratic, and the range, ·85 to 1·60, is high for so short a period.

ŒSCULUS HIPPOCASTANUM.

No. in List.	Annual Av. 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
9	·33	·35	·5	·10	00	·25	·10	·25	·25	·30	·00	1·65	·16	53·75
73	..	·70	1·10	·90	·80	·85	·90	·75	·60	*·25*	*·60*	6·60	·82	11·85
80	..	1·05	1·35	1·30	1·15	*·10*	*·40*	*·55*	1·25	1·25	·95	8·30	1·19	15·45
4	..	..	..	..	..	1·35	1·40	1·05	1·05	*·75*	*·60*	4·85	1·21	19·00

No. 9, the only Horse Chestnut observed in the first decade, was somewhat crowded, but had a fair head of foliage, and was four feet in girth. In 1878 the girth-increase was 0·70, but it suffered a decided fall from the very low temperatures of the next two winters, only to rally again to 0·70 in 1881. Next year, from some cause that affected the species universally near Edinburgh, the foliage withered in May, but it revived next year, and has been dense and healthy ever since. Nevertheless, the average increase for the six years following 1882 was only 0·17, and for the next ten 0·16. In twenty years it has increased only five inches. Is the singular fact of apparent healthiness and vigour, along with an extremely low rate, the prolonged effect of the disease of 1882? Or may it be due to the over-

topping of it by a neighbouring tree, although this cause could not have operated at first? Of the two very young trees, Nos. 73, 80, growing near each other in the South border of the Arboretum, the first has proved inferior to the second, although of the same age, the rate of No. 73 having been ·81 and of No. 80 1·19. That of No. 4, a somewhat older tree in the North border, was 1·21, when its career was interrupted by pruning, as that of the other two had been by transplantation.

The range was moderate in them all, ·60 to 1·10 in No. 73; ·95 to 1·35 in No. 80; and 1·05 to 1·40 in No. 4.

ULMUS MONTANA.*

* Erroneously named U. campestris in my former paper.

No. in List.	Annual Increments.										Total.	Annual Av.	Girth at last.
	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
93	1·75	1·80	1·75	1·50	1·30	1·70	1·60	2·05	1·75	1·35	16·55	1·65	30·75
94	1·15	1·75	1·50	1·30	*·10*	*·30*	*·80*	1·55	1·60	1 20	10·05	1·43	22·30
	2·90	3·55	3·25	2·80	..	..	..	3·60	3·35	2·55	..	..	..

In the Edinburgh city gardens the Wych Elm resists the deleterious influences of town life better than any other species. In the Botanic Garden there is no specimen of considerable size, and thus it happened that Sir Robert did not experiment on the species, and I have no records in the first decade. In the second the two healthy young trees, Nos. 93, 94, in the Arboretum have done remarkably well, the former yielding an annual rate of 1·65 for ten years, the latter 1·43 for seven years, the other three years of its decade having been employed in making up the loss sustained by transplantation. Not one of the seventeen records falls to one inch.

The *range* has been moderate, 1·30 to 2·05 in No. 93 and 1·15 to 1·75 in No. 94, and there has been no marked depression, although both trees were almost at their lowest rate in 1897, the united increments being 2·55. The best year was 1895, with 3·60, being an average of 1·80, but several other years were nearly as good.

ULMUS CAMPESTRIS.

This great ornament of the South-west of England makes but a poor show in Scotland, where it is scarcely recognisable as the same tree. Two tall, lanky, but well-clothed specimens in the Botanic Garden, however, girth 58 and 59 inches. A quite young one was selected in the Arboretum in 1892, when it girthed 9·60 inches. The increases for the next four years were only ·75, ·60, ·55, and ·50, yielding a rate little over half an inch, and as it had a very shabby appearance it was cut down.

TILIA EUROPŒA.

No. in List.	Annual Av., 1st Decade.	Annual Increments. 1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth at last.
2	·30	·00	·50	·40	·25	·20	·40	·35	·00	·30	·35	2·75	·27	81·50
18	·35	·30	·15	·55	·15	·45	·65	·45	·10	·40	·00	3·20	·32	49·40
69	..	·60	·85	·75	·55	1·00	·90	·70	·70	·85	*·00*	6·90	·77	12·60
85	..	·50	60	·65	·45	·75	·70	·55	·50	·60	*·05*	5·30	·59	11·45
		1·40	2·10	2·35	1·40	2·40	2·65	2·05	1·30	2·15	..			
3	..					1·35	1·45	1·25	·90	*·60*	*·50*	4·55	1·24	19·90

The fine spreading Lime, No. 2, stands free in the centre of the Botanic Garden, and is one of its best trees. It increased in the first decade at the rate of ·30 and in the second ·27, a slow progress; but it looks healthy, and is approaching seven feet in girth.

No. 18, although only four feet in girth, has nearly as poor a rate. Possibly it has been permanently checked by the low temperatures in the winter of 1879, as it fell in that year to ·40 from ·70 in 1878, and in the two following years was only ·15 and ·25. Although it may have been somewhat crowded formerly it has not been so when under observation, and it is now a well-formed, healthy-looking tree, so that its continued low rate is somewhat mysterious. It has recently, 1899, been transplanted a short distance, and now stands quite free,

The rates of the quite young Nos. 69, 85 are only ·77 and ·59, and seem poor compared with those of most other forest trees in the Garden, but No. 3, not much older, averaged 1·24 in four years, so that the conduct of Nos. 69, 85 may be exceptional.

In the species there seem to have been years of depression in 1888, 1891, and 1895.

The range in the young trees was not excessive, ·55 to 1·00, ·50 to ·75, and ·90 to 1·35.

FRAXINUS EXCELSIOR.

No in List.	Annual Increments.										Total.	Annual Av.	Girth at last.
	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
23	·85	1·15	·90	·80	*·30*	*·25*	1·05	1·40	1· 0	*·20*	7·35	1·05	14·70
75	·45	·60	·45	·65	·65	·65	·60	*·5*	*·25*	·50	4·55	·57	9·40
2	..	..	..	..	1·30	1·10	1·20	1·25	*·65*	*·45*	4·85	1·21	18·25

This species was not observed in the first decade. In the second the two very young trees, Nos. 23, 75, of nearly the same girth, and growing in the same circumstances in the South border of the Arboretum, fared so differently that No. 23, with an average of 1·05, grew at nearly twice the rate of No. 75. Both were transplanted during the decade, No. 23 twice. No. 2, a somewhat older tree in the West border, had a rather better rate than No. 23, or 1·21. The ranges were moderate, ·85 to 1·40, ·45 to ·65, and 1·10 to 1·30.

FRAXINUS ORNUS.

This flowering Ash, a graft on a two-foot stool of the common Ash, and a transplant from the older Garden of 1822, was a handsome and flourishing tree about six and a quarter feet in girth in 1878, and grew at the rate of ·41 in the first decade. It still looks fairly well, but girth-increase almost ceased in the second decade, the total being less than an inch. The girth in 1897 was 80·30, and that of the stool at its narrowest 107·50.

CASTANEA VESCA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
4	·94	·60	·75	1·00	·60	·90	·90	·40	·80	·45	·55	6·95	·69	87·20

This rather handsome tree grew at the rate of nearly an inch annually in the first decade, and was little affected by the low temperatures of 1879, 1880, and 1881. In the third quinquennium, however, the rate fell to ·77, and in the fourth to ·62, so that the tree seems to be past its best. It still looks well, and has reached the respectable girth of seven feet three inches.

The range in the first decade, ·75 to 1·10, was slight, but the decline in the second has raised it to ·45 to 1·10 in the whole period of twenty years.

JUGLANS REGIA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
12	·13	·05	·00	·15	·00	·50	·25	·25	·15	·15	·10	1·40	·14	136·50

As the Walnut is rare in the Edinburgh district, it is somewhat surprising to see so large a specimen in a situation so little favourable to tree longevity as the Arboretum, and where it has been so much exposed to the west winds. It has a short stem, eleven feet four inches in girth at the narrowest, a foot above ground, which has only increased an inch or two in twenty years. The two chief limbs girth upwards of eight and five feet. The only annual measurements kept up were on the latter, and it has increased, very irregularly, only two and a half inches in twenty years. Very probably the girth-increase was permanently checked by the low temperatures of 1880, as in the previous year it increased ·40 and in 1878 ·50, almost as much as in the following eighteen years. In some years it produces an abundance of fruit, which, however, never reaches anything like maturity. The

soil of the Garden seems rather favourable to the walnut, as a very handsome specimen, four feet nine inches in girth, recently transplanted, promises to do well.

SALIX SP.

No. in List.	Annual Rate, 1st Decade.	Annual Increments										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
19	...	·90	1·80	1·65	1·65	2·40	2·80	2·65	4·00	3·00	2·40	23·25	2·32	26·25

This Willow, on the South side of the pond, but on dry ground, was measured in its infancy at three feet above ground, the point being raised to five feet when practicable. It was at first only an inch and a half in girth, and is now about two feet at the five-feet mark, having grown twenty-three inches in ten years, at the rate of 1·68 in the first quinquennium, and 2·97, or all but three inches, in the second. The increases of four inches in 1895 and three in 1896 are quite unequalled in other species in all my twenty years' observations.

POPULUS FASTIGIATA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
76	...	·75	1·75	1·35	·75	1·45	*·00*	*·50*	·95	dying	...	7·00	1·17	15·05
87	...	·80	1·35	1·00	·45	·80	dead	...	...	...	...	4·40	·88	12·65
9	...	...	...	...	...	1·25	1·35	1·05	1·30	*·80*	*·65*	4·95	1·24	15·10

Three of this species were under observation in the second decade, but the careers of Nos. 76 and 87 have been ended by transplantation followed by death, and that of No. 9 by transplantation threatening death. The average rate in the few available years was 1·18 in No. 76, and 1·24 in No. 9, and if we deduct the years 1891 and 1892 from No. 87, when it was evidently failing, its rate would be 1·05, or not much less than in the others.

ALNUS GLUTINOSA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
88	...	·85	1·20	·60	·70	·65	·70	·50	·75	*·10*	*·05*	5·95	·74	14·20
7	...	...	...	...	...	·85	·80	·60	·75	*·30*	*·15*	3·00	·75	11·85

The results in this species are also not very satisfactory. No. 88 at first looked well, and in 1889 had an increase of 1·20, but fell off in appearance thereafter, with an increase never rising above ·75 in the six next years. It was then transplanted. No. 7 has never looked vigorous. The annual averages of the two, ·74 and ·75, are almost identical, but cannot be regarded as representative of normal growth.

BETULA ALBA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
1	·07	·05	·00	·20	·05	·05	·10	·10	·05	·15	·00	0·75	·07	56·80
78	...	·80	1·35	1·10	·95	1·45	1·30	1·25	trans	pl'd &	died	8·20	1·17	19·55
82	...	·70	·90	1·10	·80	1·40	cut	down	...	...	...	4·90	·98	26·65
17	...	...	...	...	...	1·70	1·80	1·60	1·35	*·50*	*·30*	6·45	1·61	20·20

The only Birch measured in the first decade, No. 1, was a transplant from the former Garden in 1822, and was for long a chief ornament of the present one. Previously to 1878 it had been measured for three years, and had an annual rate of ·41, but in that year it dropped to ·25, and possibly the tree was past its prime. Then came the three winters so disastrous to girth-increase in general, when many twigs died, the girth-increase almost ceased, and at the end of the decade not half of the long weeping branches remained. In the second decade there was no rally of girth-increase, which in twenty years has only amounted to an inch and a half, but there has been little further degeneration in appearance, and the tree, now nearly five feet in

girth, still retains something of its original beauty. The cause of its falling off has been ascertained by recent borings to be a fungoid disease in the stem. A Birch of the same size at Craigiehall in the first decade grew for eight years at the annual rate of nearly half an inch.

The two younger Birches, Nos. 78, 82, yielded rates of 1·17 and ·98 for seven and five years respectively, the ranges being ·80 to 1·45 and ·70 to 1·40. But No. 17, about the same age, showed the much better average of 1·61 for the four available years of its career.

CARPINUS BETULUS.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
33	·41	·25	·40	·45	·30	·45	·55	·35	·30	·50	·25	3·80	·38	52·40
81	...	·80	1·00	·65	·55	·45	*·00*	*·35*	·65	·85	·70	5·65	·71	11·90
86	...	·40	·70	·60	·70	·75	·80	·65	1·00	*·15*	*·00*	5·60	·70	11·30

No. 33, a tall, erect, and handsome tree in 1878, above three and a half feet in girth, grew at the rate of ·41 in the first decade and in the second at the somewhat less rate of ·38, always rather falling off in condition. It is now four feet four inches in girth. The annual rate of the two much younger Hornbeams, Nos. 81, 86, selected for the second decade in the South border of the Arboretum, was ·70 and ·71. Their growth was erratic, as shown by the range, which in the former was ·45 to 1·00 and in the latter ·40 to 1·00.

LIRIODENDRON TULIPIFERA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
6	·60	·35	·40	·80	·50	·65	·40	·75	·35	·40	·25	4·85	·48	86·55

This short-stemmed but handsome spreading tree seems to have been a quick grower up to a girth of about six feet, at the

narrowest part, four feet two inches above ground, as Sir Robert Christison ascertained its rate to have been 1·20 for the three years before the first decade, and in the first year of that decade it grew 1·00. It then encountered the three hard winters, in the two first of which the rate fell to ·40 and ·30, and it never afterwards rallied to above ·80; the average rate in the first decade being ·60 and in the second ·48. Notwithstanding this progressive decrease, the tree is still handsome and healthy looking, with a girth of above seven feet at four feet above ground, and nearly ten feet at the base.

ROBINIA PSEUDACACIA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
14	...	...	...	...	...	·60	·75	·85	1·40	1·05	·95	5·60	·93	11·90

This very young tree is thriving well in the North border of the Arboretum. It was but slightly pruned in 1895, so I have included the two following years' results. The rate, compared with other infant trees, seems good, as it is barely a foot in girth, and has increased nearly at the rate of an inch a year for six years. The growth was progressive, from ·60 to 1·40 for four years, but has declined to ·95 in the next two years.

CRATÆGUS OXYACANTHA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
16	·55	·60	·65	·65	·45	·50	·65	·35	·05	·10	·05	3·85	·55	47·55
19	...	1·05	1·65	·95	1·00	1·20	·45	·50	·85	·10	·20	7·65	·96	10·40
11	...	...	...	...	...	1·00	1·10	·85	1·10	·20	·25	4·05	1·01	14·45

The handsome Hawthorn, No. 16, at the East walk of the Garden, grew at the rate of a little above half an inch in the first decade, and attained a girth of above three and a half feet.

In the first seven years of the second decade its rate continued precisely the same ; but in 1895 its roots were cut round about to prepare it for transplantation. It then almost ceased to grow till 1899, when it was transplanted to the Arboretum. It now girths all but four feet, and promises to do well in its new quarters.

The rates of the two quite young trees, Nos. 19 and 11, in the second decade, for eight and four years respectively, have been ·96 and 1·01, or about one inch each. The increase in No. 19, the one observed for the longest period, has been erratic, as proved by the extreme range of ·45 to 1·20 in eight years.

CYTISUS LABURNUM.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
21	...	·75	1·00	·85	·90	·70	1·05	·75	*·15*	*·35*	·85	6·85	·86	13·30
1	...	...	...	...	...	·85	·55	·85	·45	*·30*	*·35*	2·70	·67	11·80

The results in these young Laburnums, still only about a foot in girth, have been ·86 and ·67, or an average of about three-quarters of an inch. The range in the one longest tested, No. 21, has been moderate, ·75 to 1·05.

PYRUS COMMUNIS.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
8	...	...	...	...	...	·95	·90	·65	·70	*·25*	*·10*	3·20	·80	14·70

The rate of this young Pear tree, in the West border of the Arboretum, was ·80 for four years, when it was healthy-looking, but the increase almost ceased from excessive pruning, which threatens the life of the tree.

PYRUS AUCUPARIA.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
77	...	·80	·40	·75	·55	·75	·60	·55	*·5*	*·35*	·70	5·10	·64	12·45
79	...	·75	1·05	1·10	·90	*·20*	*·45*	·80	·80	·90	·85	7·15	·89	14·70
13	...	...	...	...	...	·85	·90	·75	·70	*·10*	*·00*	3·20	·80	16·50

The rate of No. *77* was only ·60, kept down perhaps by the very sandy soil where it grew, in the South border of the Arboretum, as No. *79*, in the East border, had the considerably better rate of ·89. It was somewhat less, only ·80, in No. 13, favourably situated in the West border, but it has been under observation for only four available years. The ranges of all three, ·40 to ·70, ·75 to 1·10, and ·70 to ·90, have been moderate.

PRUNUS PADUS.

No. in List.	Annual Rate, 1st Decade.	Annual Increments.										Total.	Ann. Av.	Girth at last.
		1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.			
18	...	·65	·90	·80	·70	·70	1·00	·60	*·00*	·75	·70	6·80	·76	11·20
22	...	1·20	1·45	1·35	1·35	*·15*	*·80*	1·05	1·55	1·35	1·10	10·40	1·30	17·20
5	...	...	...	...	...	2·00	1·90	1·60	1·70	*1·10*	*1·00*	7·20	1·80	21·65

These two trees, growing apparently under much the same conditions in the South border of the Arboretum, before being transplanted, have fared very differently, the rate of No. 18 being only ·76, while that of No. 22 was 1·30. The range in both was comparatively small, ·60 to 1·00 and 1·05 to 1·55. But No. 5, South of the Arboretum Lodge, proved greatly superior to these, with an average of 1·80 for four years, and the small range of 1·60 to 2·00. It is thus one of the few trees of any species that has grown as much as two inches in a single year.

B. Annual Rate and Range of Girth-increase in Deciduous Trees at Different Ages.

The rate of girth-increase in trees must evidently be affected by various conditions of locality, such as soil, shelter, crowding or the reverse, the effects of which cannot always be easily eliminated. But another condition of no little influence is age, for there is a natural rise in the annual increase from infancy through youth, and a subsequent decline, the limits of which in the different species have not been, perhaps cannot be, determined. To get rid in some degree of this last cause, I have divided my trees in Tables I. to V. under five categories, according to their size. Usually only the quickest growers have been given, as being more likely to be representative of the normal characteristics of the species than such as proved comparative failures. Some have been under observation for a period sufficiently long to appear in more than one of the categories.

Leaving the Tables mainly to tell their own tale, attention may be directed to a few of the chief points in each of the categories.

ANNUAL RATE AND RANGE OF INCREASE IN GIRTH IN DECIDUOUS TREES.

TABLE I.—Under 15 inches in Girth at the end of the Observations.

No. in List.	Species.	Girth at last Observation.	Annual Rate.	Least Increase in a Year.	Greatest Increase in a Year.	Number of Years.
96	Salix	12·70	2·06	1·65	2·80	five.
94	Ulmus montana	15·00	1·45	1·15	1·75	three.
22	Prunus Padus	13·15	1·30	1·15	1·45	five.
98	Fagus sylvatica	14·55	1·29	1·00	1·55	five.
16	Acer Pseudoplatanus ...	15·	1·27	1·20	1·40	three.
9	Populus fastigiata	13·65	1-24	1·05	1·35	four.
76	Do.	14·15	1·17	·75	1·75	five.
61	Quercus rubra	10·95	1·18	·90	1·50	five.
23	Fraxinus excelsior	14·50	1·07	·85	1·40	five.
78	Betula alba	14·50	1·05	·95	1·35	five.
11	Cratægus Oxyacantha ...	14·00	1·01	·85	1·10	four.
19	Do. ...	10·10	·96	·45	1·65	eight.
14	Robinia Pseudacacia ...	11·90	·93	·60	1·40	six.
70	Quercus robur	13·90	·89	·50	1·20	nine.
79	Pyrus Aucuparia	14·05	·89	·75	1·10	eight.
21	Cytisus Laburnum	13·30	·86	·70	1·05	eight.
8	Pyrus communis	14·35	·80	·65	·95	four.
69	Tilia europœa	12·60	·77	·60	1·00	nine.
7	Alnus glutinosa	11·40	·75	·60	·85	four.
88	Do.	14·05	·74	·50	1·20	eight.
81	Carpinus Betulus	11·90	·71	·45	1·00	eight.
86	Do.	11·15	·70	·40	1·00	eight.
16	Quercus Ilex	8·60	·63	·45	·85	seven.

TABLE II.—Between 15 inches and 2 feet in Girth.

No. in List.	Species.	Girth at last Observation.	Annual Rate.	Least Increase in a Year.	Greatest Increase in a Year.	Number of Years.
96	Salix	23·85	3·21	2·65	4·00	three.
5	Prunus Padus	21·65	1·80	1·60	2·00	four.
93	Ulmus montana	19·55	1·70	1·50	1·80	four.
17	Betula alba	19·40	1·61	1·35	1·80	four.
54	Quercus conferta	24·50	1·61	1·10	1·90	five.
55	Do.	21·40	1·58	1·10	1·80	five.
20	Fagus sylvatica	19·80	1·45	1·20	1·70	three.
74	Acer Pseudoplatanus ...	18·80	1·47	1·40	1·55	five.
3	Tilia europœa	18·80	1·24	·90	1·45	four.
2	Fraxinus excelsior	17·15	1·21	1·10	1·30	four.
4	Œsculus Hippocastanum ...	17·65	1·21	1·05	1·40	four.
12	Acer campestris	19·75	1·20	·85	1·60	six.

TABLE III.—Between 2½ feet and about 5 feet in Girth.

54	Quercus conferta	·36	1·86	1·30	2·05	six.
40	Do.	·36	1·69	1·05	1·80	six.
55	Do.	·36	1·60	1·30	2·10	six.
93	Ulmus montana	·31	1·71	1·35	2·05	three.
43	Quercus Cerris	·53	·57	·35	·65	twenty.
16	Cratægus Oxyacantha ...	·48	·55	·10	·80	twenty.
33	Carpinus Betulus	·52	·40	·10	·55	twenty.
18	Tilia europœa	·46	·35	·15	·70	ten.
28	Acer Pseudoplatanus ...	·62	·35	·15	·50	ten.
9	Œsculus Hippocastanum ...	·52	·32	·05	·75	ten.

TABLE IV.—Old Trees, from about 6 feet to 7½ feet in Girth.
Decade 1878-87.

No. in List.	Species.	Girth at last Observation.	Annual Rate.	Least Increase in a Year.	Greatest Increase in a Year.	Number of Years.
7	Fagus sylvatica	·82	1·03	·65	1·20	ten.
8	Do.	·70	·99	·90	1·20	ten.
4	Castanea vesca	·80	·94	·75	1·10	ten.
6	Liriodendron tulipiferum ...	·82	·60	·30	1·00	ten.
3	Fraxinus Ornus	·80	·41	·20	·75	ten.
2	Tilia europœa	·78	·30	·00	·65	ten.

TABLE V.—Decade 1888-97.

7	Fagus sylvatica	·90	·85	·60	1·20	ten.
8	Do.	·80	·92	·80	1·10	ten.
4	Castanea vesca	·87	·69	·40	1·00	ten.
6	Liriodendron tulipiferum ...	·86	·48	·25	·80	ten.
2	Tilia europœa	·81	·27	·00	·50	ten.

TABLE VI.—Rates of Old Trees at Craigiehall, Cramond, for comparison.

10	Quercus Cerris	·80	·92	·70	1·25	eight.
20	Fagus sylvatica	1·43	·81	·60	·95	eight.
16	Quercus robur	1·27	·69	·45	1·00	eight.
5	Betula alba	·60	·45	·40	·55	eight.
6	Fraxinus excelsior	1·44	·37	·25	·70	ten.
7	Acer Pseudoplatanus ...	1·30	·40	·20	·55	ten.

I. TREES UNDER 15 INCHES IN GIRTH.

Annual rate.—These infant trees have been under observation for from three to eight years. Fully one-half of the twenty-three trees and of the nineteen species had an annual rate of an inch or upwards, the Willow being *facile princeps* with a rate of two inches for five years, when it grew in girth from three to thirteen inches. The Wych Elm follows with

nearly an inch and a half for three years; then come the Cherry, Beech, Sycamore, and Poplar with about an inch and a quarter, and the American Oak, Ash, Birch, and Hawthorn with about an inch. At the other end of the scale are Alder and Hornbeam with three-fourths of an inch, Robinia, British Oak, Rowan, Laburnum, Pear, and Lime being slightly better than that.

Annual range.—Naturally this tends to be greatest in the trees that were longest under observation; but even confining ourselves to the seventeen which had from five to nine years' records the range is not great. In ten the maximum was less, sometimes much less, than double the minimum; in six it was only rather more than double; and in only one was it extreme, being three and a half times greater than the minimum. This was the Hawthorn, No. 19, a very infantile specimen, and in the slightly older No. 11 the range was quite slight.

Maximum single year's increase.—Only three of the twenty-three trees failed to attain one inch of increase in one or more years; these were the Pear, with 95; Alder, No. 7, with 85; and Evergreen Oak, with 85. But another Alder, No. 88, attained 1·20. The highest results were—Willow 2·80, Wych Elm 1·75, Poplar 1·75, Hawthorn 1·65.

II. TREES BETWEEN 15 INCHES AND TWO FEET IN GIRTH.

Annual rate.—Of the twelve trees, belonging to eleven species, admissible to this category, eight have already figured in the infantile period. The Willow reappears with the very high rate of 3·21 for three years. The Cherry now takes second place with 1·80, and Wych Elm follows with 1·70; but the Birch, and the two new comers of *Quercus conferta*, are also above an inch and a half, and *Acer campestris*, at the bottom of the list, averages, along with Lime, Ash, and Horse Chestnut, about an inch and a quarter.

Annual range.—This is much less than in the infantile period. In no tree is the maximum double the minimum; generally it is considerably less, and only in *Acer campestris* does it come perilously near as much.

Maximum single year's increase.—Willow again far and away heads the list with no less than four inches in a single year. Cherry is the only other that attains even two inches, although

one Hungary Oak comes near it with 1·90; the other Hungary Oak, with the Wych Elm and Birch, attain fully an inch and three-quarters, and the Ash, at the bottom of the list, reached an inch and a quarter.

III. TREES BETWEEN TWO AND A HALF AND FIVE FEET IN GIRTH.

Annual rate.— Few of the species and none of the actual trees of the first or Infant Table are to be found in this category, which includes ten trees, three being Hungary Oaks. They head the list, one of them with 1·86, but it is fair to state that they are younger than most of the others; the Wych Elm is well up with 1·71; but the next best, a Turkey Oak, has only ·57, and the others dwindle down to ·32, the rate for ten years of a Horse Chestnut.

Annual range.—This was moderate in the three Hungary Oaks, the Wych Elm, and Turkey Oak, the maximum being less than double the minimum; but it was very great in Hawthorn, Hornbeam, Lime, Sycamore, and Horse Chestnut, the proportion being as ·50 to ·15 in Sycamore, the best of them, and as ·05 to ·75 in Horse Chestnut, the worst; a proof, I think, that these trees, healthy though they look, had passed their prime of growing power when only from four to five feet in girth.

Maximum single year's increase.—The three specimens of Hungary Oak are conspicuous with 2·10, 2·05, and 1·80, and the Wych Elm also mounted a trifle above two inches; but Hawthorn, Lime, and Horse Chestnut do not attain more than about three-quarters of an inch, Turkey Oak somewhat less, Sycamore and Hornbeam only half an inch.

IV. TREES FROM ABOUT SIX TO SEVEN AND A HALF FEET IN GIRTH.

Our list is now reduced to six trees, none of which appeared in the former categories. As they were observed for twenty years they may conveniently be divided into two decades.

Annual rate.—The two Beeches, which attained respectively nearly seven and nearly six feet in girth in the first decade, and seven feet and a half and six feet and a half in the second, are at the head, with a rate of 1·03 and ·99 in the decade 1878–87,

and ·88 and ·92 in the decade 1888–97. This shows a considerable falling off in the second period, although the trees seem as vigorous and healthy as ever. The Spanish Chestnut, with ·94 and ·69, shows the same tendency, as do the Tulip tree, with ·60 and ·48, and in a less degree the remarkably handsome Lime, nearly seven feet in girth, with ·30 and ·27. As to the flowering Ash, although its rate was ·40 in the first decade, it almost ceased to increase in the second, while showing little degeneracy in its general aspect.

Annual range.—This was slight in the Beech No. 8 and the Spanish Chestnut, at least in its first decade; moderate, the maximum being somewhat less than double the minimum, in Beech No. 7; large in the Tulip tree and flowering Ash; and extreme in the Lime, ·00 to ·65.

Maximum single year's increase.—Beech No. 7 attained 1·20 in both decades, and No. 8 the same in the first decade and 1·10 in the second; Spanish Chestnut reached 1·10 in the first and 1·00 in the second; Tulip tree 1·00 in the first and ·80 in the second; and Lime ·65 in the first and ·50 in the second.

C. Comparison with Trees in the Neighbourhood of Edinburgh.

The rates, particularly of the older trees in the Botanic Garden, by no means represent the capacity for increase in trees of the same or even of greater size in the Edinburgh district, when more favourably situated as to soil.

Even the handsome Beeches Nos. 7, 8, with a rate of ·85 and ·92, when six and a half and seven and a half feet in girth respectively, were nearly equalled by a specimen twelve feet in girth, with a rate of ·81 for eight years, at Craigiehall; and the wonderful tree at Newbattle, nineteen feet in girth, shows what is possible at so great a size, by having increased at the annual rate of about half an inch for fifteen years.

The largest British Oak in the Garden is much of a wreck, although only eight feet in girth, and has been increasing for twenty years at about the annual rate of only a quarter of an inch; but one at Craigiehall kept up a rate of nearly three-quarters of an inch for eight years, although at the considerably greater girth of ten and a half feet.

A fine Turkey Oak in the Garden, four and a half feet in

girth, had a rate of ·57, while one at Craigiehall, six and a half feet in girth, gave a rate of ·92 for eight years, and a very vigorous specimen at Cramond, nearly thirteen feet in girth when measured in 1878, must certainly have been a rapid grower.

The handsome Sycamore, No. 28, five feet in girth, with the unaccountably low rate of ·35, is not much above the ·22 of the largest Sycamore, eleven feet in girth, in the Garden; and a Craigiehall tree, nearly as large, excelled it with a rate of ·40 for ten years.

The finest Birch in the Garden ceased to increase when a few inches short of five feet in girth, while a slightly larger specimen at Craigiehall continued to grow at the rate of nearly half an inch for eight years.

D. Aggregate Annual Results.

The results in the aggregate are chiefly interesting as showing, in the first place, the effects upon girth-increase of good or bad seasons; and, secondly, any tendency there may be towards alteration in the rate from increasing age in the trees. This inquiry must be confined to the group of adult and aged trees, as in them alone has the period of observation, amounting in most of them to twenty years, been sufficient to yield reliable results. As the two kinds of results just specified are concurrent it will be easier to study them together than separately, and it will be advantageous to take first the species which seem to be still growing with undiminished vigour, as far as external appearance goes, and subsequently those that may be suspected of having decidedly passed their prime. The first set includes Beech, Hungary Oak, and Turkey Oak, of each of which from two to four specimens were under observation. These will be dealt with separately. The second set contains nine species, mostly illustrated by only one specimen, and may be taken in mass.

The first decade of observations, 1878–1887, was remarkable for three successive most unfavourable seasons, 1879, 1880, and 1881. In all three the winters were marked by exceedingly low temperatures, and in 1879 the growing months were remarkably cold and sunless. Fortunately the measurements in most of the species began in the previous year, and thus we can appreciate the extraordinary immediate loss in the aggregate girth-increase

and the prolonged effects on some of the trees, all of which is fully detailed in former papers.* Suffice it to say here that in 1880, the worst year for the deciduous trees, their aggregate girth-increase was only half what it was in 1878, and that, while the Deciduous group reached their minimum of increase in 1880, the second of the three severe seasons, rallying very decidedly in 1881, the Pinaceæ continued to fall off in that season and did not rally till 1882.

The second decade shows no such startling results, and the other seasonal fluctuations, considerable though they be, are probably only such as may be ordinarily expected in a climate so variable as ours ; but they are interesting as showing that the species were not all implicated in the same seasons of depression. The effects of increasing age seem to be pretty clearly indicated also.

FAGUS SYLVATICA.

AGGREGATE GIRTH-INCREASE IN FOUR BEECHES FOR TWENTY YEARS.

First Decade, ...	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Increase, ...	0	2·85	1·95	2·75	3·35	2·90	3·45	2·85	3·10	2·60
Second Decade, ...	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Increase, ...	2·25	2·35	2·35	2·30	2·80	2·50	2·75	2·05	2·65	2·25

These four Beeches girthed, in round numbers, five and a half, six and a half, seven, and seven and a half feet in 1897, and showed no outward sign of diminished vigour. The Table shows, however, that they never quite regained the standard of 3·60 in 1878, the year preceding the three severe seasons, although twice, in 1882 and 1884, they very nearly did so. Their minimum, 1·95, occurred in the second bad season, and severe as the fall may seem, it was less than in any of the other deciduous species. The rally to 2·75 in 1881 and to 3·35 in 1882 was so complete that evidently no permanent injury had been done, and the subsequent gradual though fluctuating

* "The Influence of the Unfavourable Season of 1879 on the Growth of Trees." By Sir R. Christison, Bart., Tr. Bot. Soc. Ed., 1880.

"The Growth of Wood in 1880." By Sir R. Christison. *Op. cit.*, 1881.

"The Depression in Girth Increase of Trees in 1879, 1880, 1881." Dr. D. Christison. *Op. cit.*, 1888-89, p.

decrease in girth-increase is probably due to increasing age. In the second decade the maximum, 2·80, compares unfavourably with the 3·60 before the bad years, and 3·45 after them, of the first decade. The range in the first decade, 1·95 to 3·60, is great owing to the severe winters; in the second it is remarkably small, 2·05 to 2·80. That the Beeches were subject to minor depressions, in common with other species, in 1883, 1885, 1887, and 1895 is evident, but I have not been able to inquire into their causes.

QUERCUS CERRIS.

AGGREGATE GIRTH-INCREASE IN TWO TURKEY OAKS FOR EIGHTEEN YEARS.

	1878.	1879.	1880.	1881.	1882.	1883.	1884	1885.	1886.	1887.
First Decade, ...	..	..	1·05	1·85	1·55	1·45	1·55	1·50	1·45	1·45
	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Second Decade, ...	1·20	·75	1·35	1·10	1·40	1·50	1·30	1·05	1·50	1·15

Unfortunately these Turkey Oaks only came under observation in the third year of the first decade, but the decided rally from 1·05 in that year to 1·85 in the next indicates that they shared in the general depression of the time. It is somewhat remarkable that they never again approached the standard of 1881 nearer than 1·55. The only other startling event in their career was the great fall in 1889 to the minimum, ·75, due apparently to some cause specially affecting the species, as few others showed any sign of depression then. On the whole, there has been a falling off in the amount of girth-increase with time, but not to a marked degree.

The range was 1·05 to 1·85 in the first decade, and ·75 to 1·50 in the second.

QUERCUS CONFERTA.

AGGREGATE GIRTH-INCREASE OF THREE HUNGARY OAKS FOR FOURTEEN YEARS.

1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
..	..	3·60	5·15	5·25	5·40	5·05	4·8	4·65	5 30
1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
3·65	4·50	5·05	4·05	5·15	6·00	..	..	..	..

The Hungary Oaks only came under observation in the same year as their Turkish cousins, but, like them, a rise from 3·60 in 1880 to 5·15 in 1881 indicates a marked depression during the severe winters of 1879 and 1880. They then went on steadily till 1888, a year of pretty general depression, when they descended nearly to the level of 1880. Another severe fall, to 4·05, occurred in the generally unfavourable year of 1891, but an immediate recovery took place, and in 1893 they reached their maximum of 6·00. A severe pruning, to promote upward growth, has been successful in that object, but has reduced their girth-increase to a mere trifle for six years. Previously it is plain that, on the whole, their girth-increase had been increasing, due probably to their being adolescents and not adults.

The range in the first decade was from 3·60 to 5·40, and in the second from 3·65 to 6·00.

AGGREGATE INCREASE IN GIRTH FOR TWENTY YEARS OF NINE OTHER SPECIES OF INFERIOR OR DECLINING VIGOUR.

FIRST DECADE.

	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Tilia europœa (2)	1·20	·55	·15	·90	·95	·55	·70	·65	·50	·40
Castanea vesca	1·10	·90	·85	1·10	·90	1·00	1·00	·85	1·00	·75
Liriodendron tulipifera ..	1·00	·40	·30	·65	·60	·45	·65	·55	·70	·65
Acer Pseudoplatanus ..	·50	·20	·15	·30	·40	·45	·55	·40	·35	·20
Œsculus Hippocastanum	·75	·50	·35	·70	·10	·30	·20	·05	·20	·20
Carpinus Betula	·40	·35	·10	·55	·5 0	·45	·55	·40	·30	·50
Quercus rubra	·50	·40	·30	·50	·40	·40	·45	·55	·45	·55
Juglans regia	·50	·40	·00	·00	·10	·10	·15	·00	·15	·15
Betula alba	·25	·05	·05	·10	·10	00	·10	·00	·10	·00
Total	6·20	3·75	2·25	4·80	4·15	3·70	4·35	3·45	3·80	3·40

SECOND DECADE.

	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Tilia europœa	·30	·65	·95	·40	·65	1·05	·80	·10	·70	·35
Castanea vesca	·60	·75	1·00	·60	·90	·90	·40	·80	·45	·8
Liriodendron tulipifera ..	·35	·40	·80	·50	·65	·40	·75	·35	·40	·25
Acer Pseudoplatanus ..	·20	·20	·30	·10	·35	·25	·15	·15	·35	·15
Œsculus Hippocastanum	·35	·10	·05	·00	·25	·10	·25	·25	·30	·00
Carpinus Betula	·25	·40	·45	·30	·45	·55	·35	·30	·50	·25
Quercus rubra	·40	·30	·50	·35	·45	·40	·55	·40	·35	·25
Juglans regia	·05	·00	·15	·00	·30	·25	·25	·15	·15	·10
Betula alba	·05	·00	·20	·05	·05	·10	·10	·05	·15	·00
Total	2·55	2·75	4·45	2·30	4·05	4·00	3·60	2·55	3·35	2·20

The progressive though fluctuating degeneracy in this group is very marked. From the standard of 6·20 in 1878 the fall in 1880, the second severe season, was to 2·25, and the rally in 1881 was only to 4·80, an amount which they never again quite reached. Their average for the last five years was little above 3·00, or one-half the standard of 1878. It is probable, therefore,

that the severe seasons of 1879 and 1880 produced, besides an immediate severe depression, a permanent effect, by accelerating, or it may be in some cases inducing, the falling off in girth increase to be looked for in trees either beyond their prime or in weak health ; and this took place in the majority without any apparent degeneracy in the foliage. In the two Limes and the Sycamore it has always been fine, and the same may be said, in a somewhat less degree, of the Spanish Chestnut, Tulip Tree, and Hornbeam. The conduct of the Horse Chestnut was peculiar. It probably rallied completely in 1881 from the previous severe seasons, but in 1882 fell a victim to some disease that withered the foliage early in summer of nearly all the Sycamores near Edinburgh, and, although subsequently the foliage was always healthy and dense, the girth-increase for fifteen years has been very slight, and in some seasons there has been none at all. Permanent injury to girth-increase, if it existed at all, is least traceable in the Hornbeam and American Oak. In the Walnut and Birch the degeneracy both in appearance and girth-increase is distinct.

E. Variety in the Incidence of Years of Depression on the Different Species.

This is perhaps most simply shown by the following statement:—Of the nine species in twenty years, 4 were affected in 1879, 8 in 1880, 1 each in 1881, 1882, and 1883, 2 in 1885, 2 in 1887, 3 in 1888 and 1889, 5 in 1891, 2 in 1894, 4 in 1895, 1 in 1896, and 8 in 1897.

F. Capacity of Girth-increase as shown in Favourable Years.

To show the growth accomplished by trees of the different species under favourable circumstances I have drawn up Table VII. From this it appears that *Salix* stands, in a most marked degree, at the head with an average increase of practically three inches, and a maximum increase in a single year of four inches, the average girth being nineteen inches. In the four best consecutive years it grew fully a foot in all. No other tree comes up to this, but *Quercus conferta* comes next with an average for five consecutive years of above an inch and three-quarters, and *Ulmus montana* is third, with a little below that amount, the

TABLE VII.—Average Annual Increase in Girth in the five best consecutive years (Column A), and in the best single year (B), in Trees of different species at different sizes ; (C) gives the Girth at the middle of the five years' period.

No.	Species.	Average for five best consecutive years.	Best Single Record.	Girth in inches.
		A	B	C
	Under one foot in girth.			
19	Salix sp.	1·68	2·40	6
22	Prunus Padus	1·34	1·45	11
9	Populus fastigiata	1·24	1·35	11
61	Quercus rubra	1·18	1·50	9
80	Œsculus Hippocastanum ..	1·17	1·35	10
14	Robinia Pseudacacia ..	1·00	1·40	9
79	Pyrus Aucuparia	·95	1·10	10
23	Fraxinus excelsior	·91	1·15	10
21	Cytisus Laburnum	·90	1·05	11
67	Acer Pseudoplatanus ..	·86	1·05	9
88	Alnus glutinosa	·80	1·20	11
86	Carpinus Betulus	·78	1·00	9
16	Quercus Ilex	·68	·85	7
15	Quercus Cerris . ..	·67	·70	8
6	Ulmus campestris . ..	·60	·75	11
	One to two feet in girth.			
19	Salix sp.	2·97	4·00	19
55	Quercus conferta	1·71	1·80	19
93	Ulmus montana	1·62	1·80	16
74	Acer Pseudoplatanus ..	1·47	1·55	16
20	Fagus sylvatica	1·45	1·70	19
22	Prunus Padus	1·26	1·55	15
3	Tilia europœa	1·24	1·45	17
78	Betula alba	1·23	1·45	15
4	Œsculus Hippocastanum ..	1·21	1·40	15
2	Fraxinus excelsior	1·21	1·30	16
	One to two feet in girth —*continued*.			
12	Acer campestris	1·20	1·60	16
19	Cratægus Oxyacantha ..	1·17	1·65	14
70	Quercus robur	1·01	1·20	13
69	Tilia europœa	·83	1·00	13
8	Pyrus communis	·80	·95	13
79	Pyrus Aucuparia	·80	·95	15
	Two to four feet in girth.			
54	Quercus conferta	1·87	2·30	40
93	Ulmus montana	1·69	2·05	27
40	Quercus conferta	1·46	1·80	47
16	Cratægus Oxyacantha ..	·58	·65	41
45	Quercus Ilex	·56	·70	45
41	Carpinus Betulus	·49	·55	47
	From four to six feet in girth.			
63	Quercus Cerris	·70	·85	65
41	Carpinus Betulus	·43	·55	51
	From six to seven feet in girth.			
7	Fagus sylvatica	1·15	1·20	77
7	The same tree	1·00	1·20	84
4	Castanea vesca	·97	1·10	73
4	The same tree	·83	1·00	83
6	Liriodendron tulipifera ..	·63	·80	84
2	Tilia europœa	·39	·65	76
2	The same tree	·35	·40	80

respective best single years yielding 2·30 and 2·05. Their average girths were forty and twenty-seven inches.

It would be tedious to speak of all the trees in detail ; suffice

it to say that the following thirteen additional species attained an annual average of an inch to an inch and a half in their best consecutive five years :—*Acer Pseudoplatanus*, *Fagus sylvatica*, *Prunus Padus*, *Populus fastigiata*, *Tilia europœa*, *Betula alba*, *Œsculus Hippocastanum*, *Fraxinus excelsior*, *Acer campestris*, *Quercus rubra*, *Cratægus Oxyacantha*, *Quercus robur*, *Robinia Pseudacacia*. These are arranged in order, *Acer Pseudoplatanus* at the head with an average of all but an inch and a half, and *Robinia* at the foot with exactly one inch ; but it must be remembered that the comparison is not quite fair, as the ages of the trees were very different.

Species that appear to thrive in the Garden but yield comparatively low rates are *Carpinus Betulus*, *Pyrus communis*, *Pyrus Aucuparia*, and *Quercus Cerris*.

II. MONTHLY RESULTS.

The trees adopted at various periods for monthly measurements were selected from those observed annually, and the reasons for choosing and abandoning successive sets, already given in the Introduction, apply with even greater force now than in the First Part of our subject.

Monthly measurements were commenced tentatively by Sir Robert Christison in 1880 upon five deciduous and six evergreen trees, but the tape he used was too coarse to yield very reliable results. In 1882 I added about thirty-five deciduous examples, and took monthly measurements of the whole, in the growing season, till 1887. The early results, down to 1882, were included in a Paper to the Royal Society of Edinburgh in 1883,* and the whole results were communicated to the Botanical Society in 1887.†

But the objections, already explained, to observations upon old and large trees induced me to abandon this set in 1887 and take up the fresh set ‡ of about thirty-five young trees, used

* "Observations on the Annual and Monthly Growth of Wood in Deciduous and Evergreen Trees." By the late Sir Robert Christison, Bart., and Dr. Christison. Trans. Royal Society of Edinburgh, 1883, pp. 45, 66.

† "On the Monthly Increase in the Girth of Trees at the R. Botanic Garden and at Craigiehall, near Edinburgh," by David Christison, M.D. Trans. Bot. Soc. Ed., 1887.

‡ "Observations on the Increase in Girth of Young Trees in the Royal Botanic Garden, Edinburgh, for five years ending 1891," by David Christison, M.D., President. Trans. Bot. Soc. Ed., 1892.

also for annual observations, selecting as far as possible such as had smooth bark and regularly cylindrical stems. These having become ineligible as a connected set in 1892—although some of them became available afterwards, as they recovered at various dates from transplantation—were replaced by the final young set of twenty trees, available from 1892 to 1895, but then disabled for my purpose by a severe pruning.

The plan followed in dealing with the monthly observations is to give *in extenso* the results for the set of 1892–95, not hitherto published, to compare these with the results yielded by the other young set of 1887–91, and to make use of the original set of older trees, 1882–87, only incidentally.

In considering the records of 1892-95, I shall first try to give the aggregate results, and then describe the conduct of each species separately, inquiring at the same time how far the results may agree with those obtained from other young trees observed in 1887-91, in so far as the same species happen to have been examined in both these periods.

In the first place, however, it is well to state that neither the number of trees of each species, nor the length of time during which they have been under observation, is sufficient to warrant the deduction of precise conclusions or definite laws. At first sight, indeed, it might seem that three specimens of a species, of similar ages, growing in the same locality, and under observation, two of them from 1887 to 1891, and the other from 1892 to 1895, should yield true averages, but that this is not so is proved by the occasional quite contradictory conduct of a tree in one year as compared with the other three or four years, or what is still more striking, by the contradictory conduct of one tree during the whole four or five years of observation, when compared with the other two trees. Neither is it always easy to account for this erratic conduct, although among probable reasons may be suggested—temporary unhealthiness, not, it may be, betrayed by the appearance of the tree; individuality of character, as when we see two trees of the same species, and equally vigorous, of which one invariably comes into leaf much earlier than the other; difference of age, which, even when slight, has, I suspect, considerable influence in early youth; difference of position, which even within narrow limits may place trees under very

different conditions of soil, exposure, etc.; unsuitability of the species to the climate or soil; the complicated effects of weather affecting species or individual trees in different ways. But notwithstanding all this, the results in some species agree quite as remarkably as in others they disagree, and while greater confidence must be placed in the former, some idea may be formed, on a careful consideration, of the general tendencies in the latter also.

A. Aggregate Results.

A. For the Months Separately.

The chief points to which attention will be directed under this head are—the aggregate increase in girth of the twenty trees due to each month in succession in each year and over the whole period; the proportion or percentage of seasonal increase due to each month in each year and on the average; the species that yield the largest and smallest proportions of seasonal increase in each month; and the largest individual scores or records in a single year that may have happened in any species in each month.

APRIL.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	0·15	1·15	1·30	0·50	0·77
Percentage of seasonal increase, ...	0·6	4·7	6·0	2·4	3·4
Number with no increase, ...	17	7	3	11	9·5

The average annual increase for April amounts to only three-quarters of an inch, somewhat less than for September, at the other end of the season, and, as might be expected from our variable springs, the range, ·15 to 1·30 in amount and 0·6 to 6·0 in percentage, is very great.

The number of trees that yielded no increase in April in one or more seasons was large, the annual average default being about one half of the whole, but the proportion of the default varied as much in the different years as from 3 to 17.

Species with the Largest Proportional Increase in April.	1892.	1893.	1894.	1895.	Total.	Aver-age.	Seasonal p.c.
Quercus robur, ...	...	10	10	5	·25	·06	9·4
,, Cerris, ...	...	10	5	5	·20	·05	7·3
Fraxinus excelsior, ...	5	10	10	10	·35	·09	7·2
Betula alba, ...	...	15	15	5	·35	·09	5·4
Robinia Pseudacacia, ...	5	5	5	...	·15	·04	5·2
Quercus rubra, ...	...	10	10	5	·25	·06	5·0
Species with the Smallest Proportional Increase.							
Œsculus Hippocastanum, ...	...	...	...	...	...	...	...
Tilia europœa, ...	...	...	5	...	5	·01	1·0
Populus fastigiata, ...	...	...	5	...	5	·01	1·0
Acer Pseudoplatanus, ...	...	...	5	...	5	·01	1·2
Fagus sylvatica, ...	...	...	5	...	5	·01	1·2

Large individual scores were scarcely to be expected. *Salix* alone reached a quarter of an inch once, and did not exceed it, and ·15, the next best score, was only recorded three times, once in *Salix* and twice in *Betula*.

MAY.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	2·75	4·70	2·55	2·95	2·24
Percentage of seasonal increase, ...	11·3	19·0	11·8	14·3	14·1

The average annual increase is two inches and a quarter, or about three times greater than in April, and the range, though not so excessive as in that month, is still high. A total absence of increase was only recorded twice, but in sixty-two of the eighty observations the amount did not reach a quarter of an inch, and in thirteen it was only ·05.

SPECIES WITH THE LARGEST PROPORTIONAL INCREASE IN MAY.	1892.	1893.	1894.	1895.	Total.	Average.	Seasonal p.c.
Betula alba, ...	·30	·50	·35	·25	1·40	·35	21·7
Fraxinus excelsior, ...	·20	·30	·20	·25	·95	·24	19·5
Prunus Padus, ...	·25	·50	·30	·25	1·30	·32	18·0
Salix sp., ...	·35	·45	·30	·50	1·60	·40	14·5
SPECIES WITH THE SMALLEST PROPORTIONAL INCREASE.							
Robinia Pseudacacia, ...	5	5	5	10	·25	·06	9·6
Cratægus Oxyacantha, ...	10	15	5	10	·40	·10	10·2
Ulmus campestris, ...	5	10	5	5	·25	·06	10·4

Several species besides those in the Table showed a *capacity* for May growth by having an occasional good score. *Acer Pseudoplatanus* once had ·35, *Fagus* and *Tilia* 30, and *Pyrus communis* 25. *Betula*, *Prunus*, and *Salix* alone reached half an inch, once each, and none of them exceeded it.

JUNE.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	8·05	7·05	5·80	5·80	6·67
Percentage of seasonal increase, ...	33·4	28·5	26·7	28·0	29·1

The average annual increase for June is six inches and three-quarters, or three times that of May, and the range is considerably less than in that month. There was no record so low as ·05, and only three of ·10. Of the eighty records, fifty-three were above a quarter of an inch, and of these seventeen were half an inch or more.

Species with the Largest Proportional Increase in June.	1892.	1893.	1894.	1895.	Total.	Aver-ge.	Seasonal p.c.
Acer Pseudoplatanus, ...	·55	·50	·50	·15	1·70	·42	40·3
Tilia europœa, ...	·65	·55	·50	·25	1·95	·49	39·4
Fraxinus excelsior, ...	·55	·45	·40	·45	1·85	·46	38·1
Species with the Smallest Proportional Increase.							
Robinia Pseudacacia, ...	·10	·15	·10	·25	·60	·15	15·9
Salix sp., ...	·80	·60	·40	·95	2·75	·69	20·0

In June growth becomes well established, and the annual variations are much less than in the earlier months. The differences in the proportional increase of the species appear to be mainly due to normal differences in the distribution of girth-increase over the growing season in the different species. For example, the increase is much more evenly spread over the months in *Salix* than in *Acer*, so that the proportion of increase due to June is much less in the former. The highest single score was very nearly one inch in 1895 by *Salix*.

JULY.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	7·60	6·65	7·15	5·35	6·69
Percentage of seasonal increase, ...	31·5	27·0	33·0	26·0	29·4

The average annual increase is six inches and three-quarters, or the same as in June, and the range is similarly moderate. The records fall as low as ·10 five times, and of these two were ·05, all in 1895, when, as appears from the Table, there was a great general depression in July.

SPECIES WITH THE LARGEST PROPORTIONAL INCREASE IN JULY.	1892.	1893.	1894.	1895.	Total.	Average.	Seasonal p.c.
Populus fastigiata, ...	·55	·50	·40	·40	1·85	·48	37·5
Cytisus Laburnum, ...	·25	·15	·35	·10	·85	·21	34·2
Pyrus Aucuparia, ...	·15	·25	·30	·20	·90	·22	34·0
Tilia europœa, ...	·40	·45	·45	·30	1·60	·40	32·4
Œsculus Hippocastanum, ...	·45	·40	·40	·30	1·55	·39	32·0
SPECIES WITH THE SMALLEST PROPORTIONAL INCREASE.							
Betula alba, ...	·40	·40	·40	·30	1·50	·37	23·3
Robinia Pseudacacia, ...	·25	·35	·20	·15	·95	·24	24·6
Salix sp., ...	·65	·65	·70	·85	2·85	·71	25·0

In July the variation in the comparative seasonal percentage of the species attains a decided minimum, being only from 23·3 to 37·5, whereas in June, the next steadiest month, it is 15·9 to 40·3. In July, in no less than eight species the seasonal p.c. lies between 30 and 32.

Half an inch or upwards was attained in all four years by *Salix* and *Prunus*, in two years by *Populus*, and in one year by *Fagus*, *Quercus rubra*, and *Acer campestris*. The highest single score was ·85 by *Salix*. Forty-seven other records are between a quarter and half an inch, so that only twenty of the eighty records fell below a quarter of an inch.

AUGUST.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	4·90	4·35	3·80	4·20	4·31
Percentage of seasonal increase, ...	20·3	17·6	17·5	20·3	18·9

The annual average increase is four inches and a half, about two-thirds that of June or July and double that of May, and the

range is small. There was no increase on three occasions, and it fell to ·05 ten times, and to ·10 twelve times.

Species with the Largest Proportional Increase in August.	1892.	1893.	1894.	1895.	Total.	Average.	Seasonal p.c.
Robinia Pseudacacia, ...	20	25	25	45	1·15	·39	34·2
Quercus rubra,...	No ob.	25	30	50	1·05	·35	26·3
Salix sp., ...	45	75	75	95	2·90	·72	25·8
Populus fastigiata, ...	30	25	35	30	1·20	·30	24·0
Species with the Smallest Proportional Increase.							
Fraxinus excelsior, ...	15	...	5	10	·30	·07	6·2
Acer Pseudoplatanus, ...	5	20	10	5	·50	-12	9·7
Tilia europœa, ...	15	10	5	20	·40	·10	10·1
Quercus robur,...	15	10	5	...	·30	·07	11·7

The variation in the seasonal proportion of the species in August, 6·2 to 34·2, is very great compared with June or July, and even exceeds that of May. An increase of half an inch is only attained four times, of which *Salix* claims three, *Quercus rubra* being the other successful candidate. There were twenty-eight records between a quarter and half an inch, The maximum record, ·95, or nearly an inch, was by *Salix*.

SEPTEMBER.

Aggregate Results, 20 Trees.	1892.	1893.	1894.	1895.	Average.
Total increase, ...	·70	·80	1·10	1·85	1·11
Percentage of seasonal increase, ...	2·9	3·2	5·0	9·0	5·
Number with no increase, ...	10	9	6	8	8·2

The average annual increase of September, the last month of the growing season, is a little more than an inch, only a quarter

of an inch above that of April, the first month of the season, and only a fourth that of August. The range is greatly less than in April, but much greater than in May. The number of records of no increase amounted to nearly one-half of the whole, and was not much less than in April.

SPECIES WITH THE LARGEST PROPORTIONAL INCREASE IN SEPTEMBER.

	1892.	1893.	1894.	1895.	Total.	Average.	Seasonal p.c.
Salix sp., ...	20	15	25	70	1·30	·32	10·7
Robinia Pseudacacia, ...	...	10	15	30	·55	·14	10·5
Fagus sylvatica, ...	...	10	5	15	·30	·07	6·9
Betula alba, ...	5	10	5	15	·35	·09	5·4

SPECIES WITH THE SMALLEST PROPORTIONAL INCREASE.

Quercus robur,...	...	...	...	...	...	...	...	...
„ rubra,...	...	...	...	...	...	...	...	...
Fraxinus excelsior, ...	...	...	...	...	...	...	...	...
Populus fastigiata, ...	5	...	...	...	5	·01	1·0	
Pyrus Aucuparia, ...	...	...	5	...	5	·01	1·5	

Salix alone reaches half an inch, and that only once, but with the phenomenal score of ·70. *Robinia* follows with ·30, which is perhaps still more remarkable, as its total annual increase is only about a third of that of *Salix*. No other species scored higher than ·15.

B. FOR THE MONTHS IN GROUPS.

1. *Two periods of three months each.*—As stated in my previous paper, the division of the growing season into two periods of three months each, although the only practicable one with observations at monthly intervals, does not imply that the periods of actual growth are equal in the two divisions. Unquestionably there is a great variety both in the normal beginning and normal ending of seasonal girth-increase in the different species, but

as the beginnings and endings are very gradual it would be perhaps impossible to define their precise limits by girth measurements. On the whole, however, a division into a first half-season consisting of April, May, and June, and a second comprising July, August, and September, besides being very convenient, is probably fair enough.

It appears from the little Table annexed that in three of the years 1892 to 1895 the half-seasonal results were remarkably uniform, being nearly as 45 to 55 in favour of the second half, but that in 1893 the proportion was slightly in favour of the first half, thus reducing the four years' averages to 47, 53, in round numbers.

	1st Half Season.	2nd Half Season.
1892, ...	45·3	54·7
1893, ...	52·2	47·8
1894, ...	44·5	55·5
1895, ...	44·7	55·3
Average, ...	46·7	53·3

The young trees observed in 1887–91 yielded a somewhat greater superiority for the second half-season, the figures being 44, 56. This is no great difference, but when a comparison is made with the adult and aged trees of 1882–87 the superiority of the second half in them is much more marked, the figures being 35, 65, proportions which are very little affected, as I find, by limiting the comparison to the species which are represented in both sets of trees. Thus, the result arrived at in 1891—that adult and old trees have a greater tendency than young ones to throw their main girth-increase into the second half-season—is amply confirmed by the more recent observations.

The variation or range of the half-seasons would have been almost *nil* but for the exceptional year 1893; even with it the figures are only 44 to 52 for the first half and 48 to 55 for the second, in round numbers.

2. *Three periods of two months each.*—Dividing the growing season into equal first, middle, and last periods, it comes out that the girth-increase in the first was less than in the last on the average, though not in the year 1893, but that both, as a matter of course, were much below the middle, in which nearly three-fifths of the whole seasonal increase took place, whereas the first period claimed only a sixth and the last one quarter of the whole.

	First.	Middle.	Last.
1892, ...	11·9	64·9	23·2
1893, ...	23·7	55·5	20·8
1894, ...	17·8	59·7	22·5
1895, ...	16·7	54·0	29·3
Average, ...	17·5	58·5	24·0

The annual variation or range was much greater in the first period than in the others, being in the proportion of two to one, whereas in the last it was as three to two, and in the middle period as six to five. The excessive variation of the first period is no doubt due to the great irregularity in the arrival of spring in our climate. In the two midsummer months growth is well established, and therefore is much steadier. In the two autumn months the girth-increase begins to die away, and therefore again becomes more irregular, but probably it is less affected by climatic variations than in the spring months, and hence its range is less.

3. *Six periods of one month each.*—The Table of monthly percentages shows that the first and second months are exceeded by the last and second last months respectively, but only on an

Percentage of Monthly Girth Increase in Twenty Young Deciduous Trees for Four Years, 1892-1895.

	April.	May.	June.	July.	August.	Sept.
1892, - -	0·6	11·3	33·4	31·5	20·3	2·9
1893, - -	4·7	19·0	28·5	27·0	17·6	3·2
1894, - -	6·0	11·8	26·7	33·0	17·5	5·0
1895, - -	2·4	14·3	28·0	26·0	20·3	9·0
Average,	3·4	14·1	29·2	29·4	18·9	5·0
AVERAGE OF THIRTY YOUNG DECIDUOUS TREES FOR FIVE YEARS, 1887-1891.						
	1·5	12	31	30	20·5	5·0

average, as in the four years April twice exceeded September, and May once exceeded August. The proportions of June and July are almost identical, and of course greatly exceed those of the other months, even August. When compared with the trees of 1887–91 as shown in the Table there is a close correspondence, the only great difference being in the April proportion, the month in which disproportion is almost inevitable. Stated roundly, April claims $\frac{1}{30}$ of the annual girth-increase, May $\frac{1}{8}$, June and July not far from $\frac{1}{3}$ each, August $\frac{1}{5}$, and September $\frac{1}{20}$.

As to the variation or range in the months, it is, as might be expected, extreme in April, the amount of increase being nearly twelve times greater in the best year than in the worst, whereas even in September the best is only three times greater than the worst. May follows next in the ratio of less than two to one, while in June, July, and August the variation is comparatively trifling.

4. *Order of precedence of the months in the amount of girth-increase.*—The sequence in the case of the young trees of 1892-95 is as follows:—July 23·4 p.c., June 29·2, August 18·9, May 14·1, September 5, April 3·4. This differs but little from the results in the thirty young trees of 1887–91, for, although the positions of June and July are reversed, the difference between the two months in both sets of observations is very trifling. The sequence and proportions for 1887–91 are:—June 31, July 30, August 20·5, May 12, September 5, April 1·5.

B. Results in the Species Individually.

In treating the Second Part of this Division of my subject, a tabular view of the results, followed by remarks, is given for each species. Each Table is constructed so as to show, first, the amount and p.c. for each month and for the half-seasons in the single tree of the set 1892-95. The corresponding p.c. for the other sets are then given. The last column gives the girth of the trees at the end of the observations upon them. The remarks that follow bear chiefly upon the proportions of the half-seasonal increase, and of the monthly increase. Finally, the highest record for each month is given, to show the capacity of growth of each species in each month under the most favourable circumstances.

The detailed records for the sets of 1884-87 and 1888-91, formerly published, could not be reproduced here without unduly swelling the bulk of this Paper, but many quotations from them occur in the text.

No. 20.—Fagus sylvatica.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at the end of the Observations.
1893.	...	30	50	45	35	10	80	90	...
1894.	5	15	50	40	25	5	70	70	...
1895.	...	10	35	30	30	15	45	75	...
Total,	5	55	135	115	90	30	195	235	17
P.C. -	1·2	13·0	31·3	26·7	20·9	6·9	45·5	54·5	...
Two Young Beeches, 1888-91.									
P.C. -	0·5	8·0	32	34	23	2·5	40·5	59·5	13, 15
Four Adults, 1884-87.									
P.C. -	4·1	8·2	25·6	31·4	24·8	5·9	37·9	62·1	64, 70, 80, 81
Five Adult and Aged (Craigiehall), 1884-87.									
P.C. -	1·7	10·3	27·6	38·3	18·1	4·0	39·6	60·4	138, 121, 101, 78, 66

The half-yearly results in No. 20 show a sufficiently well marked preponderance of the second half, although it is less evident than in the other groups given in the Table, whether of young or old trees.

The monthly amounts and proportions indicate that the species is rather late in beginning to grow, and that the increase is comparatively small in the first two months. The four adults of 1884-87, indeed, have a fair proportion in April, but in May it is correspondingly small. In No. 20 June yields the highest increase, but it is not much above July. In the other sets it is the reverse, but the superiority of July is well marked only in the old trees. The united percentage of June and July is 58 in No. 20; 66, 57, and 66 in the other sets. On the whole the species continued to increase in girth well on to the end of the season.

The highest records in each month of No. 20 were 5 in April, 30 in May, 50 in June, 45 in July, 35 in August, and 15 in September. Taking in the three sets of older observation published in my former Papers, the figures are but little raised except in July. The highest there are April 15, May 30, June 55, July 60, August 40, and September 15.

[QUERCUS ROBUR.

No. 10.—QUERCUS ROBUR.

Year.	Apr.	May.	June	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at end of Observations.
1892.	...	15	30	30	15	...	45	45	...
1893.	10	15	20	20	10	...	45	30	...
1894.	10	10	20	20	5	...	40	25	...
1895.	5	10	15	5	0	...	30	5	...
Total,	25	50	85	75	30	...	160	105	13
P.C. -	9·4	18·8	32·1	28	11·7	...	60·3	39·7	...
FOUR YOUNG OAKS, 1887-91.									
P.C. -	1·5	15·5	17·5	40	21	4·5	34·5	65·5	11, 10, 8, 8
OLD OAK (CRAIGIEHALL), 1884-87.									
P.C. -	7	24	7	41	21	...	38	62	80

The results for the half-seasons in No. 10 are completely at variance with those for the other four young trees and for the old oak at Craigiehall. The incidence of the half-seasonal growths is greatly in favour of the first half in No. 10, and as much in favour of the second half in the others. No. 10, also, in place of agreeing with the young trees in having a very small April growth and a substantial September growth, corresponds with the old tree in having a large April proportion and no increase in September at all.

The difference may be partly explained by the manifestly increasing and abnormal deficit in No. 10 in the second half-season, which in the fourth year fell almost to zero. The uniformity in the records of the other four young trees tends to prove that their results are normal on the whole. Of the eighteen observations thirteen yield a great preponderance in the second half; in two the half-seasons are equal; and the three in which the first preponderates all happened in one year, and appear therefore to be due to a special failure, analogous to that of No. 10,

although in the latter the failure continued from season to season.

On the whole, therefore, it seems probable that the normal conduct of the very young British Oak is to throw its growth mainly into the second half of the season.

None of the Oaks yield remarkably large individual scores. The highest records in young and old are—April, 10; May, 30; June, 30; July, 40; August, 40; September, 10. So that there is not a single instance in any month of half an inch increase.

No. 15.—Quercus Cerris.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at end of Observations.
1892.	...	10	25	25	15	...	35	40	...
1893.	10	10	25	15	10	...	45	25	...
1894.	5	5	10	30	5	5	20	40	...
1895.	5	10	15	20	15	5	30	40	...
1896.	5	30	10	20	5	...	45	25	...
1897.	5	10	15	20	15	...	30	35	...
Total,	30	75	100	130	65	10	205	205	...
P.C. -	7·3	18·3	24·4	31·7	15·8	2·5	50	50	10
Two Well-Grown Trees, 1884-87, 1887-91.									
P.C. -	2	24	14	34	20	6	40	60	63, 43

Although the half-season growths are exactly equal in No 15 on an average, they vary exceedingly from year to year; sometimes the first half greatly predominates, but in other years it is the reverse. This is probably due to youth, as in the two well-grown trees, one of which was at Craigiehall, the predominance of the second half-season is quite pronounced in every record.

The discrepancies between the young No. 15 and the two well-grown trees are not so great as between the young No. 10

and the other examples of *Quercus robur*, but they are great enough. They appear to be chiefly due to an almost invariable and remarkable deficiency in June in the older trees, whereby the amount is actually much less than in May. But for this strange anomaly the half-seasons would be about equal, as in No. 15. Another difference is that the percentage of April is greater, and of September less, in the young tree than in the older ones.

The highest individual records, including the three trees, were 10 in April, 20 in May, 25 in June, 30 in July, 30 in August, and 15 in April.

NO. 18.—QUERCUS RUBRA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1890.	...	10	20	40	15	5	30	60	...
1891.	...	10	15	45	25	5	25	75	...
1892.	...	10	30	50	25	...	40	75	...
1893.	10	20	45	45	30	...	75	75	...
1894.	10	15	25	35	50	...	50	85	...
Total,	20	65	135	215	145	10	220	370	11
P.C. -	3·4	11·0	22·8	36·5	24·6	1·7	37·2	62·8	...

The half-season results show a great preponderance in favour of the last, and this happened in every year of the five but one, when they were equal. The April proportion is small, but if the observations had been confined to the first three years it would have been nil, showing the necessity of a large number of years to give a fair average in the weak months of April and September, in which last month the percentage is even less. The proportion for August is high, higher than for June, and July is decidedly the best month. The record of 50 in August 1894 is very remarkable. It is very large for that month in any tree, and is the maximum of its year.

The highest individual records for each month were—for April 10, May 20, June 45, July 50, August 50, September 5.

THE GENUS QUERCUS.

Five species of *Quercus*, comprising ten young and four adult trees, have been under observation at various periods, two of which — *Q. conferta* and *Q. Ilex*—have been dealt with in my Paper of 1892. Taking the whole, the following have showed a decided preference for the second half-season :—

Quercus robur—four young trees	35	65
,, ,, —one adult tree	38	62
,, conferta—three young trees	39	61
,, Cerris—two adult trees	40	60
,, rubra—one young tree	37	63
,, Ilex—one young tree	25	75

On the other hand, of an apparently exceptional character were—

Quercus Cerris—one very young tree...	50	50
,, robur—one young tree, 1892-95	60	40

In the first of these the result may be due to extreme youth, and we have already given reasons why the results in the second may be abnormal.

Q. conferta is the most reliable species, as the three trees were vigorous, quick growers, and behaved with great uniformity. In it, therefore, the superiority of the second half-season is well made out, and this is the more remarkable as its April growth was steadier and larger than in any other kind of Oak or any other species under observation. In the other species of Oaks, indeed, the April increase was very small.

Apparently exceptional points in the genus are the low rate of June-increase in a large proportion of the trees, but most marked in the two adult examples of *Q. Cerris* and the old Craigie-hall tree, and the large percentage of August-increase in *Q.*

rubra. As to the first point, the following remarks occur in a previous Paper :—*

"I have made a separate study of this genus, as there seems to be a tendency in it to early vigour, followed by a period of slower growth. This is seen most unequivocally in the three Turkey Oaks, in all of which the June percentage is much exceeded by that of May on the one side and July on the other,

No.		April.	May.	June.	July.
63	Q. Cerris .	...	28	17	31
43	,, .	2	20	11	37
10*	,, .	3	22	6·5	35
	Average .	1·5	23	11·5	34

* At Craigiehall.

No.		April.	May.	June.	July.
40	Q. conferta .	8	6·5	20	35·5
54	,, .	9	9	29·5	34
55	,, .	9	13	22·5	34
	Average	8·7	9·5	26	34·5

No.		April.	May.	June.	July.
72	Q. robur .	2	20·5	22·5	39
12	,, .	7	24	7	41
2	,, .	...	20·5	13	43·5
70	,, .	2·5	12·5	16	38
1	,, .	...	11	18	42
	Average .	2·3	17·7	15·8	40·7

44	Q. palustris	10	18	16	41
61	Q. rubra .	2	15	20	39

the general average of the three for from four to five years being 23 for May, 11·5, or exactly half, for June, and 34 for July. In the three Hungary Oaks, the most vigorous growers in early spring of all my deciduous trees, the same tendency is shown, but at an earlier stage and in a considerably less degree, the general proportions being 8·7 for May and 9·5 for June. The general average of the five British Oaks is 17·7 for May and 15·3 for June, in strong contrast with the proportions for thirty trees in mass, which are 12 for May and 31 for June. In *Q. palustris*, not a reliable specimen, however, June is slightly below May. In *Q. rubra* there is no actual inferiority, yet the tendency to it is probably shown by its May increase being one-third above that of the general average of trees, and the June increase one-third below it.

* Trans. and Proc. Bot. Soc., Ed., March 1892, p. 314.

NO. 4.—ŒSCULUS HIPPOCASTANUM.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	45	45	35	...	55	80	...
1893.	...	20	45	40	30	5	65	75	...
1894.	...	20	20	40	15	10	40	65	...
1895.	...	10	30	30	30	5	40	65	...
Total,	...	60	1·40	1·55	1·10	20	200	285	...
P.C. -	...	12·3	29·0	32·0	22·7	4·0	41·3	58·7	18
TWO YOUNG TREES, 1887-91.									
P.C. -	...	9·0	31·0	34·5	22	3·5	40	60	11, 13.

No. 4 is in agreement with the two trees of the earlier period, not only in the general particulars, but in details and degree. The second half-season predominates, there is no increase in April and little in September, July is the best month, and the percentage for August is high. The best individual records in the three trees are 20 in May, 50 in June, 45 in July, 35 in August, and 10 in September.

NO. 16.—ACER PSEUDOPLATANUS.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	55	35	5	5	65	45	...
1893.	...	35	50	30	20	5	85	55	...
1894.	5	5	50	45	10	5	60	60	...
Total,*	5	50	155	110	35	15	210	160	...
P.C. -	1·3	13·5	41·9	30	9·4	3·9	56·7	43·3	16
THREE YOUNG TREES, 1887-91.									
P.C. -	0·5	13	42·5	30	13	1	56	44	15, 14, 8

* I have omitted 1895, as in that year the increase suddenly fell off to less than half an inch, indicative of some abnormal condltion.

The correspondence between the single tree of the recent period and the three earlier ones is even more marked than in the last species (Horse Chestnut). Indeed, it is almost precise in every particular, with the trifling exception that the increase is more equally diffused over August and September in No. 16 than in the others. There is an appreciable though not excessive preponderance of the first half-season, due to the unusually large proportion of 42 per cent. of the increase being in June. 72 per cent. of the increase takes place in the two months June and July. The Sycamore is the first among forest trees to be in full foliage in the Edinburgh district, yet the girth-increase is slow to start, and is slight in May. It makes amends, however, by rushing on quickly in June. The best single records per month are 5 in April, 35 in May, 60 in June, 50 in July, 35 in August, and 5 in September.

No. 12.—Acer campestris.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	5	20	35	55	45	5	60	105	...
1893.	10	20	30	35	30	5	60	70	...
1894.	5	10	40	35	10	5	55	50	...
1895.	...	...	20	10	5	...	20	15	...
1896.	...	15	30	40	15	...	45	55	...
1897.	...	10	25	25	30	...	35	55	...
Total,	20	75	180	200	135	15	275	350	...
P.C. -	3·2	12	28·8	32	21·6	2·4	44	56	19

The conduct of No. 12 has been most erratic. Starting in 1892 with the very large increase of 1·65, of which three-fifths were due to the last half-season, it fell off, in that half only, the next two years, till in the third the first half was slightly in excess. In the fourth year the foliage looked very sickly and some twigs

died, the increase falling to 35. In the next two years the tree revived, the increase rising to about an inch annually, still far below 1892, but with the second half-season again in excess. It seems probable, therefore, that this is the rule. The highest single records were—April 10, May 20, June 40, July 55, August 45, September 5.

I have been able to give seven years' results, as this tree was only very slightly pruned in 1896. It is the only one of the species that I have observed.

NO. 2.—FRAXINUS EXCELSIOR.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	5	20	55	35	15	...	80	50	...
1893.	10	30	45	25	...	..	85	25	...
1894.	10	20	40	45	5	...	70	50	...
1895.	10	25	45	35	10	...	80	45	...
Total,	35	95	185	140	30	...	315	170	...
P.C. -	7·2	19·5	38·1	29	6·2	...	64·8	35·2	17
TWO YOUNG ASHES, 1887-91.									
P.C. -	2	23·8	43·5	21·2	8·5	1	69·3	30·7	8, 10

The single Ash, No. 2, agrees in the main with the two younger trees of 1887-91. In both the second half-season is greatly inferior to the first, and June is by far the best month. The chief difference is the greater April growth of No. 2, but taking April and May together the proportions are almost identical.

No. 2 furnishes all the highest single scores, 10 in April, 30 in May, 55 in June, 45 in July, 15 in August, the annual increase having been much greater than in the other two, which were comparatively in their infancy.

No. 3.—Tilia europœa.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	65	40	15	5	75	60	...
1893.	...	30	55	45	10	5	85	60	...
1894.	5	15	50	45	5	5	70	55	...
1895.	...	10	25	30	20	5	35	55	...
Total,	5	65	195	160	50	20	265	230	...
P.C. -	1·0	13·1	39·4	32·4	10·1	4·0	53·5	46·5	19
Two Young Limes, 1887-91.									
P.C. -	...	13·5	53·5	24·5	5·5	3	67·	33·	10, 10
One Adult Lime, 1884-91.									
P.C. -	...	3	32·5	55	6·5	3	35·5	64·5	46

The results in the three sets are very contradictory in the months of June and July. The two young trees of 1887–91 raised more than half their annual increase in June, whereas the adult of 1884–91 performed the same feat in July. In No. 3 July was inferior to June, but not so remarkably as in the other two young trees. The result of all this is that the young trees agree in throwing the largest share of their growth into the first half-season, but in No. 3 the excess is slight, while in the others it is very great. On the other hand, the second half-season is greatly in excess in the adult tree. The latter, however, although healthy in appearance, grew at the rate of only about a quarter of an inch annually, so that the results are untrustworthy. The two young Limes were also slow growers, and it is probable that No. 3 gives the most reliable results. They all agree in the smallness of the increase in the first and last two months. 72 per cent. of the annual increase took place in June and July in No. 3, 77 per cent. in the other two young trees,

and 87 per cent. in the adult. The highest single records all took place in No. 2, and were 5 in April, 30 in May, 65 in June, 45 in July, 20 in August, and 5 in September.

ULMUS MONTANA.

No Wych Elm was under monthly observation in 1892–95, but I give the results in two thriving specimens for 1888–91 :—

NO. 93, 94.—ULMUS MONTANA.

No.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
93.	10	105	200	180	150	35	315	365	19·55
94.	15	85	205	135	95	30	305	260	16·35
Total,	25	195	405	315	245	65	620	625	...
PERCENTAGE.									
93.	1·5	15	30	26·5	22	5	46·5	53·5	...
94.	2·5	15	36·5	24	17	5	54	46	...
	2	15	32·5	25·5	20	5	49·5	50·5	...

The general result is that the two half-seasons are nearly equal. But taking details, No. 93, the more vigorous grower, although 94 is little inferior to it, has a slight preference for the second half-season, while 94 has a somewhat greater preference for the first half. The difference is somewhat greater than it would otherwise have been owing to the peculiar results in 1888, when the increase in the two trees was nearly equal in the first half, while in the second half that of 93 was just double that of 94.

June was decidedly the best month in both ; the proportions of May and August were fair, but those of April and September rather insignificant.

The highest individual records were 5 in April, 30 in May, 65 in June, 50 in July, 50 in August, and 15 in September.

ULMUS CAMPESTRIS.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	5	25	20	25	...	30	45	...
1893.	5	10	20	25	...	...	35	25	...
1894.	5	5	15	15	5	10	25	30	...
1895.	...	5	20	10	10	5	25	25	...
Total,	10	25	80	70	40	15	115	125	...
P.C. -	4·2	10·4	33·3	29·2	16·6	6·3	47·9	52·1	12

This species does not attain perfection in Scotland, as is indicated by the low rate of increase, only from half to three-quarters of an inch annually in this specimen. The half-seasons are nearly equal, and June is the best month, but in no month is there a better single record than a quarter of an inch.

SALIX SP.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	35	80	65	45	20	115	130	...
1893.	15	45	60	65	75	15	120	155	...
1894.	25	30	40	70	75	25	95	170	...
1895.	5	50	95	85	95	70	150	250	..
1896.	25	55	55	75	65	25	135	165	...
1897.	...	35	15	70	90	30	50	190	...
Total,	70	250	345	430	445	185	665	1060	...
P.C. -	4·0	14·5	20	25	25·8	10·7	38·5	61·5	23
THE SAME TREE WHEN YOUNGER, 1888-91.									
P.C. -	1·0	13·5	22·5	26·5	26·5	10	37	63	8

Although only one Willow was under observation, the results are probably among the most reliable of all, from the large increments all through the nine years. The tree also has been steadily under observation for the long period of nine years, which enables a comparison to be made between three years of infancy and six of youth, observations having been begun when it was a mere wand, an inch and a half in girth, and continued till it measured two feet. It will be seen from the Table that there is scarcely any difference in the monthly percentages between the earlier and later stage, a larger proportion for April in the later stage being alone noticeable. The second half-season preponderates in the large proportion of above three to two. No single month has the mastery, July and August being equal, and June not much behind them. September is unusually high, and thus the increase is more equably distributed over the growing season than in any other species.

Very high individual scores are numerous. Three times, once in June and twice in August, the tree nearly accomplished a score of an inch, but perhaps the record of nearly three-quarters of an inch in September of 1895 is more remarkable. The highest records for each month are:—April, 25; May, 55; June, 95; July, 85; August, 95; September, 70.

NO. 9.—POPULUS FASTIGIATA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	25	55	30	5	35	90	...
1893.	...	15	45	50	25	...	60	75	...
1894.	5	10	15	40	35	...	30	75	...
1895.	...	15	45	40	30	...	60	70	...
Total,	5	50	130	185	120	5	185	370	...
P.C. -	1·0	10·1	26·4	37·5	24	1·0	37·5	62·5	14
TWO YOUNG TREES, 1887-91.									
P.C. -	1	8	20·5	34·5	33	3	29·5	70·5	14, 12

There is a substantial agreement in the main facts between No. 9 and the two of the earlier period, all of much the same age. The main increase is thrown into the second half-season very decidedly in No. 9, but still more so in the others, and July is the best month, but only to a trifling degree above August in the latter. Indeed, the percentage of 33 in August with them is almost unprecedentedly high; *Robinia* alone slightly exceeds it, and no other species comes near it.

The best individual records are April 5, May 20, June 55, July 65, August 50, September 10.

NO. 7.—ALNUS GLUTINOSA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	30	20	20	5	40	45	...
1893.	5	15	15	30	15	...	35	45	...
1894.	...	...	15	25	20	...	15	45	...
1895.	5	15	15	20	15	...	35	35	...
Total,	10	40	75	95	70	5	125	170	...
P.C.	3·4	13·5	25·3	32·2	24·0	1·6	42·2	57·8	11
ONE YOUNG TREE, 1887-91.									
P.C.	1	11	38	33	16	1	50	50	14

This species is not satisfactorily made out. No. 7 gives a decided superiority to the second half-season, while the half-seasons are equal in the other tree. Both, but particularly the latter, were erratic in their conduct, and it is not safe to draw any conclusions as to the monthly distribution of the species.

The highest records were April 5, May 20, June 45, July 40 August 25, September 5.

NO. 17.—BETULA ALBA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	30	50	40	45	5	80	90	...
1893.	15	50	35	40	30	10	100	80	...
1894.	15	35	40	40	25	5	90	70	...
1895.	5	25	30	30	30	15	60	75	...
Total,	35	140	155	150	130	35	330	315	...
P.C.	5·4	21·7	24·0	23·3	20·2	5·4	51·1	48·9	20
TWO YOUNG TREES, 1887-91.									
P.C.	1·5	15	32·5	27·5	19	4·5	49	51	25, 14

No. 17 agrees closely with the other two in the half-season proportions, which are nearly equal. The chief difference in details is that the increase of the first half-season was more equably distributed in No. 17 than the others. The former was much quicker in growth, so that all the highest scores occur in its records. They are April 15, May 50, June 50, July 40, August 45, September 15.

A much larger Birch, at Craigiehall, five feet in girth, and growing at the rate of half an inch yearly, gave quite different and altogether anomalous results. During the six years' observations it had no increase whatever in April and May, the only instance in any tree of any kind I ever met with. Consequently the proportion of the first half-season, confined to the single month of June, was only 27 p.c. With all this the tree seemed quite healthy.

NO. 11.—CRATÆGUS OXYACANTHA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	35	30	20	5	45	55	...
1893.	5	15	35	25	25	5	55	55	...
1894.	5	5	30	25	15	5	40	45	...
1895.	...	10	30	30	15	15	40	60	...
Total,	10	40	130	110	75	30	180	215	...
P.C.	2·5	10·0	33·0	27·9	19·0	7·6	45·5	54·5	14
ONE YOUNG TREE, 1887-91.									
P.C.	4·5	9·5	28	22	24·5	11·5	42	58	15

The two agree in giving a slight or moderate predominance to the second half-season and in the monthly details, except that the distribution is more equable in the earlier example, in which the increase is remarkably large at the end of the growing season, the amount for August being greater than in July, and that for September almost unprecedentedly high.

The highest scores are April 15, May 15, June 40, July 35 August 45, September 25.

NO. 1.—CYTISUS LABURNUM.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	20	25	30	...	30	55	...
1893.	...	10	20	15	10	...	30	25	...
1894.	5	5	20	35	10	5	30	50	...
1895.	...	10	20	10	5	...	30	15	...
Total,	5	35	80	85	55	5	120	145	...
P.C.	1·9	13·2	30·2	32·0	20·8	1·9	45·3	54·7	11
A YOUNG TREE, 1887-91.									
P.C.	7	14·5	24·5	25·5	20	8·5	46	54	9

The half-yearly results in No. 1 in its two years of greatest increase are much in favour of the second period, but the reverse is true of the two less prosperous years, the general result being still in favour of the second period. These results are confirmed by the other tree in every particular. The erratic conduct in both has been too great to establish a law. The only marked difference in the two trees is the more general distribution of the increase in the earlier tree, the percentage for April and September being unusually high.

The highest individual scores are April 10, May 15, June 35, July 35, August 30, September 10.

PYRUS AUCUPARIA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	5	35	30	15	...	40	45	...
1893.	5	20	35	25	5	...	60	30	...
1894.	5	5	20	30	10	5	30	45	...
1895.	...	10	15	20	15	...	25	35	...
Total,.	10	40	105	105	45	5	155	155	...
P.C.	3·1	12·9	34	34	14·5	1·5	50	50	14
TWO YOUNG TREES.									
P.C.	1·5	5·5	29·3	37	20	6·7	36·3	63·7	15, 9

The conduct of all three trees was erratic, except the quickest grower of the two earlier ones, which always threw the mass of its growth into the second half-season, the percentages being 28 and 72. The highest individual scores were—April, 5; May, 20; June, 35; July, 45; August, 30; September, 10.

PYRUS COMMUNIS.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	...	10	40	15	20	10	50	45	...
1893.	...	25	20	25	15	5	45	45	...
1894.	...	10	20	25	10	...	30	35	...
1895.	5	5	25	20	5	10	35	35	...
	5	50	105	85	50	25	160	160	14
	1·6	15·6	32·8	26·9	15·6	7·5	50	50	...

The rate of increase seems low, but I have no other specimen for comparison, and, as it has steadily decreased annually, the tree may not be in a normal condition. As it stands, the half-seasons are exactly equal. June is the best month, and the September proportion is above average. The best single scores are—April, 5; May, 25; June, 40; July, 25; August, 20; September, 10.

NO. 5.—PRUNUS PADUS.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	5	25	60	65	40	5	90	110	...
1893.	10	50	40	50	35	5	100	90	...
1894.	5	30	50	50	20	5	85	75	...
1895.	5	25	50	55	30	5	80	90	...
Total,	25	130	200	220	125	20	355	365	...
P.C. -	3·5	18·0	27·8	30·6	17·4	2·7	49·3	50·7	20
ONE YOUNG TREE, 1887-91.									
P.C. -	2	8	36	32	18	4	46	54	13

The half-season proportions agree fairly well in these two trees, in giving a slight preference to the second. In the general distribution they differ in the higher percentage of No. 5 in the beginning of the season, and in its preferring July, while the other chooses June. No. 5 was much the more vigorous of the two, having the high average annual increase of an inch and three-quarters. The highest scores are all from it, except for September. They are—April, 10; May, 50; June, 60; July 65; August, 40; September, 15.

NO. 14.—ROBINIA PSEUDACACIA.

Year.	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.	Girth in Inches at last Observation.
1892.	5	5	10	20	20	...	20	40	...
1893.	5	5	15	15	25	10	25	50	...
1894.	5	5	10	25	25	15	20	65	...
1895.	...	20	25	35	45	30	45	110	...
1896.	10	15	15	30	30	...	40	60	...
1897.	5	5	15	15	50	5	25	70	...
Total,	30	55	90	140	195	60	175	395	...
P.C. -	5·2	9·6	15·9	24·6	34·2	10·5	30·7	69·3	12

The most remarkable fact about this stranger from a warmer clime is the general distribution over the six months, combined with a great excess of energy in the last half of the season. In one year the increase for September was no less than ·30; its percentage for that month, 10·5, is high; and as to August, it takes the premier place among the months with 34·2 per cent., and it is the only month with an individual score of half an inch.

I have no other tree of the species to compare it with, but another foreigner—a much older tree, however—has a similar but even more extreme record. This is *Liriodendron tulipiferum*, a handsome specimen, nearly seven feet in girth in 1887, when its four years' record closed. I give the monthly proportions for the two trees :—

	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.
Robinia Pseudacacia ...	5·2	9·6	15·9	24·6	34·2	10·5	30·7	69·3
Liriodendron tulipiferum	2	4	4	34	43	13	10	90

C. General Conclusions from the Monthly History of the Species.

In considering some of the conclusions that may be drawn from the history of the species, it is necessary to adopt three categories according to the degree of reliability in the results obtained in the different species. The first includes the species of the period 1891–94 (in which only one example of each was observed) that yielded results in conformity with those obtained from one or more trees of their own species under observation in 1887–91. The second comprises the species in which the results for the two periods are at variance, or are otherwise invalidated. The third contains the species of which only one tree has been under observation.

The chief points to which attention will be directed are the comparative tendency in the different species to early or late increase in girth during the growing season, and the comparatively wide or limited distribution of the girth-increase over the growing season in the different species.

1. Species in which the resnlts for 1892-95 and for 1887-91 are in substantial agreement.

In this category the results are naturally the most reliable, and may be held to establish fairly well the characteristics of the species included, in regard to the points under consideration.

(a.) **The comparative tendencies of the species towards early or late increase in girth during the season of growth** are shown in the Table which gives the percentage of girth-increase due to each month in the trees of 1887–91 and of 1892–95 combined, the arrangement being in the order of greatest tendency to increase in the latter half of the season.

[TABLE.

	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.
Populus fastigiata, ...	1	9	23·5	36	28·5	2	33·5	66·5
Quercus conferta, ...	9	9·5	20·5	34·5	23	3·5	39	61
Œsculus Hippocastanum,	0	11	30	33	22	4	41	59
Fagus sylvatica,... ...	1	10·5	31·5	30·5	22	4·5	43	57
Cratægus Oxyacantha, ...	3·5	9·5	30·5	25	22	9·5	43·5	56·5
Prunus Padus, ...	3	13	32	31	18	3	48	52
Betula alba, ...	3·5	18	28	25·5	20	5	49·5	50·5
Ulmus montana, ...	2	15	32·5	25·5	20	5	49·5	50·5
Fraxinus excelsior, ...	4·5	22·5	40·5	25	7	0·5	67·5	32·5

On referring back to the history of the species, where the averages for both periods, 1892-95 and 1887-91, are given, it will be seen that in *Œsculus*, *Acer*, and *Betula* these averages are almost identical as regards the half-seasons, and that in general there is a close approximation even in the monthly averages. In *Fagus*, *Fraxinus*, *Populus*, *Cratægus*, and *Prunus* the differences in the two periods are greater, but it is only a question of degree, the general tendencies being similar. *Quercus conferta* is included, although no example was under observation in either of the above periods, because the three trees of 1884-87 yielded such large and steady results, all in harmony with each other, that the laws of girth-increase are probably as well established in it as in any other species. The specimen of *Ulmus montana* observed in the last period proved an utter failure, but as the two of 1887-91 were very fine trees, I give the average as being probably reliable enough, although there were some considerable disagreements in details.

The general result is that in *Populus*, *Quercus*, and *Œsculus* the difference in favour of the second half-season is large; in *Fagus* and *Cratægus* it is comparatively small; in *Ulmus*, *Prunus*, and *Betula* there is an equality, or nearly so; and in *Fraxinus* the advantage is largely on the side of the first half-season. Taking the extremes, the proportions are as 2 to 1 in favour of the second half-season in *Populus*, and the same in favour of the first half-season in *Fraxinus*.

(b.) The distribution of the girth-increase over the growing season shows considerable variety in the Table, but it is difficult to indicate it systematically. One way is to set the three best consecutive months against the other three. The three best are June, July, and August, except in *Fraxinus*, which prefers May, June, and July. The percentages then are as follows :—

	Three Best Consecutive Months.	The Other Three Months.
Populus fastigiata, ...	88 p.c.	12 p.c.
Fraxinus excelsior, ...	88	12
Œsculus Hippocastanum, ...	85	15
Fagus sylvatica,...	84	16
Prunus Padus, ...	81	19
Quercus conferta, ...	78	22
Ulmus montana, ...	78	22
Cratægus Oxyacantha, ...	77·5	22·5
Betula alba, ...	73·5	26·5

But this chiefly shows that certain species accomplish a considerably greater part of their increase in the three chief months than others, and therefore have presumably a less general spread over the whole period, and the comparative wideness of the spread is better seen if we take the percentages in each species due to the months of April and September united, or at the beginning and end of the season. The order is thus :—*Cratægus* 13 per cent., *Quercus* 12·5, *Betula* 8·5, *Ulmus* 7, *Prunus* 6, *Fagus* 5·5, *Fraxinus* 5, *Œsculus* 4, *Populus* 3. The result is but slightly to change the order as obtained by the first process, and to show that on the whole the seasonal distribution is widest in *Cratægus*, *Quercus conferta*, and *Betula*, and is most limited in *Fraxinus*, *Œsculus*, and *Populus*. A further examination proves that the limitation to a comparatively small increase is at both ends of the season in *Populus*, at the beginning of the season in *Œsculus* and *Fagus*, and at its end in *Fraxinus*.

To put the case in another way, it may be said in a rough way that increase in girth was going on with comparative vigour for five months in *Quercus conferta* and *Cratægus*, for four months in *Fagus*, *Œsculus*, *Prunus*, *Ulmus*, and *Betula*, and for only three in *Populus*, *Acer*, and *Fraxinus*.

(c.) **Progress of girth-increase from month to month.**—Usually there is a progressive rise from the minimum in April to a maximum either in June or July, from which the fall to September is also progressive. Sometimes the actual minimum is in September instead of April. The only exception to this progressive rise and fall is in *Quercus conferta*, in which the percentages for April and May are equal, and the observation is quite reliable, as the amounts are substantial and consistent throughout. Of course it results from what has gone before that the rise and fall are quicker or more abrupt in some species than in others.

(d.) **Highest and lowest average percentages in each month, and the species to which they were due.**—The highest for April was 9 per cent. of the annual increase in *Quercus conferta*; for May, 22·5 in *Fraxinus*; June, 42 in *Acer*; July, 36 in *Populus*; August, 28·5 in *Populus*; September, 9·5 in *Cratægus*. The lowest for April was 0·0 in *Acer*; for May, 9 or 9·5 in *Quercus conferta*, *Populus*, and *Cratægus*; June, 23·5 in *Populus*; July, 25 or 25·5 in *Fraxinus*, *Betula*, and *Cratægus*; August, 7 in *Fraxinus*; September, 0·5 in *Fraxinus*.

2. Species in which the results for 1892-95 are at variance with those for 1887-91, or which are otherwise untrustworthy.

The reasons for regarding as more or less questionable the results in this class have been already given in the history of the five species which it includes, and need not be repeated.

(a.) Comparative tendencies towards early or late increase in girth.—Taking the results for what they are worth, the first five species in the Table seem to have a decided preference for the last half of the season, while the sixth is in favour of the first half.

	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.
Quercus robur, ...	1·5	15·5	17·5	40	21	4·5	34·5	65·5
Carpinus Betulus, ...	2	8	29·5	27·5	26	7	39·5	60·5
Pyrus Aucuparia, ...	2	9·5	31·5	35·5	17·5	4	43	57
Alnus glutinosa,... ...	2	12·5	32	32·5	20	1	46·5	53·5
Cytisus Laburnum, ...	5	14	27	28·5	20·5	5	46	54
Tilia europœa, ...	1	13	46·5	28·5	8	3	60·5	39·5

With regard to *Quercus robur*, for the reasons given in its history I have rejected the tree of 1891–95 and adopted the average of the four young Oaks of 1887–91, as being much more likely to be truly representative. As the defaulter has been transplanted to properly prepared ground, it will be interesting to see whether it will now fall into line with the others.* The erratic conduct of the representatives of *Pyrus*, *Alnus*, and *Cytisus* defies explanation, and there was nothing for it but to take their combined averages for both periods. In *Tilia* the difference is rather of degree than kind, but is so extreme as to shut it out from the reliable list. It is probable enough, however, that the united average, which I have given, is fairly representative. *Carpinus* was not observed in 1892–95, but the two young trees of 1887–91 did not agree well, and were in total disagreement with an old tree.

(b.) **The distribution of the girth-increase over the growing season** seems to be most extended and equable in *Cytisus Laburnum*, and confined within the narrowest limits in *Tilia europæa*, in which three-fourths of the whole took place in two months.

(c.) **Progress of girth-increase from month to month.** — In none of these species, except *Quercus robur*—and that in a less degree—was there a check in the rise and fall such as was noticed in *Quercus conferta* of the previous set. In three of them the movement was of an average kind, but in *Quercus robur* a very marked rise in July, and in *Tilia* a still more marked rise in June, were noticeable.

(d.) **Highest and lowest scores in each month.**—The highest for April was 5 p.c. of the annual increase in *Cytisus*; May, 15·5 in *Quercus*; June, 46·5 in *Tilia*; July, 40 in *Quercus*; August, 21 in *Quercus*; September, 7 in *Carpinus*. The lowest for April was 1 in *Tilia*; May, 9·5 in *Pyrus*; June, 17·5 in *Quercus*; July, 28·5 in *Cytisus* and *Tilia*; August, 8 in *Tilia*; September, 1 in *Alnus*.

3. Species in which only one young tree has been under observation.

As we have no means of checking the results in these species

* October 1899. I find that it has done so in this the first available year since transplantation, the increase having been ·35 in the first half-season, and ·70 in the second.

by comparison, all that can be done is to give the results in the same tabular form as in the other two classes, and although there is a considerable variety in their reliability it does not seem to be practicable to divide them into categories in that respect, and it will be sufficient to point out the species which appear to be most worthy of confidence, as we go along.

	Apr.	May.	June.	July.	Aug.	Sept.	1st Half Season.	2nd Half Season.
Robinia Pseudacacia, ...	5	9·5	16	25	34	10·5	30·5	69·5
Quercus rubra, ...	3·5	11	22·5	36·5	25	1·5	37	63
Salix sp., ...	2·5	14	21	26	26·5	10	37·5	62·5
Acer campestris, ...	3	12	29	32	21·5	2·5	44	56
Ulmus campestris, ...	4	10·5	33·5	29	17	6	48	52
Quercus Cerris, ...	7·5	18	24·5	31·5	16	2·5	50	50
Pyrus communis, ...	1·5	15·5	33	27	15·5	7·5	50	50

The *Robinia*, always in good condition, growing consistently, and under observation for six years, may be considered reliable for so very young a tree. It threw no less than 70 p.c. of its increase into the latter half of the growing season, surpassing in this proportion all my other trees, save *Liriodendron tulipiferum*, another native of sunnier climes, in which the proportion rose to 90 p.c., but which does not appear in the Table, as it is an old tree.

If results in any single tree may be relied on as representative of its species, our *Salix* may make the claim, owing to its large increments and the regularity and consistency of its conduct during the long period of nine years.

Quercus rubra and Q. Cerris are not quite so favourably situated, as although they are fine, healthy trees, growing at good rates, they were somewhat erratic in conduct, due perhaps to extreme youth. *Q. Cerris* also disagrees with the two adult and very fine trees that were under observation in the earlier period.

Ulmus campestris and *Acer campestris* are species that can scarcely be said to thrive in Scotland, and the example of *Pyrus*

communis is under suspicion in regard to health, as its increase diminished year by year in place of increasing as it ought to have done in so young a tree; but taking the first year, when the increase was all but an inch, the distribution in the half-seasons was nearly the same as in the total period of four years.

As to the distribution in the four most reliable species, it may be pointed out that it is well spread over the season in all of them. Even in *Robinia*, which shows such a decided preference for the end of the season, the increase began in April in five years out of six. In *Salix* the spread is more equable over five months than in any other species under my observation, and although the proportion for April, the remaining month, is small, it is quite appreciable.

The highest records for the months are—for April, 7·5 in *Quercus Cerris*; for May, 18 in *Q. Cerris*; for June, 33·5 and 33 in *Ulmus* and *Pyrus*; for July, 36·5 in *Q. rubra*; for August, 34 in *Robinia*; and for September, 10·5 and 10 in *Robinia* and *Salix*. The lowest—in April, 1·5 in *Pyrus*; May, 9·5 in *Robinia*; June, 16 in *Robinia*; July, 25 in *Robinia*; August, 15·5 and 16 in *Pyrus* and *Q. Cerris*; September, 1·5 in *Q. rubra*.

D. Bi-Monthly percentage of Increase in the Single Trees of Twenty Species, 1891-95.

The last form in which I show the comparative proportions of the monthly increase in girth of the different species is in bi-monthly periods for the twenty single trees of the set 1891–95, Table VIII. As previously explained, some of these trees are less reliable than others, but I give the whole for what they are worth. A few of the chief results may be pointed out.

In the first, or April-May period, a proportion of 20 p.c. and upwards, or one-fifth of the seasonal growth, was attained by five species, while in nine species it was below 15 p.c. The highest proportion was in *Quercus robur*, 28 p.c., and the lowest in *Populus fastigiata*, 12 p.c.

In the middle, or June-July period, eleven, or a little above the half of the species, attained a proportion of above 60 p.c. of the seasonal growth, and in three the proportion was below 50 p.c. The highest proportion was 72 p.c. in *Acer Pseudoplatanus*, and the lowest, 40 p.c., in *Robinia Pseudacacia*.

In the last, or August-September period, nine species, or nearly one-half, attained a proportion of 25 p.c., or one-fourth of the seasonal growth, and in four it was under 15 p.c. The highest proportion was 45 p.c. in *Robinia*, and the lowest 6 p.c., in *Fraxinus excelsior*.

TABLE VIII.

BI-MONTHLY P.C. OF GIRTH-INCREASE IN SINGLE TREES OF TWENTY SPECIES, 1891-95, ARRANGED IN THE ORDER OF AMOUNT.

	First Two Months.		Middle Two Months.		Last Two Months.
Quercus robur -	28·2	Acer Pseudop. -	71·9	Robinia - - -	45·0
Betula alba - -	27·1	Tilia - - -	71·8	Salix - - -	36·5
Fraxinus excelsior -	26·7	Pyrus Auc. - -	68·0	Fagus - - -	27·8
Quercus Cerris -	25·6	Fraxinus - -	67·1	Œsculus - - -	26·7
Prunus Padus -	21·5	Populus - - -	63·9	Cratægus - -	26·6
Salix sp. - -	18·5	Ulmus - - -	62·5	Quercus rubra -	26·1
Pyrus communis -	17·2	Cytisus - - -	62·2	Alnus - - -	25·6
Alnus glutinosa -	16·9	Œsculus - - -	61·0	Betula - - -	25·6
Pyrus Aucuparia .	16·0	Cratægus - -	60·9	Populus - - -	25·0
Acer campestris -	15·2	Acer camp. - -	60·8	Acer camp. - -	24·0
Cytisus Laburnum -	15·1	Quercus rob. - -	60·1	Pyrus com. - -	23·1
Robinia Pseud-acacia	14·8	Pyrus com. - -	59·7	Ulmus - - -	22·9
Acer Pseudoplatanus	14·8	Prunus - - -	58·4	Cytisus - - -	22·7
Ulmus campestris -	14·6	Fagus - - -	58·0	Prunus - - -	20·1
Quercus rubra -	14·4	Alnus - - -	57·5	Quercus Cerris -	18·3
Fagus sylvatica -	14.2	Quercus rub. - -	57·3	Pyrus Auc. - -	16·0
Tilia europœa -	14·1	,, Cerris -	56·1	Tilia - - -	14·1
Cratægus Oxy-acantha	12·5	Betula - - -	47·3	Acer Pseudop. -	13·3
Œsculus Hippocas-tanum	12·3	Salix - - -	45·0	Quercus rob. - -	11·7
Populus fastigiata -	11·1	Robinia - - -	40·5	Fraxinus - -	6·2

INDEX.

PAGE.

INTRODUCTION, ... 41
General Explanations, ... 44
I. Annual Results, ... 45-80
A. General History of the Species separately, ... 46-65
B. Annual Rate and Range of Girth-increase in Deciduous Trees at different ages, ... 66-72
I. Trees under 15 inches in girth, ... 69
II. Trees between 15 inches and two feet in girth, ... 70
III. Trees between two and a half and five feet in girth, 71
IV. Trees from about six to seven and a half feet in girth, 71-72
C. Comparison with trees in the neighbourhood of Edinburgh, 72-73
D. Aggregate Annual Results, ... 73-78
E. Variety in the incidence of years of depression in the different species, ... 78
F. Capacity of Girth-increase as shown in favourable years, 78-80
II. Monthly Results, ... 80-119
A. Aggregate Results, ... 82-91
1. For the months separately, ... 82-88
2. For the months in groups, ... 88-91
1. Two periods of three months each, ... 88
2. Three periods of two months each, ... 90
3. Six periods of one month each, ... 90
4. Order of precedence of the months in the amount of girth-increase, ... 91
B. Results in the Species individually, ... 92-111
C. General Conclusions from the Monthly History of the Species, ... 112-118
1. Species in which the results for 1892-95 and for 1887-91 are in substantial agreement, ... 112-115
a. The comparative tendencies towards early or late increase in girth, ... 112
b. The distribution of the girth-increase over the growing season, ... 114
c. Progress of girth-increase from month to month, 115
d. Highest and lowest average percentage in each month, and the species to which they were due, 115
2. Species in which the results for 1892-95 are at variance with those for 1887-91, or which are otherwise untrustworthy, ... 115
a. Comparative tendencies towards early or late increase in girth, ... 115-116
b. The distribution of the girth-increase over the growing season, ... 116
c. Progress of girth-increase from month to month, 116
d. Highest and lowest scores in each month, ... 116
3. Species in which one young tree has been under observation, ... 116-118
D. Bi-monthly percentage of Increase in the Single Trees of Twenty Species, 1891-95, ... 118-119

On the Life-History and Habits of Clerus formicarius, Linn.

BY

R. STEWART MACDOUGALL, M.A., D.Sc.

With Figures 11-14.

THE family Cleridæ consists of soft-skinned beetles, generally gaily coloured (the "bunting" beetles of the Germans), with elongated bodies. The legs have five-jointed tarsi, but to prove this requires, in some cases, very careful observation. In habit both imago and larva are predaceous and carnivorous; where the imagines frequent flowers it is probable that besides taking honey they prey upon insects; indeed, Perris[1] has recorded cases of flower-frequenting Trichodes devouring other flower-haunting insects. The so-called carrion-eaters found amongst old carcases, skins, and bones may frequent these chiefly to prey on the insect fauna (imago and larva) found characteristically in such places.

A note on the habits of some Cleridæ found in Britain may prove interesting, as introductory to the observations made on *Clerus formicarius*.

[Notes, R.B.G., Edin. No. III., 1900.]

TILLUS ELONGATUS.—Its larva has been taken by Perris in the galleries of *Ptilinus pectinicornis*, a beetle destructive to furniture and woodwork by its borings.

TRICHODES APIARIUS.—This handsome red-and-blue beetle lays its eggs in hives, and its larva on hatching passes from cell to cell of the hive, devouring the bee-grubs. The larva of *Trichodes alvearius* has the same habit, but preys on the grubs of the mason-bee.

NECROBIA RUFICOLLIS.—The imago feeds on rotting flesh, and the larva preys upon the dipterous maggots and pupæ likely to be found on such putrefying material. The larvæ of an allied French species, *Necrobia ruficornis*, found by Perris, were preying on *Anobium paniceum*. This *Anobium* is harmful in houses to vegetable matter and to books. Perris got the various stages in a hornet's nest that had stood in his room for several years, and here the *Anobium* was being attacked by *Necrobia ruficornis*.

NECROBIA RUFIPES has been found on carcases and old bones.

CORYNETES CŒRULEUS has been recorded by Sharp[2] as entering houses and performing a useful work in destroying the *Anobium* species that mine into tables and chairs.

Clerus formicarius.

IMAGO.—I quote Fowler's[3] description. Elongate, anterior parts clothed with long pilose hairs, head large, black, coarsely punctured, eyes finely granulate, antennæ black, last joint with apex ferruginous; thorax about as long as broad, red, with anterior portion (which is divided by a broad V-shaped furrow from the posterior portion) black, coarsely punctured, posterior angles rounded; elytra depressed, parallel-sided, black, with the base red, strongly punctured in front, finely behind, with two strong bands of thick white pubescence, one before the middle very irregular, and the other behind the middle; legs black, with tarsi more or less ferruginous.



Fig. 11.
Clerus formicarius.
Imago magnified.
From nature.

Found in England, Scotland, and Ireland.

LARVA.—The larva is rosy red. It has well-marked three-jointed antennæ, and on each side of the head five small simple eyes. The dark head is followed by twelve segments, of which the first three, or thoracic (each of which carries a pair of one-clawed legs), distinguish themselves thus:—The first has a brown chitinous or horny shield almost covering the upper side of the segment; the second and third each show two small chitinous spots or plates, one on each side of the middle line. The last body-segment has also a brown shield, and the body ends in two small cerci or projections.



Fig. 12.
Clerus formicarius.
Larva magnified.
From nature.

PUPA.—The pupa, which is not enclosed in a cocoon, lies in a chamber or cell whose inner walls are lined with a whitish or greyish silvery secretion. The head and body are beset with hairs. The antennæ lie along the ventral surface, concealed in part by the first two pairs of bent legs. The wings reach about half-way down the abdomen, the hinder or lower pair showing slightly below the upper pair, each of which comes to a point. From the end of the abdomen two outwardly-directed spines project.



Fig. 13.
Clerus formicarius.
Pupa magnified.
After Westwood.

LIFE-HISTORY AND HABITS.—Both larva and imago are, from the forester's standpoint, in the highest degree useful. The larva lives below the bark of conifers, such as pine and spruce, feeding upon the larvæ and pupæ and beetles of injurious species that infest these trees—*e.g.*, my last specimens were taken from below the bark of a *Pinus sylvestris* which was infested with *Hylesinus palliatus*.



Fig. 14.
Clerus formicarius.
Pupal bed in bark.
By the courtesy of
Professor Pauly.

The larvæ of *Clerus formicarius* are themselves able to bore into and tunnel the bark. While making observations on this beetle I placed several of the larvæ on the outside of some thick pieces of pine-bark. These soon buried themselves in the bark, and the glass on which the pieces of bark were resting under a bell-jar often showed little heaps of bore-dust from the tunnelling of the *Clerus* larvæ. Doubtless this

power of making galleries in every direction will facilitate their moving about in the search for prey.

The perfect beetle, found in conifer woods running over the bark of standing or felled trees, is also carnivorous, subsisting on destructive bark-boring insects. In the month of July I introduced a live *Clerus* (bred out of one of my pieces of pine-bark) into a glass tube which held four live *Hylesinus palliatus*. This *Hylesinus palliatus* is a small and destructive beetle which makes crutch-shaped galleries below and in the barkof pine and spruce and larch. For a quarter of a minute the *Clerus* ran up and down the inside of the glass, and then pounced upon one of the *Hylesinus*, seizing it in the weak spot in its armour, viz., on the under surface where the head is jointed on to the thorax. I lifted the tube to examine the more closely what would follow, lens in hand, when the *Clerus* started to run up and down the sides of the tube, and though it lost its footing several times and fell to the bottom, never for a moment did it let go its victim, whose antennæ were seen to be quivering nervously. At last, coming to rest, and propping itself on its two hind legs, the *Clerus* held the *Hylesinus* up to its mouth by means of the four front legs—a position also recorded by Ratzeburg.[4] First of all, the head of the victim was bent back and emptied by means of the jaws, and then the hind part of the body gutted in the same way. Finally the elytra were broken off and the wings torn to shreds.

In watching *Clerus* feed at different times, I noticed that the seizure of the prey was always at the same place, viz., between the head and the rest of the body. After a meal the beetle seemed to spend some time in cleaning itself, pulling its front legs through its jaws and the front legs over the antennæ.

Late one evening in July I placed in one tube three live *Hylesinus palliatus* and one *Clerus*, and in another tube seven live *Hylesinus palliatus* and one *Clerus*. Examination next evening showed that all the three *Hylesinus* in the first tube had been devoured, and five out of the seven in the second tube were only represented by scattered fragments of their external parts

No records seem to exist as to the length of life of *Clerus*

larva and imago, or of the time embraced in the pupal stage. In October 1897, on dissecting some pieces of thick bark from a full-grown pine-tree, I found larvæ of *Clerus formicarius*. I placed these pieces of bark under a bell-jar in an unheated room at the Royal Botanic Garden, and allowed them to remain until April 1898, when they were removed to a window in the Laboratory. I obtained imago-issue on the following dates :—

Two on June 29, 1898.
One ,, ,, 30, ,,
,, ,, July 12, ,,
,, ,, ,, 21, ,,

On July 14, 1898, a piece of newly-felled pine-stem was placed in a cotton sack and four of the *lerus* imagos introduced along with a number of live *Hylesinus palliatus*. The sack was allowed to stand out exposed to all weathers. At intervals up to September 30 I made examination and found the Cleridæ alive, and now and again I added fresh *Hylesinus*. On examination the *Clerus* beetles would either be found in hiding, lying close, under a piece of loose bark or a bark-scale, or else running over the log with their characteristic active and eager movement.

On January 3, 1899, I removed the log from its sack, but could find no trace of my *Clerus* beetles. Trusting that they were in winter quarters concealed in the bark crevices, I returned the log to the sack. On opening the sack again on February 25th I noticed a *Clerus* running about. The beetles continued to live till the end of May 1899. On June 3rd, eleven months from their appearance as imagos, I found three of the four lying dead ; the fourth had probably escaped by a hole in the bottom of the sack where the pine-log had worn the cotton through. These four *Clerus* beetles had appeared, after pupation, in June and July 1898.

In July 1899 I bred out another *Clerus* imago, under the following interesting circumstances. On August 24, 1898, I removed two *Clerus* larvæ from below the bark of a pine where they had been since April 15, when the piece of pine came into my possession. One of the two larvæ was placed in a

glass tube temporarily, but when I came to look for it on August 25 I found only bore-dust in the tube; the larva had buried itself in the cork.

The corked tube was then placed under a bell-jar to prevent escape of the *Clerus* larva should it bore right through the cork into the open; the tube was left undisturbed until October 12th.

On the cork being removed from the tube on October 12, the larva could not be seen, as its entrance-hole was plugged up with bore-meal. The cork was carefully cut in two and the larva found lying in the hollowed-out centre. The two parts of the cork were carefully fitted together again without disturbing the larva, and the cork then returned as the stopper of the glass tube.

At various dates up till April 14th, 1899, I looked in, and the *Clerus* still remained in the larval condition. On May 3rd the two pieces of the cork seemed to be sticking together, and a more careful looking showed the silvery whiteness with which characteristically the *Clerus* larva lines the cavity in which pupation takes place. Up till June 3rd there was no pupation, but by the next examination, on June 6th, the larva had pupated. The pupation-stage lasted till July 6th, and by July 7th the perfect insect had made its way out of the cork and was running about in the inside of the bell-jar, more than ten months from the day of the larva having entered the cork.

LITERATURE.

1. Perris. Larves des Coléoptères, 1878, p. 215.
2. Sharp. Insects, Part II., p. 255. The Cambridge Natural History.
3. Fowler. British Coleoptera, Vol. I., p. 262.
4. Ratzeburg. Die Forstinsekten, p. 36.

On the Life-History and Habits of Rhizophagus depressus, Fowler.

BY

R. STEWART MACDOUGALL, M.A., D.Sc.

With Figures 15-17.

In addition to the family Nitulidae to which our beetle belongs, there are several related families which number amongst them species which live below the bark of trees in the galleries made by the bark-boring beetles. The members of these families, so found, prey upon the insect enemies of the trees.

Professor Nitsche[1] mentions the families and some of the useful forestral species which have been noticed by different observers. Following Nitsche, and noting others from the literature, I summarise the families in tabular form, adding the name of the tree and the name of the pest infesting it.

[TABLE

[Notes, R.B.G., Edin. No. III., 1900.]

Family.	Name of Carnivorous Species.	Name of the Enemy of the Tree in whose Tunnels the Carnivorous Beetle was found.	Tree Infested.
Nitidulidæ	Rhizophagus depressus	Hylesinus and Bostrichus species	Various conifers
	Rhizophagus grandis	Hylesinus micans	Spruce
	Rhizophagus dispar	Pissodes piceæ	Silver fir
	Ips ferrugineus		Scots pine
	Ips quadripustulatus		
	Nemosoma elongatum	Hylesinus vittatus	Elm
Trogositidæ		Lymexylon dermestoides	Beech; sometimes birch, alder, ash—rarely silver fir
		Tomicus domesticus	Birch, alder, beech, oak
		Tomicus Saxesenii	Oak, beech, birch, lime, poplar, fruit trees, pine, spruce
		Hylesinus oleæ	Olive
		Tomicus bicolor	Beech; rarely hornbeam and walnut
Colydiidæ	Colydium filiforme and Oxylæmus variolosus	Tomicus monographus	Oak
	Colydium elongatum	Platypus cylindrus	Oak
Cucujidæ	Læmophlœus ferrugineus	Tomicus micrographus	Pine, spruce, silver fir
	Læmophlœus ater	Hylesinus rhododactylus	Spruce
	Læmophlœus clematides	Tomicus bispinus	Clematis vitalba

The widely-distributed family Nitidulidæ includes very diverse forms, and the species also vary in habit. Some are

found in flowers: for example, *Meligethes æneus*, the tiny shining green beetle so abundant in the flower-heads of the Cruciferæ and other plants where the larvæ feed, interfering with the production of seed; others live in putrefying organic matter, and others still, like *Rhizophagus*, are insectivorous.

The genus *Rhizophagus*, which Sharp[2] would refer to the Cucujidæ rather than the Nitulidæ, numbers in Britain some ten species, which live below the bark of trees, where they make war on the Bostrichidæ or bark-beetles.

I quote Fowler's[3] description of the imago, and his translation of Perris'[4] description of the larva, of *R. depressus*.

IMAGO.—Bright rust red, with suture of elytra generally darker; body depressed; head of male large, about as broad as thorax, of female, narrowed, thorax longer than broad, widest in front, thickly and very finely punctured; elytra with very finely punctured striæ, first interstice with a row of widely-separated fine punctures; second interstice widened and irregularly punctured at base. Length, $2\frac{1}{2}$-$3\frac{1}{2}$mm.



Fig. 15. Rhizophagus depressus. Imago magnified. From nature.

LARVA.—Length, 6 mm., rather depressed, and in the form of an elongated oval; head narrower than the prothorax; head and prothorax reddish, the base of the latter being whitish, and all the succeeding segments except the last are reddish for their basal half and whitish for their apical half; the head is long, almost elliptical, with two long impressions; the prothorax longer than the meso- or meta-thorax, and is rounded and narrowed in front; the last segment of the body is entirely ferruginous, and is furnished on its upper surface with two distinct tubercles; this segment behind is divided into two lobes, each of which terminates in three strong teeth, on the under side is a small anal appendage which is used for progression.



Fig. 16. Larva of Rhizophagus depressus. After Perris.



Fig. 17. Rhizophagus depressus. Pupa magnified. From nature.

PUPA.—The pupa is whitish in colour, and the last segment is cleft. There are long silky hairs down the sides and very small spines over the body. Length, 4 to 5 mm.

HABITS AND METAMORPHOSIS.—There is no doubt whatever that *R. depressus* is of great service to the forester in assisting to hold in check the increase of those most troublesome enemies of woods, the bark- and wood-boring Coleoptera. Two years ago I determined the beetle for a forester in charge of extensive woods in Aberdeenshire, and asked him—in connection with certain trap trees which had been felled and allowed to lie here and there in the pine wood as lures for *Hylesinus piniperda*, the pine beetle—to make frequent examination of the trees for *Rhizophagus depressus*. The trap-trees were very successful in attracting for their egg-laying numbers of *Hylesinus piniperda*, and the forester has just written me to say that in such trees where *Rh. depressus* was plentiful nearly one-half of the *Hylesinus* larvæ were destroyed.

I have taken *Rh. depressus*, imago and larva, from under the bark of Pine and Spruce; the imago moving about the borings and the *Rhizophagus* larva (also capable of active movement) lying alongside the larva or pupa of the injurious species; *e.g.*, recently on removal of bark I got two *Rhizophagus* larvæ lying in the bed of, and attached to, a *Hylesinus palliatus* pupa. The head of one of the larvæ was sunk deep in the *H. palliatus* pupa.

In June 1898, under the bark of some pine (*Pinus sylvestris*) branches I found a number of *Hylesinus palliatus* at work, the mother galleries having been partly made. Each *H. palliatus* mother tunnel held two *Rh. depressus* imagines.

In other two cases of grown pine and spruce, the bark in each case infested by *Hylesinus palliatus* and the wood by *Bostrichus lineatus*, I got numbers of *Rhizophagus* larvæ. In October 1898 and February 1899, in the galleries of *Hylesinus piniperda* which held larvæ and pupa and dead beetles, I also found *Rh. depressus* at work.

Again, in February and March 1898, on an Austrian Pine

(*Pinus Austriaca*) infested with a *Bostrichus*, I found *Rh. depressus* larvæ, which, on being placed on the outside of the Pine and watched, entered by the holes the *Bostrichus* had made, and hid there.

In October 1898, on a Scots Pine attacked by a *Bostrichus*, I got in the mother galleries of the latter, *Rhizophagus* larvæ.

On April 15, 1898, there came into my possession a section, measuring a yard, of a well-grown Scots Pine. This was found on examination to contain below the bark hundreds of *Hylesinus palliatus* larvæ. To prevent the beetles, when these had attained maturity, from escaping into the open, the section of stem was placed in a sack made of strong cotton. On July 12th I found on the floor of the sack about one hundred larvæ, which, observed through their later stages, proved to be larvæ of *Rh. depressus*. These larvæ, on being touched, coiled themselves up; on being laid on a piece of paper or glass or board they crawled actively away in all directions. As the number was far in excess of what might have accidentally tumbled out of the bark, the natural conclusion was that they had voluntarily left the pine stem in order to undergo pupation in the ground. To make certain of this—I have since found in the literature that Perris[5] had previously recorded that the *Rhizophagus* larvæ became pupæ in the soil — I covered a large circular transparent glass plate with an inch and a half of soil, and dropped here and there over the surface of the soil fifty larvæ. In one minute all without exception had disappeared into the soil. Into a glass tumbler half-filled with pressed-down soil I also dropped twenty larvæ, and these, too, rapidly buried themselves.

Towards the end of July I found that a larva had pupated; the pupa was lying a little below the surface of the soil against the glass of the tumbler. On some of the soil being emptied from the tumbler, more pupæ were found, and also larvæ as yet unchanged. With the glass plate I also had success, as on holding it overhead and looking through the under surface the tracks of the larvæ, as these had moved along the plate after burying themselves, were plainly seen, and a number of pupæ were found lying on the plate at the bottom of the soil. As August went on these pupæ were noticed to be "browning,"

and later, on removing the soil from above two of them, *Rhizophagus depressus* walked out. On turning over more of the soil other two *Rhizophagus* beetles started to walk away, but on being touched they remained quite motionless, with their legs and antennæ drawn in. Others in the turned-out earth, not quite mature, had their heads and under surface quite red-brown, while their wing covers still remained whitish.

WHEN RHIZOPHAGUS MAY BE FOUND.—Without professing to discuss this question, Perris incidentally records that the adult beetles may be found flying in the evenings in February, and also got below the bark in May and June. He notes also that the larvæ may be got even in January, and the pupa in May and June.

As I have because of its practical importance recorded times of appearance and finding of the different stages of other Coleoptera, I give here in tabular form from my notes the months of the year in which I have taken *Rh. depressus* in any of its stages.

MONTH.	STAGE.
January . .	(Larva. Perris.)
February .	Adult and Larva.
March . .	Larva.
April . .	Larva.
May . .	Larva. (Pupa and Adult. Perris.)
June . .	Larva and Adult. (Pupa. Perris.)
July . .	Larva and Pupa.
August . .	Larva, Pupa, and Adult.
September .	Adult.
October . .	Adult and Larva.
November .	
December .	

In one case the larvæ of February and March were from a Pine log that I had kept under cover in a sack, and it is reasonable to suppose that the larvæ were present at the end of the previous October when I placed the Pine log in the sack.

The fact of the finding of different stages in the life-history

at one and the same time throughout the year seems to emphasise what I have argued strongly for in Papers on other Coleoptera—viz., that the flight-times of adult beetles are not necessarily as brief as the general teaching would make us believe, and that immediate or a comparatively quick-following death is not certainly the "nemesis for reproduction."

LITERATURE.

1. Nitsche. Lehrbuch der Mitteleuropäischen Forstinsektenkunde, Vol. II., p. 292.
2. Sharp. Insects, Part II., p. 232. The Cambridge Natural History.
3. Fowler. British Coleoptera, Vol. II.
4. Perris. Annales de la Societé Entomologique de France, Sér. III. Vol. I., p. 599.
5. Perris, *l.c.*, p. 602.

Enumeration of Visitors

to the Royal Botanic Garden, Edinburgh, during the Years 1889-1900.

On the 1st of April, 1889, the control of the Royal Botanic Garden, Edinburgh, was vested in the Commissioners of Her Majesty's Works, and the Garden, like the Royal Gardens at Kew, became subject to the "Act for the Regulation of the Royal Parks and Gardens, 1872." From the date specified the Garden was opened to the public on Sundays, and was also opened for an extended period on Week-days. The subjoined table shows the number of visitors to the Garden on Sundays and Week-days respectively during the eleven years which have elapsed since the Garden was transferred to the Commissioners of Her Majesty's Works:—

Year.	Total in Year.	Total on Sundays.	Most on Sunday.	Least on Sunday.	Total on Week Days.	Most on Week Day.	Least on Week Day.
*1889	368,219	187,457	13,935	129	180,762	3,834	50
1890	446,540	216,345	11,265	91	230,195	4,032	65
1891	454,083	220,543	9,445	340	233,540	3,228	76
1892	437,205	218,233	13,581	149	218,972	2,666	43
1893	531,232	271,893	12,860	45	259,339	3,197	40
1894	526,948	268,793	13,515	68	258,155	3,153	28
1895	516,608	264,497	15,227	127	252,111	5,292	26
1896	516,407	296,576	13,517	527	219,831	3,825	30
1897	475,210	271,730	16,001	74	203,480	3,153	20
1898	443,289	258,499	12,840	123	184,790	3,234	39
1899	461,686	259,424	15,161	105	202,262	2,758	30
1900	561,359	324,856	17,700	268	236,503	3,667	53
...	5,738,786	3,058,846	...	...	2,679,940	...	...

* Numbers in this year for nine months only.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

AUGUST 1901.

CONTENTS.

	Page.
The Cultivation of Fruit under Glass. By James Whytock, -	135
Observations on the Girth-Increase of Trees in the Royal Botanic Garden, Edinburgh. Part II.—Coniferæ. By David Christison M.D., - - - - - - -	173

GLASGOW:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,
And to be purchased, either directly or through any Bookseller, from
OLIVER & BOYD, Edinburgh.

[PRICE NINEPENCE.]

[*All rights reserved.*]

The Cultivation of Fruit under Glass.[1]

BY

JAMES WHYTOCK,

GARDENER TO HIS GRACE THE DUKE OF BUCCLEUCH, DALKEITH.

THE GRAPE.

IN complying with the request of the Regius Keeper to give two or three lectures on the cultivation of fruit under glass, I think it right to treat of the vine first, because it is by far the most extensively grown fruit under glass. The course of instruction of which these lectures form a part is, I understand, for the benefit of young men of the staff of the Royal Botanic Garden, most of them beginners. I shall therefore go more into elementary details of my subject than I would do were I speaking to those who are more experienced.

What I state to-night is what I have seen and experienced, but I don't think I will state anything new to you. The truth is the most of all our experiences are built upon the experiences of those who have gone before us. We either try to improve upon what has been practised successfully or, what is equally important, we avoid practices we have seen to be failures.

There is no crop grown in this country that has undergone such a change in its cultivation as has the grape-vine during the past forty years. It is now nearly half a century since the pioneers of the last generation of gardeners began to adopt what we now know to be reasonable and sensible means to grow good grapes. The practice of putting very heavy coverings of solid

[1] Three lectures delivered in the Lecture Hall of the Royal Botanic Garden in June, 1901, as part of the Course of Instruction provided for members of the staff.

[Notes, R.B.G., Edin., No. IV., 1901.]

animal manure on the borders, and of digging great holes in the vine-border and burying in them dead cows or dead pigs, was seen to produce the very worst results—thick fleshy roots which perished in winter, producing bad-coloured, ill-shanked grapes.

Those pioneers who established good grape-growing were also the first to initiate what has now become a very large industry—commercial grape-growing. Most gardeners who had reached middle age shook their heads when William Thomson built his large vineries at Clovenfords to grow grapes for market, but the prices he got—7s. 6d. to 15s. per lb.—for some years in Covent Garden, were soon seen to be too good for him to have the trade all to himself. In a few years, therefore, vineyards round London were built of a size putting Thomson's into utter insignificance, and the supply of grapes brought about a reduction in the price to a minimum of 1s. per lb. At this price the crop is not profitable, and consequently the greater part of our market grapes are poor in quality, ill-flavoured, indeed almost sour grapes. We must have fire-heat in our climate to finish our grapes properly, and the high price of coal is prohibitive when the price of grapes is so low.

I do not think I need say much upon the construction of vineries. Horticultural builders have now such large establishments and comprehensive plant and machinery that they only need to be told what a glass-house is required for, and they bring the whole material ready to put together, and erect the house with its necessary heating in very quick time. With regard to heating, it is the best economy to have abundant boiler-power and abundant surface of piping. This saves fuel, and you also thereby keep up the desired temperature without strongly-heated pipes, which are so detrimental to all vegetation.

Vineries for very early forcing should be lean-to; for mid-season the span-roof is well adapted, and gives more fruit within a given space. I think, however, it is generally admitted that a line should be drawn across the middle of England, and south of that line first-class grapes are grown in span-roofed houses, whilst north of that line the finest quality of grapes are best grown in lean-to houses. Vineries in which late grapes are to hang all through our wet winters should be constructed with a

very steep pitch; flat-roofed vineries are most prejudicial to ripe grapes hanging under them in winter.

Whilst the gardener may leave the construction of the vinery in the hands of the horticultural builder, it is essential that in every detail he superintend closely the making of the vinery border. And let me here, by way of parenthesis, say on this score to you young men, that if any one of you should be placed as an assistant where new borders are to be made, do not grumble, as I have often heard young men do, at the extra work they entail. Remember you are receiving in the work a most valuable education, without responsibility as to its success or failure, whilst the head gardener is filled with anxiety as to its success.

The bottoms of vinery borders may be said to be of two kinds—

1. Where the natural drainage is good, *e.g.* gravel. In this case six inches of broken stones laid over the bottom of the border is all that is required.

2. Where the subsoil is of an impervious or water-logged nature. In this case I have made an excellent mixture of one part cement to seven parts rough gravelly sand. Mix the whole with water, and spread all over the bottom of the border, about three inches thick, on top of a layer of ashes already put down. This bottom should not be flat. The drain for such a border is usually parallel with the outer edge of the outside border, and the bottom should slope from the back wall of the vinery to the drain. The concrete bottom will be quite hard in three days. when nine inches of broken stone may be laid equally all over it, and then all the stones covered with fresh-cut sods, the grass-side put next the stones. That completes the foundation of the border.

The depth and width of border is the next consideration.

Firstly, as to depth. Deep borders are now considered bad practice. What is desired for up-to-date grape-growing is to have the very surface of the border a close net-work of fine fibrous roots to feed upon the easily assimilated finely powdered artificial manures now specially made for feeding the vine. A depth of two-and-a-half feet, exclusive of drainage, is therefore considered enough for the border when first made.

Secondly, as to width. The inside of the house is usually all border. I am much in favour of a wide outside border, for I always notice the best and greatest number of the roots are in the outside border, even when the vines are planted inside and have a good inside border.

In making a new border for planting young vines it is bad practice to make up at once the border in its whole possible width both inside and outside; it is better to make at first a width of only three feet inside and three feet outside—that will be sufficient for the young vines for the first two years, and then three feet more may be added to both outside and inside.

The next consideration is the material of which the border is made. The soil should be of the oldest pasture land, as rich and as fibrous as you can get it. I am much in favour of skinning it from the field and carting it direct to the border, granting the border is to be two-and-a-half feet deep. I should cut up the sods into large pieces, mixing with lime-rubbish and a spadeful of half-inch bones to each barrowful of soil. I should fill up the allotted piece of border with this rough mixture to the depth of eighteen inches. For the remaining depth of one foot to be filled, I should chop the sods very much smaller, measuring it in barrowfuls, and placing it in a long narrow ridge. I should then spread over this ridge one spadeful of bone-meal and one spadeful of, say, Thomson's vine-manure to each barrowful of soil, adding a good sprinkling of finely broken lime-rubbish. This ridge being now ready for mixing, the only way I should have it done, is that the men turn it all over with their hands in order that the powdered manures may become thoroughly mixed through the soil. One foot of this mixture put on top of the one-and-a-half foot of soil already put in makes the border two-and-a-half feet deep.

This work should always if possible be done in dry weather and with the soil in a comparatively dry state, and that being so, the soil should be put into the border in layers little by little, and between each little it should get a good tramping. Loose borders soon prove an evil, encouraging thick roots to get too quickly down to the bottom of the border.

We have now got the vinery and its border, and our next consideration is the vines with which it is to be planted.

The late Wm. Thomson, senior, of Dalkeith Gardens and Clovenfords, introduced a method of raising vines from eyes, which is probably a good deal practised now, and my own experience of it leads me to say it is the best method that can be adopted for the purpose of raising vines. The method is :— Take some fresh turf-sods cut in squares in the usual manner, lay them grass-side downwards on a bed in which there is bottom-heat, then take a number of vine-eyes and insert them all over the surface of the sods at equal distances of six inches square. The time for doing this is the usual time, January or early February. When the eyes have made growth six to nine inches in length, each eye is cut all round, leaving a six-inch square of turf to each. These are now shifted into another bed and placed twelve inches apart, where they make growth three feet long. They are then cut all round again. This cutting of the roots twice causes a lot of small fibrous roots to grow, and the vines are now ready to plant out in the vinery. By the time the vines have grown to be three feet long it will be the month of May, and I have always found about the middle of May is the best time to plant a vinery with young growing vines. The process of planting in this case is of the simplest and easiest :— Take a spade or wooden shovel, get it under the sod in which your vine is growing, lift and carry to the new border, lay it on the surface, cover with a little fresh fine-chopped sods mixed with bone-meal and vine-manure, and over all place a mulch of fresh horse-droppings, give a watering, and the planting is finished. So far I advocate as the best method the raising of your own vines from eyes and the planting of them out the same early summer in their permanent quarters.

We know, however, that nurserymen all over the country grow and send out yearly immense quantities of young vines grown in pots, and so a large quantity of one-year-old vines must be planted yearly. I must refer to the treatment of these also.

About fourteen months ago I had occasion to examine the roots of young vines, planted twelve months previously, and to my astonishment I found that in planting they had simply been taken out of the pots and planted with the whole ball. Inquiring who did the work, I was told the head-gardener did it himself. I did not think that any man worthy of the name of a pro-

fessional gardener could have been found to do such a thing at this date.

On receiving one-year-old vines from a nursery with a view to planting a vinery, the first thing to do is to put them in a tank of water, and let them remain there during forty-eight hours. That will kill any phylloxera that may be on the roots. The next thing is to shake every particle of soil from the roots. If you have a melon-house with a bed and slate-slabs, sprinkle over the slabs one-and-a-half inches finely chopped sod mixed with vine-manure. Spread the roots of your vines out over the soil on slabs, then cover the roots with one-and-a-half inches of the same mixture. When the vines start to grow the roots take hold of the three inches of soil over and below them. In the middle of May, the time to plant in the vinery, take a wooden shovel and lift each vine with the soil attached to the roots, and lay it in its place on the surface of the border, covering up with an inch or two more soil and then a mulch on top of all. If this shifting from melon-house to vinery is done carefully no check will be given to growth and the vines will soon reach the top of the house. The important point gained by this method is that the roots are all on the very surface, and anyone who has grown grapes successfully knows that the roots of the vines must be there if the crop is to be a success.

Various methods have been tried to keep the roots continuously near the surface, about which I would like to say a little. The first sensational exhibits of grapes were shown by the late Mr. Fowler, of Castle Kennedy, at an International Show held in Edinburgh in 1865. He produced on that occasion very large bunches, superbly finished, of Muscats and all of the finest quality of grapes, and a bunch of White Nice sixteen pounds in weight—an unprecedented weight up to that time. I was quite a young journeyman at the time, and was allowed in the situation I was then in ten days holidays. I set off to see the vineries at Castle Kennedy and if possible find out the key of the success in grape-growing. I found there the vinery borders both inside and outside were totally covered with beds of leaves, solidly built three feet deep. These beds remained for the twelve months and were removed only to have beds of fresh leaves built in their place. The roots of the vines came up most

abundantly into the bottoms of these beds, and I was told a good quantity of guano was sprinkled in the bottom of the beds for feeding. The late Mr. Johnstone, of Glamis Castle, was foreman to Mr. Fowler, and went to Glamis about that time as gardener. Lord Strathmore built a lot of new vineries, and Johnstone followed out at Glamis the same practice of having beds of leaves on the vinery borders, and with equally good results, for he carried all before him for years in the exhibits of grapes.

Looking back, however, to these two instances of ephemeral success it is seen the vines were made to make a grand effort for a few years in their youth, and then came a great collapse, for the same vines soon became enfeebled and unfruitful.

The contrast between these vines grown in a leafy medium and, say, those grown for the last thirty years at Clovenfords is most striking. The vines planted thirty years ago at Clovenfords are as full of vigour now as ever they were, and produce as fine bunches and finish the grapes as well as one would wish to see. The feeding given to the latter all these thirty years has been solely finely powdered bone superphosphates, which always seems to attract a network of fibrous roots to the surface of the border.

Some gardeners cover the outside borders with wooden shutters. The only benefit I could ever see from that was that in a district where the rainfall is very heavy, in Ireland for instance, by putting shutters in the middle of July on the borders of a vinery filled with almost ripe Hamboro grapes, the grapes hang better through the autumn from the dry border than they would if the border had been soaked with rain. Some cover the outside border with glass, which I believe is the best covering, but in ordinary dry districts the borders are best without any covering.

Heating and airing is the next consideration, and I believe a large body of gardeners have yet to give to both these points more careful study.

The fine, large, lightly-constructed vineries we have nowadays are apt to be much too air-tight. The want of air is most prejudicial to any fruit grown under glass, and to none more so than to the vine. Of course you have the usual top and bottom

ventilation, but there are often times when it is not advisable to open air at either of these points, and yet it would be most beneficial to have a little fresh air entering the house. Some of our best grape-growers, when getting a new vinery built, allow a little space between the panes at the point when they overlap each other on the roof, and by so doing a little fresh air is admitted all over the roof. In large vineries with large panes of glass, and in which labour is scarce, these little openings all over the roof are a great benefit and prevent scorching of foliage, give to the foliage greater substance, and help colouring of the fruit as well as flavour.

It is of the greatest importance to have plenty of piping in vineries. There is nothing so hurtful to vines as over-heated pipes. I would at all times rather have a house 5° or 8° below the mean temperature than force it up with very hot pipes. Abundant piping keeps up the heat without over-heating.

Muscat grapes, the finest of all grapes and the most difficult to grow, require high temperature accompanied with abundance of moisture. When in flower Muscats should never be subjected to a temperature below 73°. Through the day run the temperature up to 90° even with little air, but be sure along with such a high temperature to keep the air saturated with moisture. These conditions will ensure a splendid set of fruit. Muscats require all through a mean temperature of 70°. The foliage of the Muscat is more tender than is that of any other vine, and it will not stand the same treatment with insecticides that of other vines will do.

The Black Hamboro is our best quality black grape. The unfortunate thing about it is that it does not keep long after being ripe. It may be said at the present time to be the least successfully grown of any of our black grapes, that is to say, at our Flower Shows we find worse exhibits of Black Hamboro grapes than of any other varieties. I do not think high temperatures suit it at any stage of its growth. It requires a mean temperature of 60° to give it good flavour and develop a good bloom on the berries. From the time it begins to change colour, air should be kept on the vinery night and day.

Muscat of Alexandria and Black Hamboro are the two best

grapes, and are the most appreciated on a gentleman's table. The other three varieties of grapes equally largely grown are classed as late keeping grapes—namely, Gros Colman, Alicante, and Lady Downe's.

Lady Downe's is the best of the three for quality and good keeping. It is a good grower, and when properly treated gives good bunches, and the fruit takes on a fine finish. One peculiarity of this grape is its need of a circulation of air night and day whilst forming its seeds, or, as we technically say, when stoning.

Gros Colman is more largely grown for market than any other. It is not a general favourite on gentlemen's tables, because it too often lacks flavour. The treatment, however, of it is becoming better understood, and good finished grapes of this sort are increasing. It takes a long season to grow; it requires the same temperature as Muscat; and the fruit seems to be best when it hangs till January.

West's St. Peter's is our best-flavoured winter grape. It gives a good bunch and is a good cropper. The fruit takes on good bloom, but the berries are rather small. In a house with a steep roof built specially for keeping late grapes, I have seen West's St. Peter's hang till March. This is the only grape the late Queen Victoria would have for winter, and it was largely grown at Frogmore.

It is not desirable to have grapes hanging on the vines after early February, and the bunch should therefore, when they are wanted later, be cut with a piece of the lateral growth attached. The lateral growth is then put in a bottle of water, and the bunch stood in a cool, dry fruit room. In this way grapes, particularly Lady Downe's, are often kept until June.

The early forcing of the vine is an important object in many gentlemen's gardens. The greatest favourites and most suited for this purpose are Black Hamboro, Foster's Seedling, and Madresfield Court.

The best plan for very early forcing of vines is to grow yearly a quantity of vines in pots—they can be grown to fruit the second year from eyes—fruit them once and then throw them away. Putting in eyes yearly keeps up the succession. I should start my eyes for pot-vines, in sods six inches square, in

same way as for planting out; get them as soon as possible into 10-inch pots, and grow them as strong as ever I could in these the first year without any bottom heat, and in the autumn ripen thoroughly. The following year, in March, I should reduce the balls, slightly loosening all the roots round the ball, and pot them in 12-inch pots in good fibry loam mixed with bone-meal and an artificial manure; grow them on as strong as I could, giving occasionally manure-water, and at the end of summer ripen well again. These plants ought now to be good fruiting canes, and fit for starting for early forcing.

The early forcing of pot-vines requires and is worth a special house. The best form of house is a lean-to, not very wide, say ten feet, with a brick-built pit three-and-a-half or four feet wide and the same in depth running along the front of the house. This pit should be filled with leaves, and a little stable-litter should be added to it, and thus a moist bottom heat is secured. The fruiting pot-vines should be plunged in this about the middle of November. Care must be taken that the bottom heat is not above 80°. The heat of this bed without any fire-heat will start the vines. When they have grown to show flower, the mean temperature may be 60° to 65° during the day, 10° higher at this sunless short-day period; it is pretty well a matter of fire-heat all through. It will be a great help to the vines if the air of the house can be changed during a short time each day. By the time the grapes are colouring it will be April, when the weather will admit of sufficient airing, so essential to the colouring and ripening of grapes. Black Hamboro is really the best and only grape for early forcing. Foster's Seedling is a good early white grape.

The house in which vines have been forced may for the summer and autumn be used as a melon and cucumber house, and the back wall devoted to tomato growing. Two or three shelves on the back wall may, when the vines are in it, be devoted to forcing strawberries.

For the early forcing of planted-out vines, the vines must be of some age and well-established, and indeed gradually brought up to it. If you force young vines, for instance plants that have been out say three or four years, you get a crop and destroy them for fruitfulness for ever after. In the early forcing of vines

it is usual to start to close them up at the end of November. But my own experience leads me to say that on planted-out vines started about Christmas the grapes will be nearly as soon ripe as upon those closed up a month earlier. A week or two after the days begin to lengthen is worth three times that during the shorter days.

I will now refer to the treatment of the growth of young vines in the first year of planting. I would allow all the rambling growth possible without any stopping, in order to secure all the root-action possible. When this first year's growth is well ripened I would cut the whole down to within two feet of the ground. All being right they will grow away very strongly the second year, and when half way up the roof I would stop them. At the point of stopping another growth will start away; this should be pinched out, and the growth that succeeds it will grow much stronger. The reason for stopping the vine half way is to cause the eyes on the lower portion of the rod to plump up better. This second year's growth should again be all well ripened and then cut back, leaving three feet of the second year's growth. It is customary, when planting afresh a vinery, to plant as many supernumeraries as permanent vines. In the third year a bunch or two of grapes may be taken from the permanent vines, whilst all possible may be taken from the supernumeraries, as in a year or two they will be taken out.

A word or two as to stopping lateral growths on old-established vines. I think a great mistake is often made in restricting too much the lateral growths. The vines should be four feet apart, and this allows good space for lateral growth, which makes the laterals much stronger.

The renovation of old borders, and the attempt to improve vines which have got into a bad state, often fall to the lot of a gardener. I should never have any hesitation in stripping the roots bare of any vines in a bad way, putting fresh soil into the border, and bringing the roots up to the surface. This work should be done in the early autumn to retain natural heat in the soil. I have seen the old soil of a vinery border mixed up with fresh soil and put back again; this proved a failure and should not be done. Some gardens are unfortunately very deficient in a water-supply. The vine, if growing in thoroughly suitable

environment, requires a great deal of water. Inside borders should never be allowed to become dry; they should get a good watering in winter, and at least two good waterings during the growing season. The watering given after the thinning of grapes should be given with manure, either by washing in artificial manure or by adding made manure-water.

If a vinery border does not dry up, the material and drainage are at fault; the vines won't thrive in it.

Perhaps I should say a few words about what varieties of grapes should be grown. I went some few years ago in the month of September to see a large garden near Northampton, and was shown into a large, lofty span-roofed vinery. In this vinery nearly every known variety of grape was growing; there were a great many bunches of grapes, but I thought it the most miserable spectacle of grape-growing I had ever seen. There was not a decently coloured bunch in the lot, as might be expected, for different varieties require different temperatures, etc. The safest guide for a gardener is to grow the varieties his employer likes. Tho two best grapes are Black Hamboro and Muscat of Alexandria. Some families will have none other, and where an almost constant supply of these grapes has to be kept up, it is the most expensive form of grape-growing; neither are late keepers, and very early forcing must be done to bring in early supplies of fruit.

Madresfield Court is one of our best black grapes, and if it is to do it must have a house to itself. I first saw this grape well grown by the late Mr. Meredith near Liverpool. He had one vinery filled by one vine of it, grown on the extension-system, and it finished splendidly, as he gave it the special treatment it requires—namely, a less restriction of growth than other vines, and plenty of air. Lady Downe's is our best late-keeping grape, and I find Appley Towers keeps about as well. The former is an old and well-known grape. The latter is new, but one that has come to stay. It is a free grower, free bearer, free setter, and finishes well. West's St. Peter's is our best-flavoured winter-grape. Alicante and Gros Colman are the only other two I need mention. The latter requires Muscat treatment to give it good flavour; Alicante does not keep beyond the turn of the year. Canon Hall Muscat is in every way the finest grape, but I have

never known it to be grown in quantity successfully away from near London. It is a sight ever to be remembered to see the span-roof vineries five hundred feet long, forty feet broad, of Mr. Peter Kay at Finchley filled entirely with Canon Hall Muscat. Something suits them there that makes them grow finer than anywhere else. I conclude by saying, however, that during the past thirty years in first-class finished grape growing, as judged by the standard of taking the best prizes at all our leading exhibitions, Scotland has taken the lead, and I would express the wish that she may long continue to hold it.

THE PEACH AND THE NECTARINE.

The cultivation of the peach in our climate can only be carried on out of doors on walls with a south aspect, and it is only in the southern portions of England that you can get peaches on open walls of a good size and of a good flavour. I have seen finer peaches grown on the open wall at Frogmore, Gunnersbury, and other places in the Thames Valley, than could be grown in peach-cases, without fire-heat, anywhere in the north of Britain.

If a gardener located in the North of England or Scotland should in his holiday go south into Kent and visit, say, Mereworth he will observe a great difference in the fruit-gardens of the two districts. The great length of walls at Mereworth is covered with splendid peach-trees. And if his visit is in the beginning of September, he will see the splendid crop of fine fruit, which probably will arouse in him, as in Johnson's Scotsman, a wish to remain where he is. We cannot all be in Kent, however, and it has struck me on my visits to Kent that gardeners have their difficulties there also, and so we must try with the usual pluck of Scotsmen, and as good skilful gardeners, to grow good peaches even under most unfavourable circumstances.

The late Lord de Vesci, whom I had the honour to serve as gardener for five years, said to me that the peach-trees on south walls in his garden at Abbeyleix, Queen's Co., Ireland, produced good crops of peaches yearly up to the date of the potato-failure, and that some climatic change must have taken place then. In 1845 the walls were covered with good peach-trees, bearing good crops—twenty-five years later there was not a peach-tree left on

the same walls, all had died out. I may mention this was a warm district, soil inclined to be light, on a limestone bottom.

It is not the cold severity of our winters that is against our growing peaches in the open in the North, it is the sunlessness and often wetness of our climate that is the obstacle. This is proved by the very large peach-orchards that exist both in the United States and Canada. In these countries the summers are very hot, so that the wood is ripened as hard as can be, and is therefore not injured by the winter's frosts many degrees below zero. The ripening of the wood of our peach-tree is the important thing we have to look to in cultivating peach-trees, and here I wish to note observations I have made—and I have heard others say they have observed the same—in relation to ripening the wood of peach-trees in a glass case without any fire-heat.

It has been my experience that where the wood of the peach-trees is ripened in a case without fire-heat, the trees should not be pruned the same as trees ripened under glass with fire-heat. It is necessary to prune the trees in a case early in January because the buds soon after become too prominent for the necessary washing and tying. Now, we frequently have some of our very coldest weather early in February. Well, if you shorten back the leading shoots in your peach-trees, in the way usually done in heated houses, and a hard frost comes afterwards, it will kill back a considerable portion of the already pruned or wounded shoot, but the frost will not affect the shoots not shortened. From that I gather that the imperfectly ripened wood in a cold case will not stand hard frosts if cut. I therefore make it a point to cut back the wood as little as possible in a cold case.

I have seen peach-trees in a cold case grown on the spur-system, but I would not adopt it. The fruit is much smaller, although I believe you get a better set of fruit by the spur-system, probably because you have a much larger quantity of flower.

The peach and nectarine lend themselves to very early forcing. Ripe fruit can be had from the beginning of May until the end of October. Mr. Chalis, a gardener of forty years standing at Wilton, wrote recently in a gardening paper that the season of ripe peaches might be extended to the beginning of December

by a system of glass copings and screens hung in front of open walls to keep out wet and frost. Wilton is on a chalk subsoil, the driest and best possible subsoil for fruit. At most places, and particularly in Scotland, it takes much watchful care and skilful working to have presentable peaches at the end of October.

The best form of house for early forcing is a lean-to house; for later crops we usually find peach-houses a continuation of a range of lean-to vineries. Span-roof houses running north and south are the best, however, for mid-season and late crops of peaches. They afford the greatest surface of fruiting space, and from the necessity of training the trees upon both sides of the span close to the glass, the fruit is finer and larger. A form of training of peach-trees in lean-to houses much advocated is that of planting the back wall with trees and then planting trees along the front of the house and training them to a curved trellis reaching to the path. At the path the trellis is a good distance from the glass, and thus all the possible light is given the trees on the back walls. This system of having trees on the back wall and along the front of house should never be adopted unless in wide, roomy houses. A good few cases have come under my notice where the curved trellis had been done away with, and the front trees trained close to the glass, as far up as it was safe without shutting out the light from the trees on the back wall. My own observations, borne out by a great deal of the best peach-growing under glass in the eountry, leads me to say—plant your trees only at the front of the house, and train them close to the roof to the top of the house. The trees will do much better and the fruit will be finer.

Good and proper ventilation is of the utmost importance in peach-houses. For houses where you have peach-trees in flower early in January and February, instead of opening the roof in cold weather, have ventilators in the back wall that can be closed with wood shutters. This ventilation must not open to the back of the wall, but at the top of the wall with perforated gratings.

The next consideration after the construction of the house is the making of the borders. Very cold clay subsoil, or low-lying places where the water does not get away, are most prejudicial to any kind of fruit-growing, and if peaches have to be grown on

such places, it is best to make a concrete floor (one of cement to six of sandy gravel), the surface of which should be three feet below the ground-level. This floor should slope from the back wall to the outside of the front border, with a good drain running outside and parallel with the outer edge of the front border. On the concrete floor lay lines of tile drains eight feet apart running at right angles to the main drain in front, then cover the whole floor and tile drains with nine inches broken stones or rough screened gravel, and over the gravel put a layer of sods, grass-side down. That would leave a depth of border of two-and-a-half feet, because we usually raise our borders a few inches above the ground-level. The width of the outside border should be the same as the width of house. In making up new borders for peach-trees they should be made as for vines. Give just breadth enough for the trees for two years, three feet inside and the same outside, then add three feet more to serve for another two years. Peach-trees do best in every way in a heavy marly soil. They live much longer in it and give much larger fruit than in a light soil. Indeed, peach-trees never thrive right, however well manured, in a poor soil. The soil should be taken fresh from an old pasture, chopped in pieces six inches square, and if of the right kind, the only mixture wanted is well broken lime-rubbish. If the soil is of a light nature I would mix one spadeful of bone-meal with every barrowful of soil, and with the last six inches of soil on the top I would mix a good fertiliser. I have proved Thomson's vine-manure an excellent manure for peach-trees on poor soils.

In planting a new peach-house with young trees, I should plant double the number of trees required eventually to fill it, and, adhering to my conviction that training against the roof is the best, I should plant along the front of the house dwarf-trained trees, and along the middle and half way up the roof I should plant standard-trained trees with long clean stems, thus covering the whole roof in very quick time. In a year or two some of these will need removing to give the remaining ones room to grow. This removing will be a benefit rather than otherwise to the trees removed, and in gardens of fair extent there are always some worn-out trees to be replaced or vacancies to fill up. Young peach-trees, when planted in a good well-made border,

grow grossly to wood for a year or two. One way to counteract that is to make no hole when planting, but plant on the very surface. If the trees make gross wood it is a very easy matter, and without any check to the trees, to get at some of the strongest roots to cut them, and then fibrous roots will be emitted. A plan adopted by the Messrs. Rivers, who are our best authorities on such things, is to put the peach-tree in a shallow box sufficient to hold the roots, a hole is then made in the border just large enough and deep enough to bury the box; the consequent restricted growth and feeding on the surface made fibrous where wanted, resulting in the tree becoming quickly fruitful. After a year or two the box decays, the decayed wood is removed, and the roots are extended; but the tree once fruitful remains fruitful, for we know a good crop of fruit is the best preventive for gross wood. Whatever form of planting is adopted it is a good practice to lift the trees clean out of the border and replant in the same place, keeping the roots near the surface. This surface rooting or network of roots on the surface is the key to all successful fruit-growing. I have frequently observed in lifting a fruit-tree that the ball of roots is such a compact mass of fibrous roots you can lift the tree and move it where you like, and the tree never feels the shift—as is shown by the crop of fruit the following year being unaffected by the shift.

The right time for transplanting or lifting a peach-tree—merely replanting of peach-trees is important—if you wish it to fruit the following season, is when the wood is matured. This you recognise by drawing your hand along the branch lightly, when the foliage parts easily from the branch. It is, however, a great advantage if at this stage you can shift the tree still retaining its foliage; a root-action will take place before the tree goes finally to rest—this applies only to home-shifting. If you get trees from a nursery, they should be thoroughly ripened and denuded of leaf.

The peach lends itself to early forcing, but wants gradual preparation for it, and early varieties must be chosen. Trees that you have brought into flower beginning of March this year, may be brought into flower a fortnight or three weeks earlier next year, then the following year a fortnight earlier still, and so on until you get them to flower at the end of December, which

is as early as may be done to secure good crops. At the beginning of forcing, low temperatures must be the rule until the fruit is set. Begin with a mean temperature of 45° to 50° and 50° to 55°; when in flower 10° to 15° higher through the day. When peach-trees in a house are in flower, I keep on air night and day and regulate the heat in the pipes to get the desired temperature. Following this practice I find, if the trees are in fair order and have been sufficiently ripened, nearly every flower sets without any outer aid in distributing the pollen. The fruit being set, increase the temperature to 60° mean and stop giving night-air. The fruit will not swell for a bit. When the stoning period begins the fruit seems to stand still for some weeks and should not in any way be forced, indeed if this is done the fruit drops off. Until the fruit begins to swell after stoning, the temperature should not exceed 60° at night, but this critical period being over you may advance the temperature 5° or even 10° and swell the fruit to a good size. When the fruit begins to ripen, you must give a good deal of air, and expose the fruit to the sun by putting aside or removing some leaves. This gives flavour and colour to the fruit.

Unless when the trees are in flower syringing and damping daily must be attended to, and when the trees get in full foliage, heavy syringing twice daily must be given to keep down red spider, occasionally using some safe insecticide. Too much stress cannot be laid upon the way the syringing of peach-trees is done. A mere wetting of the foliage is harmful. If the trees are in full foliage, a powerful garden engine should be used, going first over the trees one way then returning upon them in the opposite way, this to be done twice daily. You can have no successful peach-culture unless you keep the foliage absolutely clean and healthy. The damping and syringing is stopped when the fruit begins to ripen, and during the ripening period dryness with a good circulation of air must be kept on night and day.

The disbudding and pruning of a peach-tree is of much importance in its good cultivation. I have seen peach-trees on a roof a frightful thicket of wood, and of course with miserable results as to a crop. As soon as the trees have set their fruit it will be time to begin disbudding. It is injurious to the trees to take off too many at first. Take off first only the fore right buds, that

is those growing straight out from the trees, and even with those, should a fruit be at the base of any one of them do not remove it entirely but pinch the shoot and leave three leaves. In about three weeks afterwards the remaining shoots will get too thick, and then another thinning may be done, leaving on every branch of the winter-pruning, one shoot at the base on the upper side of the branch, one at the extremity of the branch called the leading shoot. I should also pinch two shoots on the under side of the branch to two leaves. This practice reduces the shoots to the least possible number, in fact it is only leaving one shoot to each branch to give fruit for next year, and as you know the branches made in the peach-tree this year give us the fruit next year. I would notice here too how important it is that you secure the shoot of this year at the base of the branch of last year; by doing that you keep your trees furnished with young fruitful wood to the centres of the trees. Inattention to this will cause very unsightly trees with fruiting wood only at the extremities. Another circumstance is to be noticed in connection with the disbudding and summer-pruning of peach-trees. In peach-trees of fairly rude health there is a tendency of some shoots about the centres of the trees to grow stronger than the rest, to grow what is termed gross. The practised eye knows them at an early stage, and they should be at once taken clean off, because they never ripen enough to bear fruit, and grow gross at the expense of the other branches, whilst if taken off the less vigorous shoots grow stronger.

Granted that the trees are growing under favourable circumstances as to the house and border, the three things to be guarded most against are:—

1. Green Fly, which shows itself at a very early stage of the tree's growth.

As a remedy for this I greatly dislike fumigating, because I have seen whole crops of well-sized peaches lying on the ground from the fumigating material getting overheated during the operation. I always use a mild insecticide, applying one, that is to say, weak, but frequently, and I use it before much fly shows itself, on the principle, prevention is better than cure. I find liquid quassia the safest insecticide for the early tender foliage of the peach. Sometimes peach-trees develop at the beginning of

their growth curled-up leaves, the inside of these being filled with fly. Insecticides applied with a syringe do not reach the fly. I find tobacco-powder dusted on them clears off the fly.

2. Red Spider.

Copious and vigorous syringing twice daily is the only sure preventive for this.

3. Mildew.

Some varieties are very subject to it. Soapy water and sulphur applied frequently keep it in check.

Dropping of the buds is probably one of the most serious things affecting the peach-tree. It happens all over the country irrespective of the circumstances under which the tree is grown. It has been long attributed chiefly to dryness at the root. A gardener who had charge of extensive peach-houses in this country, and was much troubled and puzzled over bud-dropping, went to Australia and grows peaches largely there. He says the soil in which the peaches grow there becomes at certain seasons as dry as it is possible to be, and there is never any bud-dropping. His experience leads him now to say that dryness at root is not the cause of it. Early this spring I saw peach-trees in heavy wet soil, and a large portion of the buds had dropped. I think gardeners have not discovered the cause of it. It certainly indicates weakness, and too heavy cropping of the trees is usually followed by bad bud-dropping. Trees growing vigorously and altogether in good health do not drop buds much.

The watering of the borders, especially inside ones, is very important. The borders are usually allowed to become pretty dry when the fruit is ripening and ripe, a dry atmosphere being then essential. During the autumn and winter the borders should get one or two good soakings, and one should be with good manure-water. A porous border, which is the best, will take more water than a stiff retentive border.

What I have said for the peach applies equally to the nectarine, although I think the nectarine requires rather more heat than the peach to ripen.

In a general way peaches do not do well on open walls in our northern climate, and so to obtain crops late into the autumn the walls have been covered with narrow glass houses, called peach-cases. I have had much experience with these cases, and

say decidedly they are not a success for good peach-growing. In the South of Ireland the trees in such a case come into flower in February or early March. Now we sometimes have had a heavy snowstorm in the middle of March when the trees are in full flower, and there being no fire-heat and a cold, leaden, dull sky, the result is no crop. At another time a favourable setting may give a crop, but a wet, sunless autumn admits of no good ripening. I put two pipes into one of these cases and all was changed. Good sets, well ripened fruit and wood, and much larger fruit.

The peach-cases at Dalkeith under my charge at present were put up thirty-five years ago, and much was expected from them, but I am sorry to say they have not been a success even when good crops are secured, for the fruit lacks size and flavour from want of heat. Probably one of the best late cases and houses of this kind is at Drumlanrig. The south boundary wall of the garden there fell down, and instead of building a new wall, a span-roof case or orchard-house with some heating in it was put up instead as a boundary. It was too large to devote entirely to peaches, but these, with the finer kinds of plums and the best varieties of pears, do splendidly in it. The heating of peach-cases costs only the initial cost of putting in the pipes; the heating required for a short time when the trees are in flower, and for a short time in autumn to ripen the wood, is easily applied without any extra tax on the ordinary heating apparatus.

There is a large variety of peaches now, and if one had only one long house with little heating and no means of forcing, one might, by a good selection of earliest, mid-season, and latest varieties, secure a supply of ripe fruit from the end of June until October.

Hale's Early is one of our best for early forcing. Stirling Castle is another old favourite for forcing. Royal George forces well too. Violette Hâtive is a very good certain cropper. Bellegarde is another good cropper. Grosse Mignonne and Noblesse are the two finest flavoured peaches. Walburton Admirable and Sea Eagle are the two best late peaches.

The following varieties of nectarines are good:—Precoce de Croncels, Lord Napier, Elruge, Humboldt Downton, Victoria, Pine Apple.

THE PEAR AND THE PLUM.

Glass cases or glass coverings of some kind should be much more adopted than they are for growing the finer kinds of plums and pears in our cold northern districts.

I have had heavy crops of pears every year from pear-trees in pots grown in the following way :—About the end of February I placed fifty pot-pears in a late vinery, keeping a lot of ventilation on both top and front night and day. This constant air prevented the vines from starting, and at the same time the pear-trees opened flower, and the abundance of air helped them to set. They set abundantly, and I then took them out of the vinery, plunged them in a sunny place, and with feeding they grew fine crops. The trees were out of the vinery in good time to let it be started, and the trees were under glass during only the short time required to set the fruit ; in other words, to protect the blossom from frost.

The best varieties of gage-plums are worthy of a glass house or case in our northern climate. I have had very heavy crops of gage-plums by the following method :—Plant against a south wall. On top of the wall put a glass coping projecting twenty-one inches. Along the whole length of the outer edge of the coping fix an iron rod, on the rod a good quantity of rings, and to the rings attach a canvas curtain which reaches to the ground. The glass coping was a permanent fixture, the curtain was fixed up when the trees opened flower. The curtain was not allowed to cover the trees through the day, only at night to protect from frost ; through the day it was tightly drawn together. Young plum-trees grow very much to wood, throwing up strong watery shoots. To counteract this I examined the roots, and often lifted the trees every autumn, cutting away strong roots, keeping the roots near the surface, and putting amongst the roots each time fresh fibrous loam. Doing this for a few years in succession made the trees very fibrous rooted and the wood of medium thickness clad all over with flower-spurs. Plum-trees in this state, and with good protection from frost, cannot fail to yield good crops even under unfavourable circumstances, and in this the skill of the gardener shows itself.

The best varieties of plums and pears are, however, worth a case or house. Heating with pipes is not required for these fruits unless in a very sunless season such as our last one. Heat in the pipes would, in the absence of sun, swell the fruit and ripen the wood. In addition to paying careful attention to the roots of the trees to make them fruitful, the plum requires disbudding and laying in yearly young wood, for it usually bears on the two-year-old wood, not on the one-year-old wood as in the case of the peach. If the laying-in of young wood is neglected for a few years in plum-trees, particularly the best kinds, the trees become just so many thick bare sticks.

The watering of borders, especially inside ones, must be carefully attended to, and, as in the case of the peach, one or two good waterings in winter are essential. Fly and scale are the two most troublesome insects to plums. The fly is easily kept in check with syringings of weak soapy water. A weak solution of paraffin kills the scale.

I would restrict the growing of pears under glass to a few really good useful sorts, and particularly to those varieties that come into use quite late. Beurre Rance is worth giving a good bit of glass-space to itself. It is one of our best late pears, but it comes to no good growing on the open wall in the North. It grows a large size under glass, and with enough of it can be used from January to March. Glout Morceau is worth growing under glass in the North for December and January. Nec Plus Meuris is another valuable late pear, and worth glass-room. Marie Louise and Doyenné du Comice are two of our finest pears, and in cold districts well worth growing under glass. Either horizontal or dwarf trained would do for back walls of houses, but I think the cordon-trained pears are most suited for growing under glass; they are more easily managed in the matter of the roots, and thereby kept more constantly fruitful than larger trees.

The following varieties of plums I have found to give very heavy crops, either under the glass cope projecting from the top of the wall I have described, or in a lean-to house, or a span-roofed orchard-house, without fire-heat:—Boulouf, Bryanston Green Gage, Coe's Golden Drop, Early Transparent Gage, Green Gage, Jefferson, Kirk's, Late Transparent, Reine Claude de Bavay, Stint. These are all plums of first-class quality and free bearing

under glass, and of course nothing but the best varieties of plums are worth going to the expense of putting glass over. In the southern counties of England, glass is not required even for these best varieties. Splendid crops are produced on open walls, and I have seen good crops on orchard-standards. If restricted to one or two varieties, I should grow Early Transparent, Jefferson, Kirk's, and Stint.

THE APRICOT.

I knew of a good south wall covered with apricot-trees, and fairly fruitful considering they were in a poor soil. It was thought, however, that covering them with a glass case would improve the crop in every way, and a narrow lean-to house was put against the wall and over the trees, but the apricot-trees did not bear so well as they had done on the open wall, and after a few years the trees died out altogether, showing that closing them in a glass house does not suit them.

I belive a very successful way to grow the apricot under glass is the following :—Erect a structure of the nature of an open shed and roof it with glass. Make the roof a good width and of the same flatness as an open shed. The apricot-trees to be used should be standard-trained with long clean stems, long enough to reach from the ground to the top of the shed. The trees should be planted at the mouth of the shed, the roots would be in the open border. This procedure meets what seem to be the two important requirements of the apricot—the roots are in the open border, and the trees are fully exposed to the air, with sufficient glass to better ripen fruit and wood and make the fruit larger. The apricot does best on heavy soils, should be well surface-fed with manure, and requires abundant moisture at the roots. Apricots do well on the open wall in many parts. It is only in districts where they do not do on open walls that glass sheds or copings should be used. Some would say let us have the finest varieties, such as Moorpark, or none at all. I say in unfavourable districts grow such varieties as Breda and Kaisha. Owners of gardens will much appreciate these, when it is a choice between them and none at all. These latter are the hardiest and most free bearing of all apricots.

THE FIG.

The cultivation of the fig under glass was, up to very recent years, generally considered a very secondary affair. The back of a vinery, or back of some house the front of which was devoted to the growth of other things considered then of more importance, was considered just the right place to plant fig-trees. I wish to say here that I have seen some splendid examples in different parts of the country of immense fig-trees on the back walls of vineries, giving large crops of very large figs, the borders for the roots in all cases being restricted to about a width of two feet. Well-grown ripe figs, however, have in recent years come to be considered our best and most to be desired fruit. It is said, from a gastric point of view, that a person may eat ripe green figs who could not eat any other fruit. We find, therefore, that in gardens where the fig formerly gave one crop of fruit in the year on the open walls, houses specially for growing the fig have been built; I instance one in such a very mild district as Fota, near Cork. And we need not wonder, for the fig does not require a high temperature, and if grown under glass in the desired temperature, it gives in the year two full crops of ripe fruit.

The form of house best adapted for early forcing is lean-to; for later crops the span-roof is best, as it gives the greater fruiting space. The roofs of the houses should be trellised in the same way as for vines, and the fig-trees trained all over the roof so as to ensure short-jointed well-ripened wood. In making borders for fig-houses, if the site is a cold clay subsoil, a concrete floor must be made, sloping to a drain running along the front of border if the house be a lean-to; or, if span-roofed, the drain should be under the pathway and the concrete floor sloping from both sides to the pathway. To have each tree growing in the most fruitful and favourable circumstances, instead of filling up the whole border with drainage as for vines, you must intersect the border with brick walls, dividing it up into as many spaces as you mean to plant trees. This restricts the root-space and prevents the roots of one tree growing into another, and thus you can control the roots of any tree you wish. These sections or root-spaces must be made in size according to the size of the tree to be

grown, or according to size of roof-space. I have seen a fig-tree covering the whole back wall of a very large vinery, and the roots confined to a space six feet long by two feet broad; fresh soil was put in each year, and with good manure waterings heavy crops were grown each year. The intersections being built, two tile-drains should be laid on the concrete of each compartment, and about eight or nine inches of broken stones laid over the whole floor for drainage, with fresh sods, grass-side down, laid all over stones.

What kind of soil do figs grow best in? The fig has a tendency in good rich soil to grow too gross wood. That does not ripen, and hence will not give fruit. A light soil well mixed with lime-rubbish is best. The depth of border for fig-trees should not be more than two feet, and in making a new border eighteen to twenty inches will be deep enough to begin with. The roots should be all on the surface of the border, and should get very frequently top-dressings of soil, bone-meal, and approved artificial manure. By this, in course of years, the border will get deeper, but the roots ever in the right direction keeping upward.

I will now treat of the raising of the young fig-trees and preparation for planting.

Raising plants from cuttings is the best method. Select for cuttings straight, short-jointed, well-ripened wood of the previous season. Each cutting should be eight or nine inches long with a strong terminal bud, and in detaching the cutting from the plant take with it an inch or two of the two-year-old wood. Insert the cuttings singly in four-inch pots, and plunge in a bottom-heat fairly strong, but the atmospheric temperature should not exceed 60°. This proper balancing of atmospheric and bottom-heat is very important. Should the atmospheric temperature be high the cuttings shoot into growth before making roots. It is better that they make roots first and the growth afterwards—sturdy and short-jointed. The time for putting in the cuttings is the middle of February, and they must be shaded until rooted. When four-inch pots are filled with roots, shift into six-inch pots, using turfy loam but no manure. The cuttings will grow away quickly now without bottom-heat. At this stage it is important to prepare your young plants with a good clean stem of twelve inches, otherwise the plants will

throw up suckers, and the trees will always remain a bunch of suckers. A clean stem of twelve inches with three buds at the top, one for leader and two for shoots right and left, should be your one-year-old plants. These are not considered the best for planting in the border. The best practice is to give another shift into an eight-inch pot in soil of a poor nature, and grow to the desired height, with a leading shoot and two side shoots again. Thus we have now two-year-old plants in rather small pots, with two tiers of horizontal shoots and a leader. The object in keeping them two years in pots is to get them into a fruitful condition.

The best time to plant figs is in the spring when they are about to start into growth, and although the two years or longer preparation of the plants may point to planting them in the open border with ball intact, I prefer to shake out the ball and to spread out the roots, keeping them very near the surface. I have seen fig-trees established in pots, the ball put into the border whole, with the result they grew almost none at all. The border before being planted should be made very firm. This makes the roots grow fibrous. A loose border makes the roots grow gross and go to the bottom of the border, and in turn makes the wood gross and unfruitful.

When a house is planted with young fig-trees comparatively small, there will be an abundance of light all over the house sufficient to admit of a number of fig-trees being grown in pots alongside the planted ones, and thus full use of the house will be made. Figs grown in pots give a good quantity of fruit. They require much attention in watering, and to be liberally supplied with manure-water. Fig-trees fruited in pots should, at the end of their fruiting season, that is in the autumn, be turned out of the pots, a good portion of the soil shaken out of the ball, any strong roots cut away, and then be repotted in good turfy soil mixed with lime-rubbish and some bone-meal. They should then stand in a cool house for winter. A top-dressing with a good artificial manure when they are growing will be beneficial.

On starting a fig-house keep the mean temperature 55°, raising through the day 10° more, or 15° with sun-heat. The temperature should be 60° at night when the trees have burst into growth, and there should be a corresponding increase of

temperature by day. When the season advances and less fire-heat is required the night temperature may be 60° or 70°. The leaves of the fig succumb more quickly than almost any other fruit-tree leaves under glass with a dry fire-heat atmosphere to red spider. Syringings and the preservation of a very moist atmosphere must be constantly attended to, and air should be given on all possible occasions through the day. I have observed that the fig when in full growth requires a great deal of water at the root, that is to say, if the soil is of the porous nature it should be. As to the pruning and general treatment of old-established fig-trees, pruning should be done in winter when the trees are dormant and do not bleed. During the summer, however, is the time to pinch and regulate the growth. Over-crowding of the branches must be guarded against. Lay in young growths, watching to keep the trees well furnished to the centre, and to give the young growth full light to ripen. Cut out old wood no longer fruitful. Pinching back young growths to three leaves. makes fruitful spurs all over the tree. The first crop of figs is on the ripened wood of the previous summer, the second crop is on the wood which has grown along with the production of the first crop. The summer-pruning and pinching must, therefore, be done with a view to secure both of these. Some shoots should be allowed to grow to keep the tree furnished and take the place of bare branches worn out, and at the same time a considerable portion of the shoots should be bruised at the point when about five eyes long. Fig-trees in summer are too apt to get overcrowded with growth; this should be strictly guarded against. When the trees ripen and drop their leaves, the borders may be kept dry, but not too dry.

Figs growing in small allotted root-spaces to each tree will be benefited by taking out the width of a spade of soil all round the outer edge of the space right down to the bottom of the border and filling in again with fresh turfy loam mixed with lime-rubbish and bone-meal. Removing also the whole of the old surface of the border, and putting on bone-meal with a little artificial manure and a little fine-chopped turfy loam, will cause a quantity of new fibrous roots to develop. By repeating this yearly the trees will be kept just vigorous enough to make good short-jointed fruitful wood. Give manure-water and plenty of water when fruit is swelling, and you will get fruit of good size.

There is a great variety of figs, and out of about fifty varieties I have found the following the best :—

Brown Turkey, Negro Largo, Pinge de Mel, St. John's, White Ischia, White Marseilles, Black Ischia.

THE STRAWBERRY.

To be successful with early forcing of strawberries, you must get runners early, grow them quickly on, and have good plants in the autumn with stout crowns well matured. In gardens where forced strawberries are grown in large quantities, plantations of strawberry-plants are now specially made for the purpose of getting early runners.

The plan adopted is :—In July, layer as many runners as are required in four-inch pots and prepare a south or warm border. At the beginning of September plant it with these now well-rooted runners taken out of the pots. Planting thus early the plants get well established before winter. The following May they will throw up flower-spikes. As soon as these show they should be all cut off; this will throw the whole growth of the plants into producing leaves and runners instead of fruit. Runners are got this way a fortnight earlier than from the older plantations, a matter of the greatest importance. The middle of June is a good time to begin preparing young plants for forcing. Several methods have been tried for the early rooting of runners, but the plan found to work best and which is most generally adopted is to fill clean two-and-a-half or three-inch pots with good rich soil—and a large number of these being filled in the potting shed can be conveyed on a handy spring wheel-barrow to the border of strawberries—then with trowel proceed to plunge the pots between the lines and place a runner on each pot, pressing it in with a stone the size of road-metal, and leave the stone on pot. The weather at this season is usually very dry, and so watering of runners must be daily looked to even although the pots are plunged. In about a fortnight or three weeks' time these little pots will be well filled with roots, and the transference into their fruiting-pots should be proceeded with forthwith. The middle of July is a good time to put them in the fruiting-pots.

Experiments have been tried in the past with different sized

pots for fruiting forced strawberries. Pots six inches in diameter are now considered the best for the whole quantity to be forced; seven-inch pots for the latest batches are considered to take less watering, but I am doubtful about it. Both six-inch and seven-inch when the season is advanced will require saucers, and six-inch with saucers will produce fruit quite as good as seven-inch pots. All the pots should be carefully washed and carefully crocked. Cover the crocks with moss, and over the moss sprinkle soot, which is a manure and a preventive against worms. Strawberries require a heavy loam, but this very often cannot be got. Get the best fibrous loam you can, chop up in small pieces, mix a six-inch potful of bone-meal to every barrowful of soil, and also add some fresh horse-droppings passed through a half-inch sieve. The soil and pots now being in readiness, take the young strawberry-plants carefully out of the three-inch pots, put them in the six-inch in such a way that the top of the three-inch ball will be half-an-inch below the rim of the six-inch; fill in the pack firmly round the ball, finishing by leaving quarter of an inch under the rim to hold water. The plants should be watered with a rose immediately after potting, and stood for a few days in a shady place where the full day's sun will not reach them; after this they should be stood in a warm sheltered place where the full sun reaches them. I have always found the plants grow better standing on boards, coal-ashes, or dry bottom, much more so than standing on the ground. Of course, wet and dry localities make a great difference in this; in a dry place on gravelly subsoil they will do well standing on the gravel walk; in a wet locality with damp, cold subsoil the plants do much better raised from the ground.

When the plants are growing they must stand sufficiently apart from one another to allow full development of the foliage, and if they show a tendency to develop several weak crowns to a pot, remove all but one to make a good strong crown. If the weather is dry through the autumn, they must be carefully looked to twice a day for watering, and when the roots reach the side of the pots, clear manure-water should be given them; soot-water being one of the best for strawberries. Keep the pots carefully weeded, and do not allow runners to get ahead on them. By the end of September the pots will be well filled with roots, and

the crowns well developed. Should the weather become cold and wet in October, the plants are better protected from it in some way, indeed put into their winter quarters.

A good place to put them for winter is in a peach-case or orchard-house, where they can remain undisturbed till well into spring. In the absence of these put them in cold-frames plunged in leaves to protect the pots from being cracked with the frost. Even in some large gardens, however, glass protection cannot be spared for them, and they are then built up in ridges, putting the pots on their sides, packing in amongst ashes or any material that will keep out the frost from cracking the pots. Care must always be taken that the roots do not get dry. I have seen a batch of strawberry-plants good in every way and splendidly prepared for early forcing, with fine ball crowns, yet having been allowed to get dry before starting to force, they never threw up flowers, and had to be thrown out after occupying bed and shelves for six weeks.

I do not know any crop that requires more watchful care than a very early batch of pots with ripe strawberries, and yet it gives more pleasure to succeed with them.

The strawberry-plants now prepared being all that could be desired for early forcing, that is with good crowns and pots full of roots, the next thing is how to begin the forcing. In most gardens there are no special houses for this. Pits, frames, peach-houses, and vineries must be used for them, and with this accommodation I have frequently picked a dish of ripe fruit in the latter end of February. The best place I have found for starting early batches of strawberry-plants is a brick-built pit, heated with a flow and return, and deep enough to be filled nearly four feet with leaves. No dung should be used; the leaves alone give the gentle bottom-heat required—namely, about 75°. If even a little dung be used with the leaves I find it a failure. The bed being duly prepared before, the latter end of November is the earliest time to plunge a batch of plants in the leaves. The heat of the leaves will be sufficient for the first fortnight, then heat may be put in the pipes to keep a temperature of 50° to 55° mean, 10° more by day with aid of sun. Keep steady at that until they throw up their flower-trusses, then they must be removed to a shelf in a house near the glass, and I have found

the best success at that period of very short day by keeping the mean temperature not less than 60°. The time of removal from pit to shelf is suitable for giving a little top-dressing to the surface of pots with artificial manure mixed either with soil or sand. Some prefer to give the top-dressing when putting them in at the beginning. This top-dressing is essential. It makes fine foliage, not liable to red spider, and helps the vigour of flower-spike. The plants being now on the shelf and in flower, to get them to set well the air must not be close and stagnant; as a rule, however, at that cold season in most of our houses sufficient air gets in at not too close places.

After the fruit is set they may be shifted to a higher temperature or the temperature increased, but try and give what air you can. You must now feed the plants to get good-sized fruit, not strong doses but weak and often. Soot-water is one of the best for pot-strawberries. A change of manure-water is best.

A good plan for feeding strawberries, especially as the season advances and pots on shelves dry up much quicker, is to place well enriched soil underneath the pots. This may be done in three ways:—Firstly, a little square sod sprinkled with artificial manure may be put under the pot; secondly, fill a saucer with a hole in bottom with a soil mixed with manure, and place the pot upon it; thirdly, half fill a six-inch pot with enriched soil, and stand the pot in it. In all three cases the soil under the pot-plant gets filled with roots and helps the size of the fruit very much. It is a mistake to leave more fruit on a pot than will swell to a good size. What you grow strawberries in pots for is dessert, and they should be a fair size.

Mildew, green fly, and red spider are the three things that injure most the foliage of strawberries under glass, and my experience leads me to say (we force 6000 pots annually) that if the plants are properly attended to at the roots with water and the manures best adapted to them, you will have very little, if any, of these pests on your plants. I have proved Veltha to be a certain preventive for mildew, and also a powerful manure for the plants. The fruit should be supported to prevent hanging over the pot-edge.

Steven's Wonder, Auguste Nicaise, and John Ruskin are the kinds I found best for very early forcing. Scarlet Queen, Royal

Sovereign, and Leader are best for later. I am fond of President too. After the strawberries are forced put them in some cold frame, and later on plant out; they will throw a very large crop the following year, then clear them out.

A word as to packing:—Line the box with wood-wool and cotton-wool, put strawberry-leaf or lime-tree-leaf round each fruit, place them husk-end down in a single layer in the box, and pack close enough to prevent shaking. I prefer wood-boxes to tin-boxes.

THE PINE-APPLE.

The first consideration for the cultivation of pine-apples is the house or structure for growing them in with least trouble and expense. I have seen during the past thirty years a good many different ways and structures for growing pine-apples throughout the United Kingdom, but have not seen one so good in every way as the pinery at Dalkeith. It may be described as a low three-quarter span-roof house seven feet high at the apex or span, and just wide enough for a bed to hold three lines of pine-apple plants in fruiting-pots, and a path two and a half feet wide running at the bottom of the back wall. The bed in which the pine-pots are plunged has a bottom-heat chamber underneath heated with hot-water pipes. The floor of the bed over the heated chamber consists of thickish stone flags. The reason for using such flags is that they retain heat better than a thinner material would do, and fluctuations in heating from the pipes underneath being too cold or too hot are not so readily felt, and therefore a steady bottom-heat is kept to the pines—a matter of great importance. Tan bark is used in the bed for plunging, and this house has always a very neat and clean appearance inside, a great contrast to the insides of pineries where dung and leaves are used or where the planting-out system is adopted. In some large gardens span-roofed houses are used for pine-growing, but they require much more heating, and that is a matter of great importance in our long, cold, sunless winters, and I think pines get drawn in span-houses. The nearer the pines are to the roof the better. Stubby, thick-necked pine-plants alone produce good fruit.

The structure best adapted for growing young pine-plants from suckers onwards as successionals is a brick-built pit with top and bottom-heat. The temperature in winter does not require to be high, and these pits are easily heated, and in case of very hard weather frigidoms can be run over the lights.

Pine-growing is becoming limited to a very few places amongst British gardens. It is expensive, especially with such dear fuel as we have been having lately, and the pine-apples now imported are abundant in quantity, of fine size and looks, and very cheap; they are, however, very deficient in flavour when compared with our home-grown ones. The public generally are not good judges of first-rate fruit; this is very noticeable in the quantities of good-looking but poor-flavoured grapes sold. I think, therefore, the wealthy leaders of society who wish the best of everything will want the best grown British pines and British hot-house fruit, as being superior to anything else.

The great decrease in British pine-growing has also restricted the varieties grown to what are the best, and they number only three or four. The Queen is the best flavoured pine, but can only be grown for summer fruit, that is from May until October —it is no good for winter. It takes the least room, growing in smaller pots than others, is of a dwarf habit, a free grower, certain fruiter, comes quick to maturity, and has a beautiful golden colour.

The smooth-leaved Cayenne is the best winter pine, that is for producing fruit from October until May. The fruit is larger and the plant is larger, requiring a pot one-and-a-half to two inches more in diameter than the Queen.

Black Jamaica is the finest-flavoured winter pine. It grows strong; fruit rather small, and of a dull colour. This variety is always much appreciated in dessert.

Charlotte Rothschild is the next best winter pine, and is rather taller-growing than the others, and has fruit similar to Cayenne.

To keep up a succession of pines all the year round, these varieties are sufficient.

Pines have been grown in very varied soils. I have seen a large number grown in nothing but peat, I think because it was the most convenient, but the fruit was very small and the plants grew

to leaf and did not fruit well. Some think heavy clay is the best. It will be found, however, that where any good pine-growing is done, the soil is of rather a light nature and fibrous. The soil I prefer for pines is an old fibrous sod, neither too light nor too heavy, and to each barrowful of soil I add an eight-inch potful of bone-meal. This is really all the mixture that is required for pines. If the soil is clay, or of a heavy retentive nature, fine lime-rubbish must be added to keep the soil open.

Suckers and crowns are the two sources from which pine-plants are raised. The crowns are only taken when suckers cannot be had. Suckers make far the strongest and best plants. There is never any difficulty getting plenty suckers from Queen-pines in summer and autumn, but there is often a difficulty in getting enough suckers from smooth Cayennes. With the latter it will be found necessary often to put the old stools, after the fruit is cut, in some warm pit to grow and produce suckers. It is a great mistake to remove the suckers from the old plants before they have grown to a good size; good suckers always make the best and quickest plants.

I shall treat of Queen-pine suckers first. Plenty of them should be had in August and September. Cut them clean at the base and remove the bottom leaves. Six-inch pots will be large enough for the most of them, seven or eight inch may be used for larger suckers. The pots should be well cleaned and crocked; the suckers should be placed well down in the pot; the soil, not of too wet and pasty a nature, should be firmed well with a blunt stick, leaving sufficient room under the rim of the pot to hold water. The pots should then be plunged in a handy succession pit with bottom-heat of 90°. Put them wide enough apart to prevent drawing and to ensure the essential stubby growth from the first. Shading and dewing will be necessary until they have made roots, after that discontinue shading and give enough water to water the whole ball. Give a good deal of air at this time to make them sturdy and prepared for winter. The temperature, say in September, may be 65°, but as November approaches reduce to 55° to 60° according to weather; the bottom-heat in winter should also be reduced; 75° keeps the roots nice and healthy.

These rooted suckers should now from the middle of November

till the middle of February be kept at rest, and the best temperature for that is 55° atmospheric, 75° bottom-heat; keep the plants dry at root, almost no watering at the roots will be required, and no moisture in the air.

From the middle to the end of February the suckers should show white healthy roots all round the sides of the pots, and be ready for a shift. I practise putting them in their fruiting-pots at once. Ten-inch is large enough for Queens. Let the full number required be thoroughly cleaned and well crocked, get all the soil prepared, and have everything in readiness before beginning to pot. The plants should be well watered before repotting. Fresh tan should be at hand too, for the best way to treat the plunging material is to throw the new tan on top of the old and then to turn them over together and thoroughly mix them with forks; this mixing of old and new tan prevents the bottom-heat rising too high. Everything being now ready, the transference into fruiting-pots and the plunging of the plants in the bed where they are to grow may proceed together. The soil for potting should not be of a wet but rather of a dry fibrous nature, and should be well rammed with a blunt stick round the ball. The plants should be plunged two feet apart every way. The bottom-heat should not be allowed to exceed 90°; if it does, move the plants from side to side, and thus make an opening all round the pot. For the first fortnight after potting, the plants will not require much water, if any, and the weather still being cold a mean temperature of 60° will do. These plants will now be grown on all summer. When the weather gets warmer a mean temperature of 70° should be maintained, shutting up in the afternoon at 90°, and giving them a syringe. By the end of August the plants should have well filled the pots with roots, and the object now is to preserve the roots and plants in a healthy state all winter. The plants must be sparingly watered in September and liberally given air in good weather; at the end of the month they should be at rest in a dry atmosphere with a temperature of 55° to 60° and a bottom-heat of 75° to 80°. They will need almost no water from October until January.

The pine-plants being rested safely until January are called fruiting plants, and now, say middle of January, should be removed to their fruiting quarters. Fresh tan must be added

and mixed as before with the old, and the plants plunged in it two feet apart. The plants must now get water to moisten the whole ball, adding to it manure-water and guano or artificial manure. The temperature should be 60° to 65° at night and 70° through the day with fire-heat, 80° with sun. The moisture must be increased by damping paths, walls, etc. Care at this season must be taken in watering not to let any plants get too wet. As the season advances a temperature of 70° mean should be maintained, and shutting up at 85° or 90° may be practised. The plants will throw up the young fruit in March and come into flower, and during the flowering period the house may be kept drier and there should be no syringing. Flowering being past, give more moisture and shut up with high temperatures from sun-heat. During May the fruit will swell rapidly. At the beginning of June the fruit will change colour, when more air and less watering and moisture will be requred ; attention must, however, always be paid to the keeping up of the bottom-heat.

To maintain a supply of ripe pines all the year round suckers must be taken and plants potted on at frequent intervals. Three lots of Queens will be required for summer, and two lots of smooth-leaved Cayenne for winter. Cayennes are much shyer of throwing suckers than Queens. Get all the suckers you can by October, and if you have not enough for your purpose use crowns in spring. In the month of March get what suckers you can also. These two lots will give the fruit for the winter and spring months. The method of growing the Cayenne from suckers until it has ripened its fruit is the same as for the Queen, excepting that the Cayenne, being a stronger grower, requires a pot two inches larger for fruiting in. The Cayennes being the winter-fruiters, you keep them growing when the Queens are resting ; that is, as I have said, you lower the temperature for the Queens and keep them drier in winter. The Cayennes you keep at a mean night temperature of 60° to 65° in winter and 10° higher through the day. Give them sufficient water and manure-water to keep them growing and to swell their fruit.

To have ripe pines all the year round should not be attempted unless there are good pineries and good accommodation for growing them ; and if there are good pineries there is no more trouble in producing pines in winter than in summer. I have

only seen pines grown on the planted-out system at one place, namely Frogmore. They grow and fruit right enough, but the pits all opening and worked from the outside with sashes seemed to me wide, unhandy things to work. The pot-system in a neither very wide nor high pinery is the best, and where the pinery is an up-to-date structure pine-growing is simplicity itself.

Scale and bug are the two insect-pests that infest pines, and the only way to effectually banish these is to destroy the plants and begin with a clean fresh stock from the suckers onwards.

Observations on the Girth-increase of Trees in the Royal Botanic Garden, Edinburgh.

BY

DAVID CHRISTISON, M.D.

PART II.—CONIFERÆ.

CONTENTS.

PAGE

INTRODUCTION, ... 174

I. Annual Results, ... 175

A. General History of the species separately, ... 175

B. Aggregate Annual Results, ... 183

a. Comparison of the best single trees of ten species in two periods of five years each, ... 183

b. Range of the Aggregate Annual Girth-increase, ... 184

II. Monthly Results, ... 187

A. Average monthly percentage in the comparatively old Coniferæ, 1882-86, ... 187

1. Proportional percentage of the first and second half-season of growth, ... 188

2. Progressive increase and decrease in the growing season, ... 188

3. Comparison with the Deciduous group of the same period, ... 188

B. Average monthly percentage in the younger Coniferæ, 1887-91, ... 189

1. Proportional percentage of the first and second half-seasons of growth, ... 189

PAGE

2. Distribution of the girth-increase over the growing season in the younger Coniferæ, ... 190
3. Progressive increase and decrease in the growing season, ... 191
4. Comparison with the Deciduous group of the same period, ... 191

THE Coniferæ under observation have not thriven so well as the Deciduous trees, not from a faulty selection, but owing to general causes affecting all of the tribe in the Garden. Poverty or incompatibility of soil may be the main cause, but not improbably increasing influences of town atmosphere contribute to the evil. That the nature of the soil is not the only cause is indicated by some pines having attained a size and beauty, when our observations began more than twenty years ago, such as none of the younger trees now coming forward give promise of reaching; and that the Coniferæ are extremely sensitive to Edinburgh atmosphere, so that they might possibly be affected even by the present comparatively slight town-surroundings, seems proved by the almost total absence of pines in the city gardens, and the miserable appearance of the few that are to be seen. Another contributory cause, in some of the pines under observation, has been overcrowding in the Pinetum, which, owing to the stress of more necessary work in rearranging the Gardens of late years, could not be dealt with in time to prevent injury.

The only species that has thriven well in the past, and continues to thrive well still, is the yew, but not a few other species have fared not badly up to and from the 15th to the 25th year of life, some individual trees to even a considerably greater age. To these, therefore, I shall mainly confine my attention, beginning, as in the Deciduous class, with the history of the species separately, although, unfortunately, except with a few, it is not possible to follow them out in the same manner, tracing the old trees from decade to decade and comparing them with younger sets in the second decade, because nearly all the Coniferæ of the first decade disappeared or became ineligible near or soon after the expiry of that period, and because there was no such difference in age between the sets in the Coniferæ as in the Deciduous class.

I. ANNUAL RESULTS.

A. General History of the Species separately.

PINUS EXCELSA.

No. in List.	Girth at 1st Observation.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	Total.	Ann. Av.	Girth at last.
2	2·60	·90	·90	1·20	1·20	1·20	1·25	1·15	·90	1·20	1·05	10·95	1·09	14·90
11	3·70	..	..	1·00	1·30	1·00	1·35	1·00	1·25	1·30	1·40	9·60	1·20	14·50

Two older trees of this species stood in the first decade on the former terrace in front of the hot-houses. No. 24, much damaged by frost in 1878, became stunted, and the rate of girth-increase was only 0·24. In the second decade it declined to 0·18, and the tree when cut down in 1894 girthed only 34 inches. No. 26, taller and better proportioned, but rather scraggy, had a rate of 0·50 in the first decade, and kept it up in the second, but was not thought worth transplanting when the terrace was removed. It attained a girth of 40 inches.

Two infant trees, Nos. 2 and 3, were selected in 1887; but No. 3, choked by its neighbours, proved useless. Its rate was only 0·38. That of No. 2 was 1·09, the range being only ·90 to 1·25. No. 11, when an infant, had been transplanted to the "Triangle," and quite recovered in 1889. It continued to thrive with a rate of 1·20 for eight years when in 1897 it was again transplanted to the Pinetum, west of the Rock Garden, from the effects of which it had not recovered in 1900. It had the moderate range of 1·00 to 1·40 during the eight years.

PINUS LARICIO.

In 1887 this was one of the largest pines in the Garden, with a girth of 5 feet 8 inches, and it had grown at the rate of 0·41 in the previous decade; in the next nine years the rate fell to 0·35, and in 1896 it was cut down, while still sightly enough, with a girth of 6 feet and a height of 60 feet.

The other species of *Pinus* did so badly that they may be very briefly noticed.

Pinus sylvestris. The failure in this is remarkable, because the species can thrive in the Garden, as one tree in the Arboretum was 7 feet 10 inches in girth when cut down a few years ago. None now living are much over 4 feet. They have poor heads, and they have ceased to increase in girth.

Pinus Murrayana. The best of two had a rate of 0·67 for ten years, and was cut down in 1897 when only 20 inches in girth and unsightly.

Pinus Pinaster, a handsome infant, increased at the rate of 0·80 for seven years, but for the next four it fell to 0·55, and the tree is now a scraggy weed.

Pinus Lambertiana and *P. Cembra.* Two of each also proved utter failures.

ABIES DOUGLASII.

In my Paper of 1888 a full acount is given of the first tree of the species in the Garden, the progenitor of all that are now in it. In 1837 it girthed 4 inches at $4\frac{1}{2}$ feet above ground. For the next 37 years its rate was fully an inch and a half, and in 1878, when nearly 50 years old, the tree was nearly $5\frac{1}{2}$ feet in girth and crowded to the ground with branches. After the severe frost of 1879 it began to lose its handsome appearance, the increase never exceeded 0·40, and it was cut down in 1887 when 67 inches in girth, 54 feet in height, and according to the rings 55 years old. None of its descendants have at all equalled, or give promise of equalling it.

No.	Girth, 1st Obs'n.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth last Obs.
66	7·90	..	..	1·20	1·25	1·10	1·10	1·45	1·00	·95	1·05	..	9·10	1·14	17·05
6	4·35	·95	·80	·40	·55	·65	1·00	1·25	·90	1·30	1·15	·85	9·80	·89	14·25
	7·80	..	..	1·20	1·20	1·05	1·10	1·10	1·30	1·20	·95	·75	9·85	1·10	17·65

None of these has ever recorded an inch and a half in a single year, a rate which their parent maintained for 37 years. No. 99 already has a scraggy look; No. 6 looks only moderately well; and No. 66 has been transplanted, so that it remains to be proved how it will do.

ABIES LOWIANA.

Of two specimens observed in the first decade one perished almost immediately. The other, No. 31, girthed 15 inches in 1876, and its annual average was 1·11 for 12 years, with a maximum of 1·40, but it then rapidly degenerated and was cut down in 1888, girthing 27 inches.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	Total.	Av.	Final Girth
8	4·65	1·95	1·50	1·85	1·90	1·65	1·70	1·85	1·50	1·05	1·20	16·15	1·61	20·85
92	3·95	1·95	1·65	·30	1·00	1·00	1·80	2·60	1·75	2·30	2·80	17·15	1·71	21·15

The two younger trees, Nos. 8, 92, show a better rate, up to a girth, however, not much above that of No. 31 when it began to fail. Their conduct, too, has been erratic. No. 92 had the high average rate of 2·22 for the five years 1892–96, but next year it dropped to ·95, and the tree looked so ill that it was cut down. In No. 8 the rate fell off from a ten years' average of 1·61 to 1·12 in 1896 and 1897. It was then transplanted. The range in No. 8 was 1·05 to 1·95, but in No. 92 was no less than ·30 to 2·80. The remarkable minimum of ·30 happened in 1889 from some unknown cause which did not affect No. 8.

ABIES GRANDIS.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Final Girth.
91	3·00	1·25	1·15	1·65	1·25	1·60	2·10	2·50	2·25	1·85	1·95	1·65	19·20	1·74	22·20

In No. 91 the rate rose prettily steadily from infancy to a maximum of 2·50 in 1893, and although it declined to 1·65 in 1897 the tree is still one of the most thickly-clothed pines in the Garden. The increments were at first taken 2 feet above ground, and the points were raised to four and then to six feet, as the tree grew. The measurements in the Table are at 2 feet; but as it is a matter of some interest, I subjoin a Table of the rates at all three points for the four years 1893–96, showing that there was no great difference at the three points. The tree was well

clothed with branches between all the points. The general results to 1899 are placed at the end of the Table. They show that for the last three years the increase at the three points was all but identical.

Girth.	Increments.						Girth.	Inc. for 3 more years.	Total Inc. for 7 years.	Av.	Girth.
1892.	1893.	1894.	1895.	1896.	Total.	Ann. Av.	1896.				1899.
At 2 ft., 12·65	2·50	2·25	1·85	1·95	8·55	2·14	20·60	4·55	13·10	1·87	25·15
At 4 ft., 7·75	2.30	2·05	1·50	1.75	7·60	1·90	15·35	4·40	12·00	1·71	19·75
At 6 ft., 6·65	2·25	2·10	1·60	1·80	7·75	1·94	14·30	4·50	12·25	1·75	18·80

ABIES HOOKERIANA.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth.
24	9·00	·60	·60	·70	·55	·50	·50	·55	·50	·55	·50	·45	6·00	0·54	15·45

This shrub-like tree grew at a somewhat better rate for the first three years, when overcrowded, than afterwards when opened up. It has suffered from pressure on one side, but is generally well clothed. The range has been from ·45 to ·70, but for the last seven years it was only ·45 to ·55.

SEQUOIA GIGANTEA.

No.	Annual Inc. 1st Decade.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth Last Obs.
25	·81	·65	·70	·85	·80	·75	·90	..	..	..	..	4·65	·76	36·70
27	1·41	·90	·70	1·00	1·00	·80	1·50	..	..	..	..	5·90	·98	44·00
1	1·37	1·35	·90	1·25	1·25	·90	·95	·90	·65	·95	45	9·55	·96	42·25
2	1·28	1·05	·90	1·05	·85	·70	·90	..	..	..	..	5·45	·90	42·10

All these trees—Nos. 25, 27, standing free on the former terrace, Nos. 1, 2 in a small grove of the species—in 1878, when from 18 to 24 inches in girth, were symmetrically clothed and crowded with branches to the ground; but they soon began to thin and

to acquire the disproportionate thickness of stem below and sinuous top characteristic of all the species in the Garden past infancy. These faults progressed with a diminution in the rate of girth increase respectively, from ·81, 1·41, 1·37 and 1·28 in the first decade to ·76, ·98, 1·10 and ·90 in the first six years of the second. Three were then cut down, and No. 1, the survivor, now standing clear by the thinning of the grove, has not benefited by the change, as its rate has still further diminished—from 1·10 to ·74 in the last four years.

ARAUCARIA IMBRICATA.

The best of several of the species observed in the first decade had a rate of 0·70 and attained a girth of twenty inches, but like all the others of its time in the Garden it had suffered seriously from the frost of 1860. Gradually deteriorating, it was cut down in 1887.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth.
64	7·25	·65	·60	·35	·55	·55	·60	·50	·75	·40	·50	·30	5·75	·52	12·70
65	14·45	·60	·60	·55	·65	·65	·60	·70	·75	·50	·65	·70	6·95	·63	22·00

Nos. 64, 65, selected in 1887, grew in a small grove of the species, unlike the earlier tree, which stood free on the former terrace. They look healthy though not close-branched, and No. 64 is overshadowed by 65, which may account for its inferior rate. No. 65, standing at a corner, is comparatively free. The range of No. 64 was ·30 to ·75; that of 65 only ·50 to ·75.

CEDRUS AFRICANA.

No.	Annual Inc. 1st Decade.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth Last Obs.
39	1·51	1·30	1·20	1·30	1·20	1·20	1·50	1·25	1.10	·50	·50	11·05	1·10	53·55

No. 39 was very handsome and densely crowded with branches, and girthed two feet in 1878, but by the end of the first decade

the branches were rather sparse, and this fault has become more prominent since. The rate, 1·51 in the first decade, fell to 1·10 in the second, and as in the last two years it was only ·50 the tree would seem to have passed its prime when only 4½ ft. in girth.

CEDRUS DEODARA.

No.	Av. Rate, 1st Decade.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth Last Obs.
29	·88	·90	1·00	1·00	·85	·55	·80	·65	·30	·85	·50	7·40	·74	42·00
30	·60	·50	·65	·75	·35	·45	·55	·60	·15	·50	·30	4·80	·48	74·80
1	1·02	1·15	·30	·75	·80	·40	·55	·90	·20	·80	·15	6·00	·60	30·35
2	1·06	1·25	1·20	1·10	·85	·80	1·10	·80	·70	·70	·20	8·70	·87	35·25

No. 30 was a fine tree, nearly five and a half feet in girth in 1878, but soon got thin at the top and assumed, gradually, a rather stunted look. Its rate in the first decade was ·60. In the second it fell to ·48, with further degeneracy in the aspect of the tree. It has now the respectable girth of a trifle upwards of six feet. The much younger No. 29 has shown the same faults, and its rate has fallen from ·88 to ·74, the girth in 1897 being only three and a half feet. Both of these grew free, but Nos. 1, 2, have always been in the middle of a rather dense grove of their species. They are both still shapely, but their rates have fallen off from 1·02 and 1·06 in the first decade to 0·60 and 0·87 in the second.

LARIX EUROPŒA.

Two young larches were selected in 1887 and looked well for some years; but one, after growing at the rate of 1·31 for seven years, became diseased and died in 1895. The other, in apparent health for three years with a rate of 1·03, rapidly degenerated, its rate falling to ·30 in the last seven years, and was cut down in 1898.

TAXUS BACCATA.

No.	Annual Av., 1st Decade	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Ann. Av.	Girth.
41	·47	·40	·60	·40	·55	·45	·45	·55	·40	·55	·20	4.55	·45	78·85
42	·26	·20	·30	·35	·30	·30	· 5	·40	·15	·20	·05	2·30	·23	39·05
48	·48	·60	·30	·55	·45	·40	·50	..	..	..	..	2·80	·46	44·80
49	·45	·45	·45	-55	·35	·40	·55	·45	·25	·50	·25	4·20	·42	32-25
50	·37	·35	·30	·25	·25	·30	·25	·45	·35	..	..	2·50	·31	39·15
53	·25	·10	·30	·30	·25	·10	·35	·20	·20	·00	·05	1·85	·18	36·05

In my Paper of 1888 the history of No. 41 is fully given. Traditionally, an age of at least 213 or possibly 260 years is assigned to it, but the observations show that its rate has been nearly half an inch for the last twenty years, and taking the same rate for its whole life, and it is not likely to have been less, the age would be reduced to 170 years, with a girth of nearly six and a half feet. The rates in the two decades are nearly the same, and would have been still nearer but for the sudden drop in 1897 to ·20. This seems to have been due to the transplantation of trees around, which formerly closely sheltered it, and resulted also in a sickly look, which has not yet (spring, 1899) disappeared ; but as in that year it once more grew ·40, or nearly its average, it is to be hoped it will again prosper.

No. 48, an equally vigorous grower, died in 1894 from having its roots pruned in preparation for transplantation. No. 50, always rather weakly, was cut down in 1896. The three survivors, Nos. 42, 49, 53, all fell off, but not much, in the second decade. Although looking equally vigorous, and not differing much in size, their rates in the second decade varied as much as from ·18 to ·44.

Nos. 48, 49, 50, were known to be 77 years old in 1896, and allowing 7 years for growth to the measuring point, their life-rates have been ·68, ·45, and ·57, and the girths attained were 44, 32, and 36 inches.

CUPRESSUS LAWSONIANA.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	Total.	Annual Av.	Girth.
9	24·50	·40	·35	·45	·60	·50	·80	·80	·85	4·75	·59	29·35
10	22·20	·40	·20	·50	·70	·55	·55	·65	·85	4·40	·55	26·60

These cypresses were fairly handsome and grew at a rather increasing rate, averaging rather more than half an inch for the eight years, and above three-quarters of an inch for the last three, when, being badly injured by frost, they were cut down.

THUJA GIGANTEA.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	Total.	Ann. Av.	Girth.
12	20·80	·50	·70	1·15	1·10	·65	·80	·85	·60	6·35	·79	27·15
13	9·90	·50	·80	·70	·60	·40	·60	·55	·45	4·60	·57	14·50

The larger of the two, standing close together, had much the better rate. Both were handsome, when they suddenly failed in 1894, ceased to increase for the next two years, and were cut down in 1897.

RETINOSPORA OBTUSA.

No.	Girth.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	Total.	Ann. Av.	Girth.
14	4·30	·45	·25	·60	·60	·40	·65	·55	·60	..	4·10	·51	8·40
90	3·05	·45	·20	·10	·10	·20	·20	·50	·50	·50	2·75	·31	5·80
15	9·60	..	..	..	·30	·25	·70	·65	..	..	1·90	·47	11·50

The results in these are little reliable. Nos. 15, 90, became scraggy and were cut down as not worth transplantation, and No. 14, four years after transplantation, has scarcely added to its girth and looks unhealthy.

B. Aggregate Annual Results.

I shall now give in a series of Tables some of the General Results of the Annual Observations on the Coniferæ.

a. COMPARISON OF THE BEST SINGLE TREES OF 10 SPECIES IN TWO PERIODS OF FIVE YEARS EACH, 1887–91 AND 1892–96.

1. TREES IN WHICH THE GIRTH-INCREASE DIMINISHED IN THE SECOND PERIOD.

No. in List.	Species.	Average Annual Increase.		Girth.
		1887-91.	1891-96.	1896.
				In.
8	Abies Lowiana - - - -	1·78	1·48	20·80
66	,, Douglasii - - - -	1·18	1·11	17·05
24	,, Hookeriana - - -	·59	·52	15·00
1	Sequoia gigantea - - -	1·16	·87	41·80
2	Cedrus Deodara - - - -	1·07	·82	35·05
39	,, africana - - - -	1·26	1·11	53·05
49	Taxus baccata - - - -	·46	·43	32·00
		7·50	6·34	

It is shown in this Table that there was a marked falling off in *Sequoia*, *Cedrus Deodara*, and *Abies Lowiana*, at girths of 42, 35, and 21 inches, a less marked decline in *Cedrus africana* and *Abies Hookeriana* at girths of 53 and 15 inches, while *Abies Douglasii* and *Taxus* showed a very slight loss at girths of 17 and 32 in.

2. TREES IN WHICH THE GIRTH-INCREASE INCREASED IN THE SECOND PERIOD.

No. in List.	Species.	Average Annual Increase.		Girth.
		1887-91.	1891-96.	1896.
91	Abies grandis - - - -	1·49	2·13	20·55
2	Pinus excelsa - - - -	1·08	1·11	14·90
65	Araucaria imbricata - - -	·61	·64	21·30
		3·18	3·88	

In this Table only *Abies grandis* shows a very marked increase in the second period, up to a girth of 20 inches, while in *Pinus excelsa* and *Araucaria imbricata* the difference is little appreciable at girths of 15 and 21 inches.

In the aggregates the loss in average annual increase in seven species was 1·16 in., and the gain in three was ·70; the nett loss being thus ·46.

b. RANGE OF THE AGGREGATE ANNUAL GIRTH-INCREASE.

The range of the 19 Coniferæ of 9 species under observation in the first decade, 1878-87, was very great, as shown below, being from 9·60 to 16·60 inches in the whole, and from 5·03 to 8·27 taking species averages. As fully detailed in former Papers, the maximum, 8·27, was in 1878, and was followed by a decline in the three eminently unfavourable succeeding years to 6·16, but the minimum, 5·03, was not reached, after a rally in 1882, till 1883, and after a second rally for two years a third fall took place in 1887 nearly to the minimum.

1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
8·27	6·45	7·05	6·16	7·05	5·03	6·41	6·93	6·68	5·80

In this decade-list we can see distinct evidence of a prolonged depression after the three bad seasons. The standard of 1878 was never again nearly reached, and after some fluctuations the final year was not far off the minimum. A detailed inqury shows that five species, *Pinus excelsa*, *Abies Douglasii*, *A. Lowiana*, *Pinus sylvestris*, and *Araucaria imbricata* had their girth-increase

permanently diminished after the three bad seasons ; that two, *Cedrus Deodara* and *Taxus baccata*, were affected, but not permanently ; and that two, *Cedrus africana* and *Pinus austriaca*, were unaffected.

In the remarkable and unaccountable second depression of 1883, in which the Deciduous trees were nearly or quite unaffected, all the deodars (4), all the sequoias (4), and all the other pinaceæ except the yew had a diminished increase.

Unfortunately, as most of the trees in this list completely failed early in the second decade, it is not in my power to give a Table of comparative results for the same trees in the two periods. The most I can do is to give the results of a new set, including a few of the old ones, in Table IX., comprising 17 trees of ten species.

Here the range proves to be actually greater than in the set of the first decade, being no less than from 6·85 to 12·30. This depends upon an abnormally high ratio in 1893 and an abnormally low one in 1897. Withdrawing these the range for the remaining eight years is reduced to from 7·70 to 10·60.

To check these results as far as possible, I give in Table X. a larger number of trees, including some additional species, treated in the same way, for the five years 1889-93. Here eleven species and twenty-six trees are dealt with. The range is from 7·45 to 9·80, and on the whole the fluctuations agree with those in the corresponding years in Table IX., 1893 in particular being decidedly the best year in both.

I have also found it possible to deal with 12 species and 23 trees for the eight years 1889-96, in Table XI. Here the range is from 10·20 to 13·00, and the agreement with the fluctuations in Table IX. is pretty close. The decided maximum is again in 1893, and the only marked difference is the comparatively small proportion of 1889 in Table IX., which, however, was almost entirely due to a single tree, *Abies Lowiana*, whose increase in that year fell 1·25 below that of 1888.

In Table IX. the remarkable fall from 10·60 in 1896 to 6·85 in 1897 was due to some cause which affected all the species with the exception of *Cedrus atlantica*, but this exception was more apparent than real, as, in fact, it had already fallen the previous year from 1·10 to ·50, the figure repeated in 1897.

TABLE IX.

AVERAGE ANNUAL GIRTH-INCREASE AND RANGE IN TEN SPECIES OF CONIFERÆ FOR TEN YEARS—1888-1897.*

	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	Total.	Av.
Pinus excelsa (one) - -	·90	·90	1·20	1·20	1·20	1·25	1·15	·90	1·20	1·05	10·95	1·09
Abies grandis (one) - -	1·15	1·65	1·25	1·60	2·10	2·50	2·25	1·85	1·95	1·65	17·95	1·79
,, Lowiana (one) -	1·55	·30	1·00	1·00	1·80	2·60	1·75	2·30	2·80	·95	16·05	1·60
,, Douglasii (one) -	·80	·40	·55	·65	1·00	1·25	·90	1·30	1·15	·85	8·85	·88
,, Hookeriana (one) -	·60	·70	·55	·50	·50	·55	·50	·55	·50	·45	5·40	·54
Sequoia gigantea (one) -	1·35	·90	1·25	1·25	·90	·95	·90	·65	·95	·45	9·55	·95
Cedrus Deodara (four) -	·95	·80	·90	·70	·55	·75	·75	·35	·70	·30	6·75	·67
,, atlantica (one) -	1·30	1·20	1·30	1·20	1·20	1·50	1·25	1·10	·50	·50	11·05	1·10
Araucaria imbricata (two)	·60	·45	·60	·60	·60	·60	·75	·45	·55	·50	5·70	·57
Taxus baccata (four)- -	·30	·40	·40	·35	·30	·35	·40	·25	·30	·15	3·20	·32
	9·50	7·70	9·00	9·05	10·15	12·30	10·60	9·70	10·60	6·85	95·45	9·51

* When more than one tree of a species is given, the average for the species is taken.

TABLE X.

THE SAME FOR A LARGER NUMBER OF TREES AND SOME DIFFERENT SPECIES FOR 5 YEARS—1889-93.

	1889.	1890.	1891.	1892.	1893.	Total.	Av.
Pinus excelsa (two) - -	1·10	1·25	1·10	1·30	1·05	5·80	1·16
Abies Lowiana (two) - -	1·05	1·45	1·30	1·75	2·20	7·75	1·55
,, Douglasii (three) - -	·90	1·00	·90	1·05	1·25	5·10	1·02
Sequoia gigantea (four) - -	·80	1·05	1·00	·80	1·05	4·70	·94
Taxus baccata (six) - -	·35	·40	·35	·30	·35	1·75	·35
Pinus Pinaster (one) - -	·80	·60	·60	·80	·95	3·75	·75
,, Murrayana (one) - -	·75	·75	·55	·70	·80	3·55	·71
,, Laricio (one) - -	·40	·40	·35	·25	·25	1·65	·33
Cupressus Lawsoniana (two)	·45	·65	·50	·65	·70	2·95	·59
Thuja gigantea (two) - -	·90	·85	·50	·70	·70	3·65	·73
Retinospora obtusa (two) -	·35	·35	·30	·40	·50	1·90	·38
	7·85	8·75	7·45	8·70	9·80	42·55	8·51

TABLE XI.

THE SAME FOR TWELVE SPECIES FOR EIGHT YEARS—1889-96.

	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	Total	Av.
Pinus excelsa (two) - -	1·10	1·25	1·10	1·30	1·05	1·05	1·25	1·20	9·30	1·16
,, Laricio (one) - -	·40	·40	·35	·25	·25	·40	·30	·40	2·75	·34
,, Pinaster (one) - -	·80	·40	·60	·80	·95	·55	·55	·55	5·20	·65
,, Murrayana (one) - -	·75	·75	·55	·70	·80	·60	·55	·60	5·30	·66
Abies Douglasii (three) - -	·90	1·00	·90	1·05	1·25	1·05	1·15	1·05	8·35	1·04
,, grandis (one) - -	1·65	1·25	1·60	2·10	2·50	2·25	1·85	1·95	15·15	1·90
,, Lowiana (two) - -	1·05	1·45	1·30	1·75	2·10	1·60	1·65	2·00	12·90	1·61
,, Hookeriana (one) - -	·70	·55	·50	·50	·55	·50	·55	·50	4·35	·54
Sequoia gigantea (one) - -	·90	1·25	1·25	·90	·95	·90	·65	·95	7·75	·97
Cedrus Deodara (four) - -	·80	·90	·70	·55	·75	·75	·35	·70	5·50	·69
,, africana (one) - -	1·20	1·30	1·20	1·20	1·50	1·25	1·10	·50	9·25	1·16
Taxus baccata (four) - -	·40	·40	·35	·30	·35	·40	·25	·30	2·75	·34
	10·65	10·90	10·40	11·40	13·00	11·30	10·20	10·70	88·55	11·06

II. MONTHLY RESULTS.

Monthly observations on a considerable number of Coniferæ were not begun till 1882, and the results for the five years ending 1886 have already been given.[1] This set of comparatively old trees were then, perforce, given up, and a younger set were observed for a second five-years' period, 1887-91. As the results for these have also been published,[2] and as my monthly records of Coniferæ then ceased, I shall only give some of the general conclusions arrived at in these earlier investigations.

A. AVERAGE MONTHLY PERCENTAGE IN THE COMPARATIVELY OLD CONIFERÆ, 1882–86.

April.	May.	June.	July.	August.	Septr.
8	22	26	24	18	2

[1] Trans. Bot. Soc., Edin., 1886-87.

[2] *Op cit.*, 1892.

The greatest percentages in the months were:—For April, 18 p.c. in *Pinus austriaca* and 16 p.c. in *Araucaria imbricata;* for May, 28 p.c. in *Abies Lowiana;* for June, 39 p.c. in *Sequoia gigantea;* for July, 30 p.c. in *Cupressus Lawsoniana;* for August, 30 p.c. in *Cedrus Deodara;* and for September, 8 p.c. in the same.

1. Proportional percentage of the first and second half-seasons of growth.

Excess in the first half was most marked in *Araucaria*, the proportions being 73 p.c. in the first and 27 p.c. in the second. The reverse was most marked in *Cedrus Deodara*, 34 p.c. in the first and 66 p.c. in the second.

2. Progressive increase and decrease in the growing season.

Abies Lowiana proved to be an exception to the normal seasonal progress, as its percentage, which was very large in May, 28 p.c., dropped in June to 18 p.c., rising again to 22 p.c. in July. *Cedrus Deodara* was remarkable for a steady rise to a maximum so late as in August.

3. Comparison with the Deciduous Group of the same period.

	April.	May.	June.	July.	Aug.	Sept.
Coniferæ - - - -	8	22	26	24	18	2
Deciduous - - - -	6	11	18	41	22	2

The Table shows that the increase was more equably distributed in the Coniferæ, and further investigation proved that this depended partly on the maxima of the species occurring in a greater variety of months, but partly also on a more equable distribution in the individual species.

B. AVERAGE MONTHLY PERCENTAGE IN THE YOUNGER CONIFERÆ, 1887–91, COMPARED WITH THE OLDER GROUP.

	April.	May.	June.	July.	Aug.	Sept.
Younger Group - - -	5·5	28	26·5	18·5	14·5	7
Older Group - - -	8	22	26	24	18	2

Compared with the older group there is a considerable difference in regard to the first and last months, the older group having a larger proportion in the first and a much smaller proportion in the last than the younger trees. But the difference is perhaps not greater than might be expected between two groups of different ages, to some extent of different species, and under observation at different periods, and difference almost disappears if we take the first and last two months together. In the older group the distribution is somewhat more equable and the maximum is attained later than in the younger trees.

1. Proportional percentage of the first and second half-seasons of growth.

The following Table shows that on comparing the two groups in this respect, the few species that occur in both have tolerably analogous results.

YOUNGER GROUP.			OLDER GROUP.		
	1st Half.	2nd Half.		1st Half.	2nd Half.
Araucaria imbricata (2)	75	25	Araucaria imbricata (3)-	73	27
Cupressus Lawsoniana (2)	73	27	Sequoia gigantea (4) -	66	34
Pinus austriaca (1) -	71·5	28	Pinus austriaca (1) -	64	36
Retinospora obtusa (1) -	70·5	29	Cupressus Lawsoniana (1)	63	37
Thuja gigantea (1) -	67·5	32	Abies Lowiana (1) -	56	44
Pinus Pinaster (1) -	62·5	37	Cedrus africana (1) -	48	52
,, excelsa (3) - -	55·5	44	Taxus baccata (4) - -	45	55
,, Murrayana (1) -	55·5	44	Cedrus Deodara (4) -	34	66
Abies Douglasii (3) -	54	46			
,, Hookeriana (1) -	51	49			
,, Lowiana (2) - -	47	53			
,, grandis (1) - -	33	67			

That the species do follow a law in throwing the mass of their growth, some into the early others into the late part of the growing season, seems fairly well indicated by a list showing the percentage of growth in the first and last half-seasons in thirty-four Coniferæ, thirteen of the old and twenty-one of the new set, in my Paper in the Transactions of the Botanical Society of Edinburgh, 1892, p. 325. The list is drawn up in the order of greatest proportion in the first half-season, one example of *Araucaria imbricata* being at the head with 79 p.c. and one of the deodars at the foot with 24 p.c.

On analysing the list of 34 trees, it appears that the four araucarias are within eleven places of the top; the three deodars within five places of the bottom, and their near relative *Cedrus africana* separated from them only by a single place: the three each of *Abies Douglasii*, *Cupressus Lawsoniana*, *Sequoia gigantea*, *Abies Lowiana*, and *Pinus excelsa* within fourteen, thirteen, twelve, nine, and nine places respectively of each other. Taking a wider view, the seven trees of four species of *Abies* are all in the lower half of the list, and six of the seven trees of four species of *Pinus* are within thirteen places, in the middle of the list.

2. Distribution of the girth-increase over the growing season in the younger Coniferæ.

There was a considerable variety in the conduct of the species in this respect. Some showed a marked activity for only three months, others for four or five. As examples of a wide distribution over the growing season in undoubtedly healthy vigorous growers the following may be taken, the averages being for a period of five years:—

PERCENTAGES OF MONTHLY INCREASE.

No.		April.	May.	June.	July.	Aug.	Sept.
2	Pinus excelsa - -	8	21·5	26	21	14	9·5
11	Do. do. - -	8·5	17	27	17	17	13·5
91	Abies grandis . -	6	19·5	7·5	20	27	20

3. Progressive increase and decrease in the growing season.

Abies Lowiana again showed a deviation from the normal monthly rise to a maximum, as the percentage was slightly less in June than in May; this deviation also revealed itself in *Abies Douglasii*, *Pinus excelsa*, and *Thuja gigantea*, but above all in *Abies grandis*, the healthiest and quickest grower of all my Coniferæ, where, therefore, disease or weakness cannot be suspected as a cause, in which the percentage was 19·5 in May and fell to no more than 7·5 in June, rising again in July to 20·0. Subsequent weekly measurements of this tree showed that there was a complete cessation of increase for at least a fortnight in June.

4. Comparison with the Deciduous Group of the same period.

	April.	May.	June.	July.	Aug.	Sept.
Coniferæ - - - -	5·5	28	26·5	18·5	14·5	7
Deciduous - - - -	1·5	12	31	30	20·5	5

The increase is somewhat more evenly distributed in the Coniferæ. It is greater than in the Deciduous Trees both in the first and last months, and if we take the first and last bi-monthly periods, it is much greater in the first and a little less in the last, whereas in the middle bi-monthly period the Deciduous class has considerably the best of it. The results agree fairly well with the comparison already made in the older groups.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

DECEMBER 1901.

CONTENTS.

	Page.
The Diameter-Increment of Trees. By A. W. Borthwick, B.Sc.,	193
Hints on Propagating Mistletoe from the Berry. By William Paxton,	212
Notes on Museum-Methods in use at the Royal Botanic Garden, Edinburgh. With Plate III. By H. F. Tagg, F.L.S., Assistant in the Museum,	213
Title and List of Contents to Vol. I., 1900-1901.	

GLASGOW:

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from

OLIVER & BOYD, Edinburgh.

[PRICE NINEPENCE.]

[*All rights reserved.*]

The Diameter-Increment of Trees.[1]

BY

A. W. BORTHWICK, B.Sc.

There are two methods, apart from the use of callipers, by which the diameter-increment or rate of growth in thickness of trees can be ascertained. One of these—the tape-method—has already been described by Dr. Christison; the other is by use of a very simple instrument invented by Pressler, and known as Pressler's increment-borer. By means of this instrument cylinders of wood about a quarter-inch in diameter and from two to six inches long—according to species—can be extracted, and upon these the breadth of the year-rings may be measured. In order to allow for any eccentricity or irregularity of growth it is safer to take the mean of four cylinders, one from each end of two diameters at right angles.

The great difference between these two methods is that the tape-method requires a very considerable period of time in order to get reliable results, as we cannot draw an average from one or two season's growths. In very few cases have careful measurements extending over a long period of time been carried out, but in the whole history of British arboriculture there is no place where more extensive and careful girth-measurements have been made than in the Royal Botanic Garden, Edinburgh.[1]

By the kind permission of the Regius Keeper I have had the rare opportunity of testing whether the increment-borer would yield the same, or approximately the same, results as were obtained by Dr. Christison by means of the tape. The trees I examined were those measured by Dr. Christison, and the

[1] See Notes from the Royal Botanic Garden, Edinburgh, Number III. (1900), p. 41.

[Notes, R.B.G., Edin., No. V, 1901.

numbers attached to the trees are those of his lists. In many cases I was able to extract cylinders fully five inches long, and in no case less than two inches. The length of the cylinder is, however, not necessarily an indication of the number of year-rings in it. A cylinder five inches long from a broad-ringed or fast-growing tree may contain no more or even fewer year-rings than a cylinder four inches long from a narrow-ringed or slow-growing tree. The greatest number of year-rings extracted was forty from a horse-chestnut, while fifteen to twenty-five was an easily obtained number from other species. (See Table I.)

The breadth of the year-rings sometimes varies greatly on different sides of the same tree, especially in isolated trees which have not been grown in the company of others. This was well shown on many of the cylinders, so that cylinders of the same length from different sides of the tree do not necessarily have the same number of year-rings, and conversely cylinders with the same number of year-rings are not necessarily of equal lengths. This can be seen from the accompanying Table III.

Having got the four borings I counted off the number of year-rings in each. It was generally found that one of the cylinders showed a smaller number than any of the others. I therefore marked off this number (say n) on each of the other cylinders, disregarding any that were left over, as they did not come into consideration in making out an average. Having done this, I next found the aggregate length of the cylinders for this number of year-rings, and by dividing this by two and subtracting the result from the present diameter (bark included) I obtained the diameter which the tree had as many years ago as there were marked off rings in the cylinders. I next subtracted in succession twice the mean breadth of each annual ring from the diameter of the corresponding year, which gave the diameter of the preceding year. This operation gave the intermediate diameters and again the diameter n years ago. The first operation was an excellent means of checking the second.

It was then an easy matter to get the circumference for each year from the diameters. By subtracting the circumference for a certain year from that of the year following I got the circumference increment.

On comparing the results obtained by both methods—tape and

borer—it is extremely interesting to find how closely they coincide. The actual figures are not the same, because the borings were not taken at the same level as the tape-measurements. I purposely took them slightly higher or lower as seemed expedient in order not to interfere with the marked circumference measured by Dr. Christison.

Although the actual figures for each separate year do not exactly coincide, still the mean or average increment for a period of five or ten years does correspond very closely. In order to show the parallelism between both methods I have arranged the final results in adjacent columns in the appended Table 11.

It has been suggested that the increment-borer might damage the trees, but if care is taken to properly fill up the holes no danger can possibly exist. I may also point out that a very short time is required for the tree to naturally occlude such a trifling wound as the instrument makes. In almost every case the trees which I bored in the spring of last year were occluded by the autumn of this year and scarcely any trace of a scar remains.

The increment-borer can also be used in pathological work. For example, in making artificial infections, in order to study the course of development and effect on the tree of any wood-destroying fungus, there is no better method than to introduce a cylinder bored from a diseased tree into a healthy one. It is then an easy matter to extract cylinders from such an artificially infected tree at different times and from different parts, and thus get exact information regarding the rate at which the disease spreads and the various pathological appearances presented by the wood as the disease runs its course.

In determining the age of trees, if the diameter is not more than one foot the number of year-rings on an extracted cylinder will give this at once. If it is not possible to bore right into the centre we can still obtain the number of year rings on a certain length of the radius and from this compute the probable amount on the whole, always taking care to allow for the greater year-ring breadth near the centre of the stem. In many cases the pith is eccentric ; if, therefore, we bore four cylinders in the radial direction one of them is generally found to reach the pith even though the diameter of the stem be more than one foot.

The relation between the wood-mass of a tree and the time taken to produce it is a subject of considerable scientific and practical importance. No matter whether the trees are grown for ornamental or economic purposes, a knowledge of the relation between time-increment and volume-increment cannot fail to be of great service. The proprietor of parks and ornamental policy-grounds is always interested to know how his trees are doing, whether they are still increasing by growth or are already mature. On the other hand in economic forestry it is essential to know the amount of timber which is or can be produced in a given time under certain climatic conditions and sylvicultural treatment, otherwise financial calculations cannot be made with anything like the degree of accuracy which the case demands. The manifold external conditions influencing the growth of trees and plants in general make it well-nigh impossible to lay down any definite rules which are generally applicable for all species. A tree which is a fast grower in one locality may behave very differently in another, hence it is necessary for accurate results to collect statistics for each locality.

At present the German yield-tables are used in this country, and for general purposes are found to be approximately accurate, but the mere fact that in Germany local yield-tables are found to be necessary shows that the general yield-tables are not indiscriminately applicable. Our climate being an insular one, milder and moister, is bound to have a different effect on tree-growth from the continental climate of Europe.

If statistics were collected, especially for the Highlands, to which the German yield-tables are probably least applicable, they would be of great service to the forester, especially in making out working plans to guide the future management of the forests.

[TABLE.

I.

DIAMETER-INCREMENT AND NUMBER OF YEAR-RINGS BORED.

	Increment in Inches.	No. of Rings.
Æsculus - - - - -	9·44	40
Carpinus Betulus - - - -	2·01	20
Castanea vesca - - - -	7·58	28
Cedrus - - - - -	8·82	23
Fagus sylvatica - - - -	3·91	14
" " - - - -	3·71	14
Fraxinus excelsior - - -	3·39	12
Liriodendron - - - -	3·17	21
Quercus Cerris - - - -	2·05	12
" " - - - -	4·54	12
Taxus - - - - -	3·62	28
Tilia - - - - -	1·74	20
Ulmus - - - - -	7·06	15

II.

COMPARISON OF DR. CHRISTISON'S RESULTS OBTAINED BY MEANS OF TAPE WITH THOSE OBTAINED BY MEANS OF PRESSLER'S BORER.[1]

ÆSCULUS.		CARPINUS.	
Tape.	Borer.	Tape.	Borer.
·35 - - -	·37	·25 - - -	·31
·5 - - -	·38	·40 - - -	·31
·10 - - -	·21	·45 - - -	·37
·00 - - -	·12	·30 - - -	·28
·25 - - -	·09	·45 - - -	·31
·10 - - -	·18	·55 - - -	·37
·25 - - -	·09	·35 - - -	·40
·25 - - -	·18	·30 - - -	·21
·30 - - -	·16	·50 - - -	·31
·00 - - -	·12	·25 - - -	·31
1·65	1·90	3·80	3·18
	1·90		3·80
	1·65		3·18
Circum. Diff. = -	·25	Circum. Diff. = -	·62
Diam. Diff.[2] = -	·08	Diam. Diff. = -	·20
Mean Annual Diff.=	·008	Mean Annual Diff.=	·02

[1] Measurements in both cases are in inches.

[2] The Circumference-Difference has been divided in each case by 3. This gives the Diameter-Difference roughly, but near enough for the present purpose.

CASTANEA VESCA.		CEDRUS ATLANTICA.	
Tape.	Borer.	Tape.	Borer.
·60	·78	1·30	1·09
·75	·81	1·20	1·16
1·00	·65	1·30	1·13
·60	·78	1·20	1·03
·90	·81	1·20	1·19
·90	·59	1·50	1·53
·40	·65	1·25	1·44
·80	·53	1·10	1·13
·45	·50	·50	·34
·55	·69	·50	·53
6·95	6·79	11·05	10·57
	6·95		11·05
	6·79		10·57
Circum. Diff. =	·17	Circum. Diff. =	·48
Diam. Diff. =	·06	Diam. Diff. =	·16
Mean Annual Diff.=	·006	Mean Annual Diff.=	·016

FAGUS SYLVATICA.		FAGUS SYLVATICA.	
Tape.	Borer.	Tape.	Borer.
·75	·87	·80	·97
·80	·75	·95	·97
·95	·94	·95	·97
·90	·91	·90	·87
1·20	·87	·90	·94
1·10	·87	·90	·87
·85	·87	·90	·72
·60	·69	·90	·72
·90	·81	1·10	·94
·80	·78	·90	·65
8·85	8·36	9·20	8·62
	8·85		9·20
	8·36		8·62
Circum. Diff. =	·49	Circum. Diff. =	·58
Diam. Diff. =	·16	Diam. Diff. =	·19
Annual Mean Diff.=	·016	Annual Mean Diff.=	·019

FRAXINUS EXCELSIOR.

Tape.	Borer.
...	...
...	...
...	...
...	...
1·30	1·09
1·10	1·13
1·20	1·25
1·25	1·19
...	...
...	...
4·85	4·66
	4·85
	4·66
Circum. Diff. =	·19
Diam. Diff. =	·06
Mean Annual Diff. =	·006

LIRIODENDRON.

Tape.	Borer.
·35	·40
·40	·31
·80	·59
·50	·53
·65	·33
·40	·50
·75	·43
·35	·43
·40	·37
·25	·21
4·85	4·10
	4·85
	4·10
Circum. Diff. =	·75
Diam. Diff. =	·25
Mean Annual Diff. =	·025

QUERCUS CERRIS.

Tape.	Borer.
·70	·47
·45	·37
·65	·56
·50	·47
·70	·47
·85	·62
·70	·62
·55	·47
·80	·65
·60	·65
6·50	5·35
	6·50
	5·35
Circum. Diff. =	1·15
Diam. Diff. =	·35
Mean Annual Diff. =	·035

QUERCUS CONFERTA.

Tape.	Borer.
1·30	1·35
1·75	1·25
2·05	1·94
1·50	1·57
1·75	1·66
2·30	1·79
...	...
...	...
...	...
...	...
10·65	9·56
	10·65
	9·56
Circum. Diff. =	1·09
Diam. Diff. =	·36
Mean Annual Diff. =	·036

TAXUS.

Tape.	Borer.
·40	·37
·60	·50
·55	·47
·55	·40
·45	·31
·45	·40
·40	·31
·55	·37
·20	·34
4·55	3·87
	4·55
	3·87
Circum. Diff. =	·68
Diam. Diff. =	·22
Mean Annual Diff. =	·022

TILIA.

Tape.	Borer.
·00	·18
·50	·09
·40	·21
·25	·28
·20	·31
·40	·28
·35	·34
·00	·25
·30	·28
·35	·31
2·75	2·53
	2·75
	2·53
Circum. Diff. =	·22
Diam. Diff. =	07
Mean Annual Diff. =	·007

ULMUS.

Tape.	Borer.
1·75	1·66
1·80	2·16
1·75	1·72
1·50	1·82
1·30	1·34
1·70	1·57
1·60	1·19
2·05	0·94
1·75	1·57
1·35	1·44
16·55	15·41
	16·55
	15·41
Circum. Diff. =	1·14
Diam. Diff. =	·38
Mean Annual Diff. =	·038

III.

DETAILED RESULTS OBTAINED BY MEANS OF PRESSLER'S BORER.

ÆSCULUS HIPPOCASTANUM.

Diam. Inct. for 40 years=9·44. Diam. in 1899=17·16. Diam. in 1859=7·72.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1860	14/64	12/64	8/64	9/64	43/64	43/128	·33	8·05	25·289880	1·036728
1861	14/64	12/64	10/64	11/64	47/64	47/128	·36	8·41	26·420856	1·130976
1862	14/64	15/64	10/64	12/64	51/64	51/128	·39	8·80	27·646080	1·225224
1863	15/64	14/64	10/64	11/64	48/64	3/8	·37	9·17	28·808472	1·162392
1864	10/64	12/64	15/64	15/64	52/64	21/64	·32	9·49	29·813784	1·005312
1865	15/64	17/64	14/64	14/64	55/64	55/128	·42	9·91	31·133256	1·319472
1866	14/64	14/64	14/64	13/64	45/64	3/8	·37	10·28	32·295648	1·162392
1867	13/64	13/64	14/64	13/64	48/64	3/8	·37	10·65	33·458040	1·162392
1868	13/64	11/64	13/64	13/64	42/64	49/128	·38	11·03	34·651848	1·193808
1869	12/64	14/64	7/64	14/64	41/64	41/128	·32	11·35	35·657160	1·005312
1870	12/64	14/64	5/64	12/64	43/64	43/128	·33	11·68	36·693888	1·036728
1871	15/64	12/64	13/64	11/64	51/64	51/128	·39	12·07	37·919112	1·225224
1872	15/64	9/64	12/64	14/64	50/64	45/128	·35	12·42	39·018672	1·099560
1873	15/64	14/64	14/64	14/64	48/64	3/8	·37	12·79	40·181064	1·162392
1874	14/64	13/64	14/64	9/64	47/64	47/128	·36	13·15	41·312040	1·130976
1875	14/64	13/64	8/64	13/64	43/64	43/128	·33	13·48	42·348768	1·036728
1876	14/64	14/64	14/64	14/64	44/64	11/32	·34	13·82	43·416912	1·068144
1877	13/64	8/64	14/64	12/64	43/64	43/128	·33	14·15	44·453640	1·036728
1878	14/64	8/64	14/64	14/64	44/64	11/32	·34	14·49	45·521784	1·068144
1879	13/64	12/64	8/64	13/64	46/64	11/32	·34	14·83	46·589928	1·068144
1880	7/64	8/64	8/64	13/64	36/64	9/32	·28	15·11	47·469576	·879468
1881	5/64	5/64	8/64	13/64	31/64	31/128	·24	15·35	48·223560	·753984
1882	5/64	7/64	13/64	12/64	37/64	37/128	·28	15·63	49·103208	·879648
1883	6/64	6/64	13/64	8/64	33/64	1/4	·25	15·88	49·888608	·785400
1884	5/64	7/64	8/64	6/64	26/64	13/64	·20	16·08	50·516928	·628320
1885	7/64	8/64	4/64	8/64	27/64	27/128	·21	16·29	51·176664	·659736
1886	3/64	2/64	3/64	7/64	15/64	15/128	·11	16·40	51·522240	·345576
1887	3/64	3/64	3/64	6/64	15/64	15/128	·11	16·51	51·867816	·345576
1888	3/64	5/64	3/64	5/64	16/64	1/8	·12	16·63	52·244808	·376992
1889	3/64	3/64	4/64	2/64	12/64	3/32	·09	16·72	52·527552	·382744
1890	3/64	3/64	2/64	1/64	9/64	9/128	·07	16·79	52·747464	·219912
..	..	..	..	..	..	..	9·44	..	..	..

ÆSCULUS HIPPOCASTANUM—*Continued.*

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter	Circumference.	Circumference Increment.
						Vulg.	Deeimal.			
1891	3/64	1/64	1/64	1/64	6/64	3/64	·04	16·83	52·873128	.125664
1892	1/64	1/64	1/64	1/64	4/64	1/32	·03	16·86	52·967376	·094248
1893	1/64	3/64	2/64	2/64	8/64	1/16	·06	16·92	53·155872	·188496
1894	1/64	1/64	2/64	1/64	5/64	5/128	·03	16·95	53·250120	·094248
1895	3/64	3/64	1/64	1/64	8/64	1/16	·06	17·01	53·438616	·188496
1896	3/64	2/64	1/64	1/64	7/64	7/128	·05	17·06	53·595696	·167080
1897	3/64	1/64	1/64	1/64	6/64	3/64	·04	17·10	53·721360	·125664
1898	2/64	1/64	1/64	1/64	5/64	5/128	·03	17·13	53·815608	·094248
1899	1/64	1/64	1/64	1/64	4/64	1/32	·03	17·16	54·909856	·094248
..	..	..	..	..	..	..	9·44	..	..	..

CARPINUS BETULUS, NO. 33.

Diam. Inct. for 20 years = 2·01. Diam. in 1899 = 17. Diam. in 1879 = 14-99.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1880	3/64	3/64	3/64	3/64	12/64	3/32	·09	15·08	47·375328	·282744
1881	2/64	3/64	3/64	4/64	12/64	3/32	·09	15·17	47·658072	·282744
1882	3/64	4/64	3/64	5/64	15/64	15/128	·11	15·28	48·003648	
1883	3/64	4/64	4/64	6/64	17/64	17/128	·13	15·41	48·412056	·408408
1884	3/64	4/64	4/64	6/64	17/64	17/128	·13	15·54	48·820464	·408408
1885	4/64	4/64	4/64	4/64	16/64	1/8	·12	15·66	49·197456	·376992
1886	2/64	3/64	3/64	4/64	11/64	11/128	·08	15·74	49·448784	·251328
1887	3/64	4/64	3/64	3/64	16/64	1/8	·12	15·86	49·825776	·376992
1888	4/64	3/64	4/64	3/64	14/64	7/64	·10	15·96	50·139936	·314160
1889	2/64	3/64	4/64	5/64	14/64	13/128	·10	16·06	50·454096	·314160
1890	3/64	3/64	4/64	6/64	16/64	1/8	·12	16·18	50·831088	·376992
1891	2/64	4/64	3/64	3/64	12/64	3/32	·09	16·27	51·113832	·282744
1892	1/64	3/64	4/64	6/64	14/64	7/64	·10	16·37	51·427992	·314160
1893	3/64	4/64	4/64	5/64	16/64	1/8	·12	16-49	51·804984	·376992
1894	3/64	4/64	3/64	7/64	17/64	17/128	·13	16·62	52·213392	·408408
1895	1/64	3/64	3/64	4/64	9/64	9/128	·07	16·69	52·433304	·219912
1896	3/64	3/64	3/64	4/64	13/64	13/128	·10	16·79	52·747464	·314160
1897	3/64	3/64	2/64	6/64	14/64	7/64	·10	16·89	53·061624	·314160
1898	2/64	2/64	1/64	3/64	8/64	1/16	·06	16·95	53·250120	·188496
1899	2/64	2/64	1/64	2/64	7/64	7/128	·05	17·	53·407200	·157080
..	..	..	..	..	..	..	2·01	..	..	..

CEDRUS ATLANTICA, NO. 30.

Diam. Inct. for 23 years=8·82. Diam. in 1899=18·43. Diam. in 1876=9·61.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1877	13/64	14/64	13/64	14/64	54/64	27/64	·42	10·03	31·510248	1·319472
1878	17/64	12/64	18/64	17/64	71/64	71/128	·55	10·58	33·238128	1·727980
1879	13/64	14/64	16/64	14/64	59/64	13/32	·46	11·04	34·683264	1·445136
1880	16/64	16/64	18/64	16/64	66/64	66/128	·50	11·54	36·254064	1·570800
1881	13/64	13/64	14/64	13/64	53/64	59/128	·46	12·00	37·699200	1·445136
1882	17/64	16/64	17/64	13/64	63/64	63/128	·49	12·49	39·238584	1·539384
1883	15/64	13/64	13/64	13/64	53/64	13/32	·40	12·89	40·495224	1·256740
1884	18/64	16/64	14/64	14/64	62/64	31/64	·48	13·37	42·003192	1·507968
1885	17/64	13/64	12/64	13/64	55/64	55/128	·42	13·79	43·322664	1·319472
1886	13/64	14/64	10/64	11/64	54/64	27/64	·42	14·21	44·642136	1·319472
1887	20/64	14/64	9/64	11/64	54/64	27/64	·42	14·63	45·961608	1·319472
1888	13/64	13/64	8/64	12/64	46/64	23/64	·35	14·98	47·061168	1·099560
1889	14/64	13/64	8/64	14/64	48/64	3/8	·37	15·35	48·223560	1·162392
1890	13/64	10/64	8/64	16/64	47/64	47/128	·36	15·71	49·354536	1·130976
1891	11/64	11/64	4/64	17/64	43/64	43/128	·33	16·04	50·391264	1·036728
1892	11/64	13/64	8/64	17/64	49/64	49/128	·38	16·42	51·585072	1·193808
1893	13/64	16/64	15/64	19/64	63/64	63/128	·49	16·91	53·124456	1·539384
1894	17/64	15/64	16/64	17/64	65/64	13/32	·46	17·37	54·569592	1·445136
1895	15/64	9/64	13/64	17/64	54/64	47/128	·36	17·73	55·700568	1·130976
1896	2/64	3/64	6/64	4/64	15/64	15/128	·11	17·84	56·046144	·345576
1897	4/64	3/64	8/64	4/64	22/64	11/64	·17	18·01	56·580216	·534072
1898	6/64	6/64	11/64	6/64	29/64	7/32	·21	18·22	57·239952	·659736
1899	6/64	4/64	12/64	6/64	28/64	7/32	·21	18·43	57·899688	·659736
..	..	..	..	..	..	..	..	8·82	..	..	..

CASTANEA, NO. 4.

Diam. Inct. for 28 years = 7·58. Diam. in 1899 = 28·5. Diam. in 1871 = 20-92.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1872	13/64	13/64	13/64	14/64	53/64	53/128	·41	21·33	67·010328	1·288056
1873	16/64	11/64	8/64	12/64	47/64	47/128	·36	21·69	68·141304	1·130976
1874	14/64	15/64	13/64	12/64	54/64	27/64	·21	21·90	68·801040	·659736
1875	13/64	15/64	14/64	9/64	50/64	25/64	·39	22·29	70·026264	1·225224
1876	13/64	11/64	10/64	13/64	47/64	23/64	·35	22·64	71·125824	1·099560
1877	8/64	13/64	13/64	13/64	47/64	23/64	·35	22·99	72·225384	1·099560
1878	11/64	13/64	11/64	12/64	47/64	23/64	·35	23·34	73·324944	1·099560
1879	13/64	8/64	11/64	11/64	43/64	43/128	·33	23·67	74·361672	1·036728
1880	9/64	13/64	10/64	12/64	44/64	43/128	·33	24·00	75·398400	1·036728
1881	12/64	12/64	8/64	10/64	42/64	21/64	·32	24·32	76·403712	1·005312
1882	7/64	11/64	9/64	10/64	37/64	37/128	·28	24·60	77·283360	·879648
1883	8/64	13/64	10/64	9/64	40/64	5/16	·31	24·91	78·257256	·973896
1884	8/64	9/64	8/64	10/64	35/64	35/128	·27	25·18	79·105488	·848232
1885	7/64	13/64	9/64	10/64	39/64	19/64	·29	25·47	80·016552	·911064
1886	7/64	17/64	8/64	9/64	41/64	17/64	·26	25·73	80·833368	·816816
1887	8/64	7/64	7/64	8/64	30/64	15/64	·23	25·96	81·555936	·722568
1888	6/64	9/64	8/64	10/64	33/64	33/128	·25	26·21	82·341336	·785400
1889	6/64	13/64	8/64	8/64	35/64	17/64	·26	26·47	83·158152	·816816
1890	6/64	9/64	8/64	6/64	29/64	7/32	·21	26·68	83·817888	·659736
1891	6/64	15/64	7/64	5/64	33/64	33/128	·25	26·93	84·603288	·785400
1892	7/64	13/64	6/64	9/64	35/64	17/64	·26	27·19	85·420104	·816816
1893	6/64	6/64	7/64	6/64	25/64	25/128	·19	27·38	86·017008	·596904
1894	5/64	8/64	6/64	9/64	28/64	7/32	·21	27·59	86·676744	·659736
1895	5/64	6/64	5/64	9/64	25/64	23/128	·17	27·76	87·210816	·534072
1896	4/64	8/64	4/64	6/64	21/64	21/128	·16	27·92	87·713472	·502656
1897	4/64	8/64	8/64	9/64	29/64	29/128	·22	28·14	88·404624	·691152
1898	4/64	8/64	4/64	7/64	23/64	23/128	·17	28·31	88·938696	·534072
1899	4/64	8/64	7/64	6/64	25/64	25/128	·19	28·5	89·535600	·596904
..	..	..	..	..	..	..	7·58	..	..	..

FAGUS, NO. 7.

Diam. Inct. in 14 years = 3·91. Diam. in 1899 = 30·92. Diam. in 1885 = 27·01.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1886	9/64	9/64	6/64	14/64	38/64	19/64	·29	27·30	85·765680	·911064
1887	8/64	15/64	7/64	14/64	44/64	11/32	·34	27·64	86·833824	1·068144
1888	8/64	8/64	7/64	13/64	36/64	9/32	·28	27·92	87·713472	·879648
1889	8/64	8/64	7/64	8/64	31/64	31/128	·24	28·16	88·467456	·753984
1890	8/64	12/64	11/64	8/64	39/64	39/128	·30	28·46	89·409936	·942480
1891	8/64	11/64	11/64	8/64	38/64	19/64	·29	28·75	90·321000	·911064
1892	7/64	11/64	10/64	9/64	37/64	37/128	·28	29·03	91·200648	·879648
1893	6/64	12/64	9/64	9/64	36/64	9/32	·28	29·31	92·080296	·879648
1894	9/64	12/64	6/64	9/64	36/64	9/32	·28	29·59	92·959944	·879648
1895	9/64	8/64	5/64	7/64	29/64	29/128	·22	29·81	93·651096	·691152
1896	8/64	10/64	8/64	8/64	34/64	17/64	·26	30·07	94·467912	·816816
1897	6/64	10/64	8/64	8/64	32/64	1/4	·25	30·32	95·253312	·785400
1898	6/64	10/64	8/64	10/64	34/64	17/64	·26	30·58	96·070128	·816816
1899	6/64	14/64	10/64	14/64	44/64	11/32	·34	30·92	97·138272	1·068144
..	..	..	..	..	..	..	..	3·91	..	..	..

FAGUS, NO. 8.

Diam. Inct. for 14 years = 3·71. Diam. in 1899 = 26·4. Diam. in 1885 = 22·69.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1886	6/64	5/64	11/64	10/64	32/64	1/4	·25	22·91	72·068304	·78 400
1887	6/64	5/64	10/64	8/64	29/64	13/64	·23	23·17	72·790872	·722568
1888	7/64	8/64	12/64	13/64	40/64	5/16	·31	23·48	73·764768	·973896
1889	6/64	9/64	13/64	13/64	41/64	5/16	·31	23·79	74·738664	·973896
1890	6/64	8/64	13/64	11/64	38/64	5/16	·31	24·10	75·712560	·973896
1891	6/64	7/64	14/64	8/64	35/64	2/32	·28	24·38	76·592208	·879648
1892	7/64	8/64	13/64	9/64	37/64	32/128	·30	24·68	77·534688	·942480
1893	6/64	7/64	13/64	9/64	35/64	37/128	·28	24·96	78·414336	·87 648
1894	5/64	6/64	12/64	7/64	30/64	15/64	·23	25·19	79·136904	·722568
1895	5/64	7/64	12/64	6/64	30/64	15/64	·23	25·42	79·859472	·722568
1893	7/64	6/64	13/64	14/64	39/64	39/128	·30	25·72	80·801952	·942480
1897	8/64	7/64	8/64	4/64	27/64	27/128	·21	25·93	81·461688	·659736
1898	8/64	6/64	8/64	5/64	27/64	27/128	·21	26·14	82·121424	·659736
1899	11/64	11/64	7/64	5/64	34/64	17/64	·26	26·4	82·938240	·8.6816
..	..	..	..	..	..	..	3·71	..	..	..

FRAXINUS EXCELSIOR, NO. 2.

Diam. Inct. for 12 years = 3·39. Diam. in 1900 = 6·8. Diam. in 1888 = 3·41.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1889	8/64	14/64	10/64	8/64	40/64	21/64	·32	3·73	11·718168	1·105312
1890	8/64	12/64	11/64	8/64	39/64	41/128	·32	4·05	12·723480	1·005 12
1891	8/64	12/64	14/64	14/64	48/64	23/64	·35	4·40	13·823040	1·099560
1892	8/64	13/64	13/64	14/64	48/64	46/128	·35	4·75	14·922600	1·099560
1893	10/64	13/64	13/64	13/64	49/64	47/128	·36	5·11	16·053576	1·130976
1894	12/64	14/64	12/64	14/64	52/64	13/32	·40	5·57	17·310216	1·256640
1895	8/64	13/64	12/64	12/64	45/64	23/64	·35	5·86	18·409776	1·199 60
1896	5/64	8/64	8/64	6/64	27/64	27/128	·21	6·07	19·069512	·559736
1897	5/64	6/64	5/64	7/64	23/64	23/128	·17	6·24	19·603584	·534072
1898	4/64	3/64	4/64	5/64	16/64	1/8	·12	6·36	19·980576	·377092
1899	6/64	5/64	6/64	2/64	26/64	13/64	·20	6·56	20·608896	·628320
1900	8/64	6/64	8/64	2/64	31/64	31/128	·24	6·8	21·36288	·727392
..	..	..	..	..	..	..	3·39	..	..	..

LIRIODENDRON, NO. 6.

Diam. Inct. for 21 years=3·17. Diam. in 1899=28. Diam. in 1878=24·83.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1879	$\frac{5}{64}$	$\frac{2}{64}$	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{28}{64}$	$\frac{7}{32}$	·21	25·04	78·665664	·659736
1880	$\frac{4}{64}$	$\frac{8}{64}$	$\frac{8}{64}$	$\frac{5}{64}$	$\frac{25}{64}$	$\frac{25}{128}$	·19	25·23	79·262568	·596904
1881	$\frac{4}{64}$	$\frac{7}{64}$	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{22}{64}$	$\frac{11}{64}$	·17	25·40	79·796640	·534072
1882	$\frac{4}{64}$	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	25·55	80·267880	·471240
1883	$\frac{3}{64}$	$\frac{7}{64}$	$\frac{7}{64}$	$\frac{4}{64}$	$\frac{21}{64}$	$\frac{21}{128}$	·16	25·71	80·770536	·502656
1884	$\frac{4}{64}$	$\frac{12}{64}$	$\frac{7}{64}$	$\frac{4}{64}$	$\frac{25}{64}$	$\frac{25}{128}$	·19	25·90	81·367430	·596904
1885	$\frac{4}{64}$	$\frac{9}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{23}{64}$	$\frac{11}{64}$	·17	26·07	81·901512	·534072
1886	$\frac{4}{64}$	$\frac{9}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{23}{64}$	$\frac{23}{128}$	·17	26·24	82·435584	·534072
1887	$\frac{4}{64}$	$\frac{12}{64}$	$\frac{8}{64}$	$\frac{5}{64}$	$\frac{27}{64}$	$\frac{27}{128}$	·21	26·45	83·095320	·659736
1888	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	26·58	83·503728	·408408
1889	$\frac{2}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{14}{64}$	$\frac{7}{64}$	·1	26·68	83·817888	·314160
1890	$\frac{3}{64}$	$\frac{7}{64}$	$\frac{8}{64}$	$\frac{7}{64}$	$\frac{25}{64}$	$\frac{25}{128}$	·19	26·87	84·414792	·596904
1891	$\frac{6}{64}$	$\frac{7}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{22}{64}$	$\frac{11}{64}$	·17	27·04	84·948864	·534072
1892	$\frac{3}{64}$	$\frac{7}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{19}{64}$	$\frac{18}{128}$	·14	27·18	85·388688	·339824
1893	$\frac{4}{64}$	$\frac{8}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{21}{64}$	$\frac{21}{128}$	·16	27·34	85·891344	·502656
1894	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{18}{64}$	$\frac{9}{64}$	·14	27·48	86·331168	·439824
1895	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{19}{64}$	$\frac{19}{128}$	·14	27·62	86·770992	·439824
1896	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	27·74	87·147984	·376992
1897	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{3}{64}$	$\frac{1}{64}$	$\frac{9}{64}$	$\frac{9}{128}$	·07	27·81	87·367896	·219912
1898	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{2}{64}$	$\frac{10}{64}$	$\frac{5}{64}$	·07	27·88	87·587808	·219912
1899	$\frac{2}{64}$	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	28·0	87·964800	·376992
..	..	..	..	..	..	..	..	3·17	..	..	..

QUERCUS CERRIS, NO. 63.

Diam. Inct. for 12 years=2·05. Diam. in 1899=22·2. Diam. in 1887=20·15.

Years.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1888	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	20·30	63·774480	·471240
1889	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	20·42	64·151472	·376992
1890	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{24}{64}$	$\frac{3}{16}$	·18	20·60	64·716960	·565488
1891	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	20·75	65·188200	·471240
1892	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{5}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	20·90	65·659440	·471240
1893	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{26}{64}$	$\frac{13}{64}$	·20	21·10	66·287760	·628320
1894	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{26}{64}$	$\frac{13}{64}$	·20	21·30	66·916080	·628320
1895	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	21·45	67·387320	·471240
1896	$\frac{7}{64}$	$\frac{5}{64}$	$\frac{8}{64}$	$\frac{8}{64}$	$\frac{28}{64}$	$\frac{7}{32}$	·21	21·66	68·047056	·659736
1897	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{7}{64}$	$\frac{7}{64}$	$\frac{27}{64}$	$\frac{27}{128}$	·21	21·87	68·706792	·659736
1898	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	22·02	69·178032	·471240
1899	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{6}{64}$	$\frac{24}{64}$	$\frac{3}{16}$	·18	22·2	69·743520	·565488
..	..	..	..	..	..	..	2·05	..	..	..

QUERCUS CONFERTA, NO. 54.

Diam. Inct. for 12 years=4·54. Diam. in 1899=14·5. Diam. in 1887=9·96.

Ye r.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1888	$\frac{16}{64}$	$\frac{12}{64}$	$\frac{12}{64}$	$\frac{16}{64}$	$\frac{56}{64}$	$\frac{7}{16}$	·43	10·39	32·641224	1·350888
1889	$\frac{12}{64}$	$\frac{16}{64}$	$\frac{16}{64}$	$\frac{18}{64}$	$\frac{62}{64}$	$\frac{1}{32}$	·40	10·79	33·897864	1·256640
1890	$\frac{16}{64}$	$\frac{22}{64}$	$\frac{20}{64}$	$\frac{22}{64}$	$\frac{80}{64}$	$\frac{5}{8}$	·62	11·41	35·845656	1·947792
1891	$\frac{18}{64}$	$\frac{14}{64}$	$\frac{14}{64}$	$\frac{18}{64}$	$\frac{64}{64}$	$\frac{1}{2}$	·50	11·91	37·416456	1·570800
1892	$\frac{17}{64}$	$\frac{18}{64}$	$\frac{22}{64}$	$\frac{17}{64}$	$\frac{68}{64}$	$\frac{17}{32}$	·53	12·44	39·081504	1·665048
1893	$\frac{18}{64}$	$\frac{18}{64}$	$\frac{20}{64}$	$\frac{18}{64}$	$\frac{74}{64}$	$\frac{37}{64}$	·57	13·01	40·872216	1·790712
1894	$\frac{12}{64}$	$\frac{13}{64}$	$\frac{10}{64}$	$\frac{8}{64}$	$\frac{56}{64}$	$\frac{7}{16}$	·43	13·44	42·223104	1·350888
1895	$\frac{12}{64}$	$\frac{6}{64}$	$\frac{16}{64}$	$\frac{10}{64}$	$\frac{44}{64}$	$\frac{11}{32}$	·34	13·78	43·291248	1·068144
1896	$\frac{10}{64}$	$\frac{15}{64}$	$\frac{9}{64}$	$\frac{4}{64}$	$\frac{38}{64}$	$\frac{19}{64}$	·29	14·07	44·202312	·911064
1897	$\frac{4}{64}$	$\frac{8}{64}$	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	14·22	44·673552	·471240
1898	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{15}{64}$	$\frac{15}{128}$	·11	14·33	45·019128	·345576
1899	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{2}{64}$	$\frac{5}{64}$	$\frac{23}{64}$	$\frac{11}{64}$	·17	14·50	45·553200	·534072
..	..	..	.	..	..	..	4·54	..	..	..

TILIA, NO. 2.

Diam. Inct. for 20 years = 1·74. Diam. in 1899 = 26. Diam. in 1879 = 24·26.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1880	$\frac{2}{64}$	$\frac{2}{64}$	$\frac{7}{64}$	$\frac{5}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	24·38	76·592208	·376992
1881	$\frac{1}{64}$	$\frac{2}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{11}{64}$	$\frac{3}{32}$	·09	24·47	76·874952	·282744
1882	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{6}{64}$	$\frac{1}{64}$	$\frac{13}{64}$	$1\frac{13}{128}$	·10	24·57	77·189112	·314160
1883	$\frac{5}{64}$	$\frac{5}{64}$	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{19}{64}$	$1\frac{19}{128}$	·14	24·71	77·628936	·439824
1884	$\frac{2}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{2}{64}$	$\frac{13}{64}$	$1\frac{15}{128}$	·10	24·81	77·943096	·314160
1885	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{2}{64}$	$\frac{10}{64}$	$\frac{5}{64}$	·07	24·88	78·163008	·219912
1886	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{10}{64}$	$\frac{5}{64}$	·07	24·95	78·382920	·219912
1887	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{2}{64}$	$\frac{3}{64}$	$\frac{13}{64}$	$1\frac{13}{128}$	·10	25·05	78·697000	·314160
1888	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{2}{64}$	$\frac{8}{64}$	$\frac{1}{16}$	·06	25·11	78·885576	·188496
1889	$\frac{1}{64}$	$\frac{2}{64}$	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{5}{64}$	$1\frac{5}{128}$	·03	25·14	78·979824	·094248
1890	$\frac{1}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{7}{64}$	$1\frac{9}{128}$	·07	25·21	79·199736	·219912
1891	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{12}{64}$	$\frac{3}{32}$	·09	25·30	79·482480	·282744
1892	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{14}{64}$	$\frac{7}{64}$	·10	25·40	79·796640	·314160
1893	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{12}{64}$	$\frac{3}{32}$	·09	25·49	80·079384	·282744
1894	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{2}{64}$	$\frac{4}{64}$	$\frac{15}{64}$	$1\frac{15}{128}$	·11	25·60	80·424960	·345576
1895	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{11}{64}$	$1\frac{11}{128}$	·08	25·68	80·676288	·251328
1896	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{12}{64}$	$\frac{3}{32}$	·09	25·77	80·959032	·282744
1897	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{14}{64}$	$1\frac{15}{128}$	·10	25·87	81·273192	·314160
1898	$\frac{2}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{13}{64}$	$\frac{3}{32}$	·09	25·96	81·555936	·282744
1899	$\frac{1}{64}$	$\frac{1}{64}$	$\frac{2}{64}$	$\frac{2}{64}$	$\frac{6}{64}$	$\frac{3}{64}$	·04	26·	81·681600	·125664
..	..	..	..	..	..	..	1·74	..	..	..

TAXUS, NO. 41.

Diam. Inct. for 28 years = 3·62. *Diam. in 1899 = 24·4.* *Diam. in 1871 = 20·78.*

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1872	$\frac{7}{64}$	$\frac{3}{64}$	$\frac{9}{64}$	$\frac{3}{64}$	$\frac{22}{64}$	$\frac{11}{64}$	·17	20·95	65·81652	·534072
1873	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	21·10	66·28776	·47124
1874	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	21·25	66·75900	·47124
1875	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	21·37	67·135992	·376992
1876	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	21·49	67·512984	·376992
1877	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	21·61	67·889976	·376992
1878	$\frac{7}{64}$	$\frac{3}{64}$	$\frac{8}{64}$	$\frac{2}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	21·76	68·361216	·471240
1879	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	21·89	68·769624	·408408
1880	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{7}{64}$	$\frac{3}{64}$	$\frac{18}{64}$	$\frac{9}{64}$	·14	22·03	69·209448	·439824
1881	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	22·15	69·586440	·376992
1882	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{19}{64}$	$\frac{19}{128}$	·14	22·29	70·026264	·439824
1883	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{19}{64}$	$\frac{19}{128}$	·14	22 43	70·466088	·439824
1884	$\frac{8}{64}$	$\frac{4}{64}$	$\frac{7}{64}$	$\frac{4}{64}$	$\frac{23}{64}$	$\frac{23}{128}$	·17	22·60	71·000160	·534072
1885	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	22·73	71·408568	·408408
1886	$\frac{6}{64}$	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{18}{64}$	$\frac{9}{64}$	·14	22·87	71·848392	·439824
1887	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{15}{64}$	$\frac{15}{128}$	·11	22·98	72·193968	·345576
1888	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	23·10	72·570960	·376992
1889	$\frac{8}{64}$	$\frac{3}{64}$	$\frac{7}{64}$	$\frac{3}{64}$	$\frac{21}{64}$	$\frac{21}{128}$	·16	23·26	73·073616	·502656
1890	$\frac{7}{64}$	$\frac{4}{64}$	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{20}{64}$	$\frac{5}{32}$	·15	23·41	73·544856	·471240
1891	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	23·54	73·953264	·408408
1892	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{3}{64}$	$\frac{2}{64}$	$\frac{13}{64}$	$\frac{13}{128}$	·10	23·64	74·267424	·314160
1893	$\frac{7}{64}$	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{2}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	23·77	74·675832	·408408
1894	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{17}{64}$	$\frac{17}{128}$	·13	23·90	75·084240	·408408
1895	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{1}{64}$	$\frac{14}{64}$	$\frac{7}{64}$	·10	24·00	75·398400	·314160
1896	$\frac{6}{64}$	$\frac{2}{64}$	$\frac{7}{64}$	$\frac{1}{64}$	$\frac{16}{64}$	$\frac{1}{8}$	·12	24·12	75·775392	·376992
1897	$\frac{6}{64}$	$\frac{3}{64}$	$\frac{5}{64}$	$\frac{1}{64}$	$\frac{15}{64}$	$\frac{15}{128}$	·11	24·23	76·120968	·345576
1898	$\frac{5}{64}$	$\frac{3}{64}$	$\frac{4}{64}$	$\frac{1}{64}$	$\frac{13}{64}$	$\frac{13}{128}$	·10	24·33	76·435128	·314160
1899	$\frac{4}{64}$	$\frac{2}{64}$	$\frac{2}{64}$	$\frac{1}{64}$	$\frac{9}{64}$	$\frac{9}{128}$	·07	24·4	76·655040	·219912
..	..	..	..	..	..	..	3·62	..	..	..

ULMUS MONTANA, NO. 93.

Diam. Inct. for 15 years=7·16. Diam. in 1900=11. Diam. in 1885=3·84.

Year.	N.	S.	E.	W.	Sum.	Average.		Diameter.	Circumference.	Circumference Increment.
						Vulg.	Decimal.			
1886	14/64	16/64	12/64	26/64	7/8	7/128	·58	4·42	13·885872	1·822128
1887	12/64	14/64	18/64	26/64	10/64	35/64	·54	4·96	15·582336	1·696464
1888	16/64	17/64	16/64	19/64	68/64	34/64	·53	5·49	17·247384	1·665048
1889	20/64	20/64	21/64	28/64	89/64	89/128	·69	6·18	19·415088	2·167704
1890	20/64	16/64	20/64	15/64	71/64	71/128	·55	6·73	21·142968	1·727880
1891	22/64	13/64	15/64	25/64	7/8	75/128	·58	7·31	22·965096	1·822128
1892	16/64	7/64	15/64	8/64	56/64	7/16	·43	7·74	24·315984	1·349888
1893	22/64	13/64	17/64	12/64	64/64	1/2	·5	8·24	25·886784	1·570800
1894	16/64	4/64	18/64	21/64	59/64	59/128	·38	8·62	27·080592	1·193808
1895	26/64	12/64	19/64	21/64	78/64	39/128	·30	8·92	28·023072	0·942480
1896	32/64	5/64	19/64	8/64	64/64	1/2	·5	9·42	29·593872	1·570800
1897	32/64	8/64	11/64	19/64	60/64	15/32	·46	9·88	31·039008	1·445136
1898	10/64	15/64	11/64	16/64	52/64	13/32	·40	10·28	32·295648	1·256640
1899	12/64	8/64	17/64	11/64	48/64	3/8	·37	10·65	33·458040	1·162392
1900	20/64	5/64	16/64	5/64	46/64	23/64	·35	11·00	34·5576	1·099560
..	..	..	..	..	..	..	7·16	..	..	..

Hints on Propagating Mistletoe from the Berry.[1]

BY

WILLIAM PAXTON.

The best tree for growing mistletoe on is a young Siberian Crab, with a stem below branches of about four feet in height. Young apple-trees are suitable also, and, in general, soft-wooded trees, such as the rowan. The best time for sowing is spring, about April, and the berries must have been freshly gathered within a few days. There are male and female mistletoe plants, which must be grown near each other in order to produce berries on the female plant.

Select a branch of from one to two inches in diameter, with clean, smooth bark, free from roughness or inequalities of any kind; also free from little side twigs from which birds could pick the berries. No incision, scratch, or bruise is to be made on the surface of the bark. This is of the utmost importance.

Take the berry between the finger and thumb and gently squeeze out the seed on to the bark, throwing away the skin. The seed will readily adhere by the viscid substance which is contained in the berry. The seed should not be rubbed in any way, but simply placed on the branch. In a short time the gummy substance dries up, leaving the seed firmly adhering to the branch. Several seeds should be placed together, or near each other, as probably only one out of half-a-dozen will grow.

Shortly after the berries have been placed a young green process appears, which turns towards the bark, and ultimately fixes itself there by a disk, but a year will have to elapse before it can be seen whether the seedling will grow or not.

[1] As we receive frequently applications for information upon this subject, this note by Mr. William Paxton of Orchardton, Fountainhall Road, Edinburgh, an enthusiastic and successful cultivator of mistletoe, should be generally useful.—*Regius Keeper.*

[Notes, R.G.B., Edin., No. V, 1901.]

Notes on Museum-Methods in use at the Royal Botanic Garden, Edinburgh.

BY

H. F. TAGG, F.L.S.,

ASSISTANT IN THE MUSEUM.

With Plate III.

CONTENTS.

PAGE

INTRODUCTORY, ... 215
PRESERVING, ... 215
I. General, ... 215
II. Methods, ... 217
A. In Liquid media—
1. Alcoholic solutions, ... 218
a. Alcohol 90 per cent., ... 218
I. For herbaceous specimens, ... 218
II. For woody objects, ... 220
III. For succulent objects, ... 220
b. Alcohol 50-80 per cent., ... 221
c. Alcohol and glycerine, ... 221
d. Synthol, ... 222
2. Aqueous solutions—
a. Formalin, ... 222
I. For retention of colour, ... 223
II. For retention of form, ... 224
III. Methods, ... 225
IV. In the field, ... 225
b. Boric acid, ... 225
c. Camphor-water, ... 226
d. Salicylic acid, ... 226
e. Fluorides of sodium, ... 226

[Notes, R.B.G., Edin., No. V, 1901.]

B. By Drying—
1. In air, ... 227
a. Branches and twigs, ... 227
b. Woods, ... 227
c. Fruits, ... 228
2. In sand, ... 228

BLEACHING—
I. General, ... 230
II. Methods, ... 231
A. In 90 per cent. alcohol, ... 231
B. Before preserving, ... 232
I. Preliminary and rapid killing—
a. In boiling water, ... 232
b. In boiling 90 per cent. alcohol, ... 232
c. In boiling acetic acid and alcohol, ... 232
II. Preliminary soaking in solutions preventing discolouration—
1. Not making specimen flaccid, ... 233
a. Acid alcohol, ... 233
b. Potassium chlorate, ... 233
2. Making specimen flaccid, ... 234
Dilute acid alcohol, ... 234
C. After preserving if specimen becomes discoloured—
1. Not making specimen flaccid, ... 234
2. Making specimen flaccid, ... 235
a. Bleaching solution, ... 235
b. Hot water and acid, ... 235

FIXING AND SUSPENDING THE SPECIMEN—
I. General, ... 236
II. Methods, ... 237
I. Cements for attaching specimen, ... 237
A. For use with alcohol, ... 237
1. For light objects, ... 237
2. For heavy objects, ... 238
B. For use with formalin, ... 239
1. For light objects, ... 239
2. For heavy objects, ... 239
II. Supports for specimens, ... 239

DESCRIPTIVE LABELS—
I. General, ... 240
II. Methods, ... 241
I. Specimens in alcohol or formalin, ... 241
II. Dry specimens, ... 241
III. Models, ... 242

LUTING FOR LIDS OF VESSELS—
I. Permanent sealing, ... 242
II. Firm sealing, ... 243
III. Temporary sealing, ... 243
BUILDING UP OF GLASS VESSELS, ... 244

INTRODUCTORY.

It has been the practice in preparing specimens for the Museum of the Royal Botanic Garden, Edinburgh, to endeavour to preserve as naturally as possible the form of the specimen, and to name, where such a course seemed to add to the educational value of the exhibit, the different organs and parts of the specimen. The object has been to facilitate a comparison by students of the specimens exhibited, with the descriptions in text-books and lecture-notes.

A specimen so prepared was exhibited at a meeting of the British Association in 1896, and again in 1901 at a meeting of the same Association some notes on the subject were submitted. Requests have since been received for fuller details; these and the frequent enquiries made by visitors to the Museum for information concerning the preservation of plants for exhibition in museums have prompted the following descriptions of the methods employed.

PRESERVING.

I. General.

In the process of preserving, two stages are to be distinguished —first, killing the plant; second, its subsequent permanent preservation. The method adopted for the latter stage is commonly made to accomplish the former also; the preservative at the same time kills. The two operations may, however, be separate and distinct, but in practice, with some few exceptions, it is not found an advantage to separate the killing and preserving processes, provided always that the preservative kills fairly quickly.

Any method which inhibits the action of putrefactive organisms will, in the simplest sense, preserve plant-structures. A preservative may, moreover, while preventing the grosser changes of

putrefaction, arrest also, to a certain extent, intrinsic decompositions following death. A preservative may alter also, harden, and render firm, or it may be render more soft, the consistency of the plant-tissues.

Upon the prevention of internal changes rests the retention of the natural colours, or, if these be destroyed, the prevention of the formation of discolouring products, while hardening, if it takes place before characters of form have been destroyed, fixes such characters permanently.

The hardening may be due to desiccation either in the air, as happens when specimens are dried, or by the dehydrating action of a liquid medium, or it may result from chemical changes in the plant-substances induced by the preserving medium employed.

Reviewing the results of many experiments, it is impossible to say of any one preserving method that it is the best; the choice of a method must rest not only upon a consideration of the general character of the specimen, but upon a consideration also of any special feature or character the preservation of which may be particularly desired. The separation of such characters into characters of colour and characters of form coincides with the separation of the methods of preserving into two groups—preserving by drying the specimen, and preserving by means of liquid preserving media,

Drying the plant has proved the only method at all satisfactory for preserving the colours of plants, but fails commonly when applied to the preservation of the natural form. Liquid preservatives are invaluable for the preservation of the form of plants, but their use involves a sacrifice of the natural colours.

Again, as preservatives of the form of plants all liquid media are not equally useful, and it is necessary to distinguish those preserving only the form and shape of the separate parts from those preserving also the relationships of the parts to one another. Expressed concretely, the separate leaves on a twig, their shape, substance, and form, may be well preserved in a given medium, but unless there is also preserved the correct angle at which the leaves stand out from the stem and their relationships to one another in leaf-symmetry, then the preservation of the form of the specimen is of a limited kind.

One has to distinguish, then, the preservation of the form of the parts and the preservation of the lie of the organs of the plant.[1]

II. Methods.

The following is a convenient grouping of the methods of preserving here referred to :—

A. *In liquid media.*

1. ALCOHOLIC SOLUTIONS.

a. Alcohol 90 per cent.
b. Alcohol, 50 to 80 per cent.
c. Alcohol and Glycerine.
d. Synthol.

2. AQUEOUS SOLUTIONS.

a. Formaline.
b. Boric Acid.
c. Camphor-water.
d. Salicylic Acid.
e. Fluorides of Sodium.

B. *By drying.*

1. In Air.
2. In Sand.

I will deal with each of these separately:—

Of the alcoholic solutions, 90 per cent. alcohol is the one generally used, and of the aqueous, formaline. The other solutions referred to are some of the less-known preservatives which have occasionally proved useful.

[1] What we in Edinburgh have been in the habit of calling the "lie" of the organs has been termed by Professor Errera, in his report on experiments made at the Institute de Botanique, Brussels, "the attitude" of the specimen. In most of the literature of the subject when a medium is described as preserving well the natural form, the shape of the separate organs is only referred to.

A. PRESERVING IN LIQUID MEDIA.

1. ALCOHOLIC SOLUTIONS.

a. Alcohol 90 per cent.

The alcohol commonly used is strong commercial methylated spirit about 90 per cent. and free from mineral naphtha. As obtained it is somewhat turbid and commonly of a slight brownish colour, and I find that specimens are stained if the preservative is used in this crude state. To prevent this, before being used the alcohol is rendered clear by distillation. The strength of the alcohol in the process is slightly raised, and varies after distillation from 91 to 95 per cent.

Such strong alcohol, perfectly clear, has been found to give by far the best results. It penetrates the tissues rapidly, quickly kills the protoplasm, and very readily hardens, the hardening being due to dehydration. As with other media, the usefulness varies with the class of specimen to be preserved.

Class I.—Herbaceous Structures.

For herbaceous structures generally, leaves, tendrils, and nearly all flowers, alcohol proves of great value, but particularly so where the lie and symmetry of the organs as well as their shape and firmness are controlled by the turgescence of parenchyma-cells rather than by special strengthening tissues. Specimens of the kind killed and preserved in any of the aqueous media become flaccid and soft, and although the separate organs may retain their form, the relationships of the parts are not preserved. Killed in alcohol or by other methods and subsequently preserved in an aqueous medium the results are similar, but killed and also preserved in alcohol such specimens retain permanently the natural shape of the parts and the relationships of symmetry.

Not an unimportant factor in these results is the readiness with which alcohol wets the surface of the specimen, removing from surface-irregularities air, which, if allowed to remain, would interfere with the ready penetration of the medium. More important is its low specific gravity and its power of rapidly dehydrating. Placed in alcohol the specimen as a rule very slowly sinks: it is slightly heavier than the medium. This being so, the

loss of turgescence gradual, and the hardening of the specimen quick, little change of position of the organs results. Whereas when a specimen is placed in an aqueous medium it is from the first evident that the buoyancy of the parts tends greatly to distort its form.

Method of Procedure. — The specimen when gathered is immersed in the preservative before the least flagging or withering occurs. In many cases it is found necessary to carry the jar with the alcohol into the garden or plant-house, and to drop at once the specimen, as it is gathered, into the preservative. In the alcohol the specimen commonly as already stated slowly sinks, but if large quantities of air are present in the tissues it may at first float or only partially sink. It is undesirable that any part of the specimen should be left uncovered, and when the specimen does not of itself sink readily, either a small weight is attached to it by a silk thread to sink it, or it is fastened in some way to the glass support on which it is finally to be mounted and is thus held immersed.

The time taken to effect the hardening varies with the size and character of the specimen. With small specimens a few minutes will suffice; with others several hours will be required; but in all cases when once immersed the specimen should not be removed until it is completely hardened.

As the alcohol enters, the air present in the tissues is driven out, and any colouring substances present are at same time discharged and diffuse in the surrounding fluid. Chlorophyll if present is thus extracted as well as the colours of most flowers, the blue colour of some alone, being to a certain extent retained.

That the bleaching may prove satisfactory the jar containing the specimen is left in a position exposed to strong sunlight, which is most effective, aiding the discharge of the colouring substances and preventing the formation of discolouring decomposition-products, when the specimen is subjected to its action immediately after being immersed in the alcohol.

In the majority of cases chlorophyll is the colour-substance principally discharged. The chlorophyll-solution thus produced, if left exposed to sunlight, decomposes, and the spirit becomes almost clear, but it proves advantage, if well-bleached specimens are desired, to pour off this chlorophyll-solution as soon as the

specimen is properly hardened, and to substitute for it fresh clear spirit. This fresh spirit may become discoloured also, and so from time to time clear spirit must be substituted for that discoloured until a discharge of discolouring substances no longer takes place. The specimen, if then white, is ready for mounting ; if it be dark-coloured and a bleached specimen is required it is treated in one of the ways described below under Bleaching (p. 230).

Class II.—Woody Objects.

Specimens of this kind appear to be equally well preserved in alcohol or in formaline, so that the choice of a preservative rests chiefly upon a consideration of the ultimate method of exhibition. If photoxylin is to be employed in the final mounting, alcohol is used ; if gelatine, then formaline is the preservative chosen.

Class III.—Succulent Objects.

When the object to be preserved is bulky and contains relatively large quantities of water the dehydrating action of alcohol becomes a disadvantage. The quantity of water to be absorbed may be considerable, and its diffusion in the enveloping alcohol being comparatively slow, the specimen may come to be surrounded by an alcoholic solution of low percentage—too weak at first to have any hardening action on the tissues. The absorption of water from the specimen proceeding faster than the process of replacement by the alcohol, the unhardened external portions collapse and the specimen becomes wrinkled on the surface. If succulent specimens are to be preserved in alcohol they must first of all be placed in a weak solution (30 per cent.) and then slowly graded from this to alcohols of greater strength.

Sections of succulent fruits, and even of flowers and other specimens coming under Class I., contract somewhat on the cut surface, the amount of contraction varying with the area of cut surface and with the degree of succulence of the specimen. The curvatures that result may be counteracted if the section is kept flat between two pieces of glass. The section freshly cut is laid upon one piece of glass, a second piece is placed over it,

and the two are then firmly tied together with thin twine. The pieces of glass with the specimen thus secured between them are placed in the preservative and are allowed to remain there undisturbed until the specimen is completely hardened.

Alcohol being extremely volatile, it must always be kept in well sealed jars if its strength as a preservative is to be maintained. Regarding the one disadvantage attaching to its use—viz., the destruction of the natural colours—a compensating feature exists in the readiness with which it bleaches white the majority of specimens. Such bleaching, if the form of the specimen is well preserved, is perhaps more to be desired than the temporary or imperfect retention of colour to be secured in some cases by the use of formaline.

b. Alcohol.—80 per cent., 70 per cent., 60 per cent.

The lower percentages of alcohol are prepared by mixing with water the requisite amount of 90 per cent. alcohol after distillation.

The objection urged against aqueous media that they do not harden delicate specimens applies also to weak alcohol.

Experiments made with alcohols of varying degrees of strength go to show that while the weaker percentages may be employed with some success in preserving certain plants they possess even for these, with the exception of succulent specimens coming under Class III., no advantages over the 90 per cent. alcohol. For the great majority of specimens the weaker alcohol proves unsatisfactory, and the results of experiments with it show that where it is desirable to fix in the best manner possible the natural lie of the parts of a specimen it is not safe to employ alcohol of less strength than 90 per cent.

70 per cent. and 80 per cent. alcohols are useful, however, for the firmer and more woody specimens of Class II., while 50 per cent. alcohol or even 30 per cent. is valuable as a commencing medium for the more succulent specimens.

c. Alcohol and Glycerine—90 per cent. Alcohol 50 c.c., and Glycerine 50 c.c.

This has proved useful for the temporary preservation of material before dissection when the 90 per cent. alcohol alone would have made the material too brittle.

For softening material already hardened it is to be preferred generally to the 50 per cent. water-solution often employed for the purpose. The glycerine tends to keep the material pliable without exerting the macerating action that water under similar circumstances with delicate specimens is inclined to do.

It has been employed with some success for succulent specimens causing less contraction in such than alcohol does alone. For this purpose the following formula is used :—

90 per cent. Alcohol, . .	50 c.c.
Water, ...	50 c.c.
Glycerine, ...	50 c.c.

d. Synthol.

Recently an alcoholic preparation called synthol has been recommended as a preservative for museum purposes.

It is claimed for it that it is a perfect substitute for absolute alcohol, and that it is an excellent dehydrating agent and a preservative of the first order.

From experiments I have made with it absolute synthol appears to act efficiently as a substitute for absolute alcohol.

For museum purposes, used undiluted, it penetrates and hardens delicate tissues rapidly and at the same time bleaches them as effectively as strong methylated alcohol. Diluted with water its action is less rapid, while the weaker percentages, as with alcohol proper, fail to harden. Photoxylin can be used with it as a mounting medium, but gelatine contracts and becomes opaque.

2. AQUEOUS SOLUTIONS.

a. Formalin.

Formol, formalin, formaline are commercial names for a 40 per cent. solution in water of formaldehyde, CH_2O. As a preservative the commercial preparation is used undiluted, or diluted with water to whatever extent required. The solutions which have been found most useful are—formalin 10 parts, water 90 parts ; and formalin 15 parts, water 85 parts. Weaker solutions have been tried, but with them moulds in nearly all cases make their appearance on the surface of the fluid. The weaker solutions prove less reliable the larger the bulk of organic substance

to be preserved relative to the amount of fluid employed. A one per cent. solution will preserve plant-structures for a time, but ultimately moulds invade the preparation, and this happens relatively sooner if any part of the specimen be left exposed above the surface of the fluid. A point of importance is the deterioration of the fluid which in the course of time appears to a certain extent to take place. Formaldehyde gas is extremely volatile, and unless the jars containing the specimens are carefully sealed a weakening of the solution undoubtedly follows. From my experiments it appears that a deterioration may result—firstly, in consequence of the volatile nature of the formaldehyde gas, and secondly, as a result of changes and decompositions which it would seem take place in the presence of organic substances in the fluid itself. This being so, it is not surprising that the weaker solutions after a time permit the growth of moulds.

A note of interest in connection with the presence of acid substances in formalin is contributed by M. Trillat,[1] who points out that commercial formalin may contain as impurities acetic acid, formic acid, and pyroligneous products.

Formalin does not very readily wet the surface of plants, and penetration of the specimen by the liquid I have found to be in consequence comparatively slow. Until penetration is complete, and even for some time after, plants may retain to a certain extent their natural colours. The results of my experiments in this direction are as follows :—

Formalin for Preservation of Natural Colours.

The red, yellow, and blue colours of flowers are better retained than they are in most other media ; but the retention is not permanent. Red and yellow colours are retained longer than blue, but even red—the colour which has proved most permanent—ultimately fades or gives place to a brown if the jar containing the specimen is exposed to the light.

Formalin does not appear to extract chlorophyll, neither does it preserve the green colour, but exposed even to diffused light the chlorophyll is decomposed and the specimen assumes a dull brownish colour, or may, finally, be bleached quite white.

[1] Journ. de Pharm. (5), xxix., p. 537.

In the stronger solutions the fading of the colours is more rapid than in the weaker ; but, as already stated, the disadvantage of the weaker solutions is that they permit the growth of moulds. If formalin is added to sea-water and the specimens are protected from the light the colours of marine algæ are fairly well preserved. These results are in agreement with most of the observations recorded.

White flowers may remain uncoloured, becoming nevertheless, as the fluid penetrates, more or less translucent, as may happen also with coloured flowers and other specimens, or they turn a dull brown colour.

The specimens which show this discolouration are, as a rule, such as would darken if preserved in alcohol ; at the same time, according to Linsbauer,[1] *Lathræa squamaria*, *L.*, in formalin does not darken so badly as when it is preserved in alcohol, while, on the other hand, I find that specimens of some orchids which in alcohol brown only slightly become in formalin almost black. Formalin is used for many fungi, particularly the more succulent forms, and changes but little the colours of the darker and duller sorts.

Formalin for Preservation of Plant-form.

Formalin fails to preserve the form of many specimens chiefly because it does not harden. Reference has already been made to this defect and to the soft and flaccid character of specimens of Class I. preserved in it. In the weaker (2 per cent.) solutions there is a tendency on the part of the petals of fragile and of fully expanded flowers to drop off after being a short time in the preservative. For succulent plants it presents the advantage that when preserved in it they do not to any extent contract.

For gelatinous or mucilaginous specimens it is valuable, causing little of the contraction and opacity which follow the immersion of such specimens in alcohol. Gelatinous bodies are hardened, swelling or slightly contracting according to the amount of absorbed water originally present. It is advisable to avoid formalin if the specimen to be preserved be one coated in

[1] Verhandl. der K.-K. Zoolog.—Bot. Gesellschaft in Wien, xliv. (1894), Sitz., p. 23.

any way with resin, for I find that the resin is coagulated and that it forms in such cases a white or grey covering over the resinous parts.

Method of Procedure in using Formalin.

The density of the fluid makes it difficult to keep the specimen submerged, and methods such as were described for buoyant specimens in alcohol have usually to be resorted to.

Specimens with waxy coatings are before preservation in formalin immersed for a minute or two in strong alcohol to wet the surface. The alcohol is not allowed to enter the specimen or to act upon it sufficiently to cause contraction of the object; but if the surface be wetted in this way the specimen sinks more rapidly and the penetration of the formalin is facilitated.

Formalin as a Preservative in Collecting.

As a preserving medium for use on excursions and in collecting, the concentrated form in which it can be carried makes it convenient,[1] this particularly so when collecting algæ, where the concentrated formalin is added to the water—sea-water or fresh water according to the habitat of the alga—in the tubes in which the specimens are placed. At the same time, Penzig[2] points out that when collecting abroad it is not so good as alcohol, because with formalin the tin cases commonly employed in work of the kind cannot be used, but glass bottles, heavy and inconvenient in transport, have to be resorted to.

b. Boric Acid.

This is recommended by Chalon[3] as one of the best of a large number of fluids he has tried for preserving botanical specimens. The solution used was a saturated or 3 per cent. aqueous solution, which was improved in some instances by adding 1 to 5 per cent. sodium sulphate.

I find the specimens, as with formalin, become flaccid, particularly those of Class I. Colours remain for some time, but fade when the specimens are exposed to light. Penetration is not very rapid, and there is difficulty at first in getting the specimens

[1] Hornell, Laboratorium et Museum, 1900, pp. 85-89.

[2] Laboratorium et Museum, 1901, p. 19.

[3] Bull. Soc. Roy. Bot. de Belge, xxxvi., Part 2, p. 39.

submerged. For some specimens of Classes II. and III., some tubers and bulbs, it has given good results, and it has, as Chalon points out, the advantage of being practically harmless to work with.

c. Camphor-water.

This is recommended by Setchell and Osterhout[1] for preserving large collections of algæ for several hours if they cannot be studied at once.

The method is to throw on to the surface of the sea-water in which they are left some chips of camphor-gum, which, though sparingly soluble, has powerful antiseptic properties.

On several occasions when collecting sea-weeds, at times when the usual preservatives have not been available, I have found that a liberal use of camphor will prevent the encroachment of putrefactive organisms for a considerable time, but beyond this I have had no experience with camphor as a preservative in museum work.

d. Salicylic acid.

A saturated solution is employed at times, but the preservative is little resorted to, as the specimens become flaccid and soft and in some cases much macerated. Chlorophyll and most other colours are destroyed although the formulæ following have given fair results in the special instances mentioned.

1. For fruits—the amount of glycerine to vary with their relative juiciness :—[2]
   1 oz. salicylic acid.
   5 gallons of water.
   a little glycerine.
2. For dark-coloured grapes :—
   1 oz. salicylic acid.
   8 oz. alcohol.
   2 gallons of water.

e. Fluorides of Sodium.

The fluorides of sodium, sodium-fluoride and sodium-bifluoride have been recommended as preserving fluids for plants and

[1] Bot. Gaz., xxi., 1896, p. 142.
[2] Bailey, Rule-book, p. 187.

animals.[1] Marpmann[2] has recommended sodium-fluoride, 2, 3, and 5 per cent. solutions in water. The bifluoride is also recommended. It possesses greater antiseptic properties than the fluoride. "It is not, in dilute solutions, directly poisonous, and so is pleasanter to work with than formol or sublimate."

I have made experiments with a number of solutions. In all cases the colours of plants fade or are destroyed. The plants become soft and flaccid, and in solutions of less than 10 per cent. fungi may appear on the surface of the fluid, and on the submerged material also.

The corroding action of the bifluoride on glass, even of comparatively weak solutions, prohibits its use as a final preservative in glass vessels.

B. PRESERVING BY DRYING.

I. DRYING IN AIR.

The following are the methods employed in dealing with the different classes of material mentioned.

a. Specimens of branches and twigs which are too large to be preserved in a fluid medium are dried by hanging them in a dry room, or, if the specimen is not too large, it is placed in a ventilated box to protect it from dust, or sand is run around it and the specimen dried in sand (*see* Drying in sand). Where the leaves are known to fall readily after drying the specimen is placed for a few minutes in boiling water before the drying process is commenced.

b. Specimens of woods and the like. Logs of wood which are to be dried and afterwards sawn or prepared as specimens of woods are placed in any dry well ventilated store. The drying should be slow and the temperature even. It is not enough that the store should be warm; unless well ventilated, the wood is liable to rot; again, if the drying is too rapid, the cracks produced are considerable. The logs are laid on their sides, freely exposing both cut ends. Where it is wished to preserve the bark, the logs are laid upon straw or brown paper. To keep free from cracks any special part of the bark I have found it an advantage to make longitudinal incisions at other parts of the circumference.

[1] Merck's Annual Report for 1899, p. 21.

[2] Marpmann, Zeitschrift fur angewandte Mikroskopie, 1899, p. 33. Centralblatt fur Bakteriologie und Parasitenkunde, 1899, Vol. 25, p. 309.

Cracks resulting from shrinkage then follow the lines initiated by the knife. Care should be taken to guard against the attacks of insects. Destructive forms are sometimes present in the logs when they are brought to the museum, and these should be searched for before the specimens are stored.

All dry specimens should be frequently examined, and any showing tunnellings of beetles or their larvæ should be promptly dealt with. If small enough they should be completely immersed in a poison solution. If this is impracticable they should be bathed or painted with the solution until it penetrates the borings completely. A poison solution I have found effective is the following:—

Naphthalene, . .	50 grms.
Corrosive sublimate, .	5 grms.
Methylated alcohol, 90 per cent., . . .	1000 c.c.

Carbolic acid is sometimes added; an objection to its use is that it may stain the specimen somewhat.

c. Dry fruits, roots with mycorhizal coverings, wood attacked by fungi, fungi themselves—particularly the more hard and solid kinds—all dry fairly well. For the majority of these no special method is resorted to. They are suspended in a well ventilated room or are simply laid in an open or ventilated box until dry. Sometimes it is advisable to pin or otherwise fasten the parts in position to prevent warping while drying.

2. DRYING IN SAND.[1]

The method of drying in sand is followed in all cases where the preservation of the colours of flowers is of importance. Some flowers so dried retain their colour if protected from strong light, and certainly look well. Preservation of the form of the flower depends much on the skill of the operator. From the nature of the method considerable shrinkage takes place, and the process consequently is not adapted to the preservation of fleshy forms.

The method I have adopted is as follows:—

A cardboard or paper box, with folding sides is secured and

[1] Errera, Report of Brit. Ass. for Adv. Science, 1896, p. 685. Cornélis, Belgique horticole, 1880, p. 230.

the bottom covered with fine, clean, dry sand to the depth of about an inch. In this the flower to be preserved, from which previously all surface moisture has been removed, is adjusted by sticking the stalk in the sand and heaping the sand around, or in any way that best will facilitate the next operation. This consists of adding slowly more sand, building it up around the corolla, and pouring it into the centre of the flower and around the parts in such a way as not to alter the shape of the flower by the weight of the sand. This is continued until the flower is completely covered. The box is next placed over an ordinary sulphuric acid desiccator and the whole stood on a plate and under a glass bell-jar. The plate with the bell-jar is then placed on the hot-water pipes used for heating the building, or in an oven kept at a temperature of about 40° C. It is left undisturbed for a week or longer, when the box is taken out and the sand is carefully run off by folding down the sides. Considerable care must be exercised in handling flowers so dried, as they become extremely brittle. Any sand that adheres is removed by means of a soft brush or by letting sand fall in a gentle stream from some height upon the specimen. The falling grains, hitting those adhering to the specimen, dislodge them, but at the same time the height from which the sand falls should be adjusted so that the force of the falling sand is not sufficient to break the specimen. Flowers so dried may be kept in any well sealed vessel, provided there is also placed within the jar a small quantity of lime or other desiccator to absorb any moisture[1] contained in the jar.

I have found the cardboard box with folding sides easier to work with than the "cornet" of paper recommended as a receptacle for the specimen and sand during the drying process.

The weak points of the process appear in the shrinking of the parts that takes place, in the difficulty of preserving the natural shape perfectly, and in the impossibility of removing the sand from the nectar surfaces present in most flowers. The adhering of the sand to the cut surfaces makes impossible the

[1] Prof. Errara recommends a glass jar with a wide mouth, the hollow stopper of which is about two-thirds filled with lime kept in position by a piece of skin.

preservation of dissections which shall show the more minute structural features of flowers.

To prevent somewhat the adhering of the sand particles to the surface of the flower, the stirring of the sand with wax, such as a paraffin candle, so that each grain of sand comes to be covered with a thin coating of paraffin, has been recommended.[1]

BLEACHING.

1. General.

The methods following apply particularly to material preserved in alcohol; they may be employed, however, with more or less success for specimens preserved in other media.

The subject for convenience will be considered under the following heads :—

A. Bleaching in 90 per cent. alcohol. The preservative in the case of material intended for alcohol is also the bleaching medium.

B. Bleaching treatment, before preserving, of material known to blacken in alcohol.

C. Bleaching of specimens already preserved, which have darkened under the action of the preservative.

Treatment of the specimens before preserving and likewise treatment after preserving are to be avoided when the simple treatment by alcohol alone can be made to give sufficiently good results.

The reasons for this are—first, treatment other than by alcohol alone has in a greater or less degree a softening and macerating action on the material bleached; and, second, such treatment tends, with an exception in the case of acid alcohol, to render the specimen flaccid. When special bleaching is, however, resorted to, better results are, as a rule, to be obtained by treating the specimens before preservation than can be secured by treatment subsequently of material already discoloured.

When it is known or supposed that a specimen will bleach in alcohol no special treatment is accorded it; if the

[1] Bailey, Rule-book, p. 187.

specimen is known to darken in alcohol it is treated before preservation ; but if placed in alcohol without treatment and subsequently found to need bleaching it is treated by one of the methods given under C. It follows that a knowledge before preserving of the behaviour in alcohol of any particular specimen is a considerable aid in choosing the best method of procedure. No definite rules can be given, but the following statements afford some indication of the class of specimen for which bleaching other than by alcohol alone will generally be found to be necessary.

Specimens usually darkening in alcohol are those whose tissues contain large quantities of tannin, similarly also those in which much resin is present. Thick and leathery leaves and leaves with thick cuticles turn brown as a rule in alcohol, as do also flowers in which brown and yellow colours predominate White flowers, if fleshy and of a waxy appearance, frequently darken ; if the petals are thin they commonly bleach well in alcohol. Leaves, stems, and other parts, of a light green colour bleach white, while those of a darker colour often do not. In the same way young tissues bleach better than older ones. Most seedlings bleach well, the exceptions being particularly some of the Ranunculaceæ and seedlings generally with slightly woody roots, for instance, palms and members of the Cupuliferæ.

Where I have found it possible to institute a comparison of the members of different families, I have found with certain exceptions that the Ranunculaceæ and Cupuliferæ among others stand out as orders the members of which do not readily bleach, while members of the Caryophylleæ, Cruciferæ, Leguminosæ, and Liliaceæ are commonly readily bleached in alcohol alone.

II. Methods.

A. BLEACHING IN 90 PER CENT. ALCOHOL.

Reference has already been made to the bleaching action of alcohol (page 219).

The essential points to be observed to secure success may bear repetition. They are :—

1. The immediate immersion of the material in the alcohol as soon as gathered.

2. The direct and immediate exposure of the jar containing the specimen to sunlight.
3. The employment of clean spirit only.

B. BLEACHING BEFORE PRESERVING.

I. PRELIMINARY AND RAPID KILLING

The darkening in alcohol of many specimens is prevented if they are first immersed in some rapidly acting killing agent. The most important of these are boiling water, boiling alcohol, and boiling acetic acid and alcohol.

a. Boiling Water.

The specimen is immersed in hot or even boiling water for from 1 to 5 minutes, or even, in the case of fleshy or solid specimens, for much longer. The length of time of immersion should vary with the character and consistency of the specimen. Subsequently the specimen is placed in alcohol and exposed to the action of sunlight.

The specimens become soft and flaccid during the process and harden subsequently in the alcohol. In the case of flowers the sap may aggregate below the epidermis in the form of blisters.

b. Boiling Alcohol 90 per cent.

This is employed in the same way as boiling water. The specimens are immersed for a varying time and are then transferred to normal 90 per cent. alcohol. Boiling alcohol penetrates more rapidly than does boiling water, but is not so effective, however, where much tannin is present, and, as with boiling water, blisters may form under the epidermis.

c. Boiling Acetic Acid and Alcohol.

Acetic acid, . . .	10 c.c.
Alcohol 90 per cent., .	90 c.c.

This penetrates rapidly. The macerating action is somewhat considerable if the treatment is other than momentary. Blisters may be produced as in the preceding cases. The bleaching which results is usually perfect.

II. BY SOAKING BEFORE FINALLY PRESERVING IN SOLUTIONS WHICH PREVENT THE FORMATION OF DISCOLOURING SUBSTANCES.

1. Methods which do not render the specimen flaccid.

a. Acid Alcohol.[1]

The plants are placed in strong 90 per cent. alcohol, to which has been added 2 per cent. by volume of hydrochloric acid. They are then exposed as much as possible to sunlight. If the spirit becomes discoloured it is changed, clean acid alcohol being substituted for the discoloured spirit removed. When bleached the specimen is left in the acid alcohol permanently or it is transferred to ordinary non-acid alcohol. In the latter case some specimens exhibit a tendency to darken, but this discolouration is not so great as when the preliminary acid alcohol has been omitted.

The acid alcohol has a macerating action on delicate structures, and the subsequent handling of such is attended with some risk. It should be remembered also, when specimens bleached in this way are subsequently mounted, that photoxylin does not hold specimens to the mounting glass satisfactorily if any acid is present in the final preservative. Specimens, therefore, treated with acid alcohol should be washed free from acid in several changes of non-acid alcohol before being finally mounted if photoxylin is to be employed. Nitric acid and sulphuric acid have been used in the same way but with less success.

b. Potassium Chlorate.

Crystals of potassium chlorate are placed at the bottom of the jar containing the specimen and nitric or hydrochloric acid is added in small quantities, only sufficient to cover the crystals, by means of a pipette, precautions being taken to keep the acid from mixing with the spirit and from coming in direct contact with the specimen.

The chlorine liberated rises through the spirit and has a slight bleaching action. The process is not so effective as that given above.

[1] Hugo de Vries, Berichte du deutschen botanischen Gesellschaft, vii. 1889, p. 298.

2.—Methods which render the specimen flaccid.

Dilute Acid Alcohol.

Alcohol 90 per cent., ...	40 c.c.
Water, ...	50 c.c.
Hydrochloric acid or Nitric acid, . .	10 c.c.

The addition of water to the acid alcohol, while rendering the specimen soft, prevents to a great extent any subsequent browning of the specimen when transferred to 90 per cent. non-acid alcohol for final exhibition.

The specimen is either first immersed in 90 per cent. alcohol for a few minutes to wet the surface and then transferred to the dilute acid alcohol, or the fresh specimen is placed at once in the diluted solution. As in other cases, sunlight favours the bleaching. The macerating action is considerable, and the method should not be employed for delicate specimens. Where the specimens are less fragile and where boiling may be undesirable the results are usually good. Such a solution with nitric acid has been used with excellent results in the case of Musa, specimens of which, owing to the large quantities of tannin present in the tissues, are bleached with difficulty.

C. BLEACHING AFTER PRESERVING.

Specimens which have darkened under the action of the preservative fall into two groups:—First, those we wish to keep hardened in alcohol; second, those which permit a transference to an aqueous medium, softening not being a disadvantage. The methods available in the former case are not so effective as those available in the latter.

1.—Methods which do not render the specimen flaccid.

For these the acid alcohol solution already described is, invariably used. The specimen is transferred to the acid alcohol and the jar exposed to sunlight. The bleaching is sometimes slow, is not always effective, and never so good as when the fresh specimen is placed at once in the acid alcohol before discolouration has taken place.

2.—Methods which render the specimen flaccid.

a. Bleaching Solution.

This is the most rapid and effective bleaching agent. Its macerating action is considerable, and it should not be employed when dealing with the more delicate specimens. The specimen is transferred from the strong alcohol and placed for several hours in alcohol of 50 per cent., from this it is transferred to water, and shortly after to a weak solution of ordinary bleaching powder. This solution is prepared by pouring warm water over bleaching powder and filtering.

After remaining in the bleaching solution for from 5 to 15 minutes, the specimen is transferred to a 2 per cent. by volume solution of hydrochloric acid in water. As the weak acid penetrates, it sets free the chlorine, which is thus brought into intimate contact with the substances to be bleached. If the specimen after some time is not sufficiently bleached it is replaced in the bleaching solution, and similarly a second time transferred to the acid. This is repeated as often as is necessary until bleaching is complete.

After bleaching, the specimen is placed in water, and from this it is graded to 90 per cent. alcohol.

The corresponding hypochlorites of sodium and potassium, "Eau de Labarraque" and "Eau de Javelle," are also powerful bleachers, breaking up on the addition of acid and setting free chlorine in the same manner as the hypochlorite of calcium. These also have a marked macerating action on the tissues.

b. Warm Water and Acid.

Nitric acid or hydrochloric acid 5 per cent.

The specimen is graded from the strong alcohol to water, and is from that transferred to a warm aqueous solution of hydrochloric acid or even to warm water alone.

After some hours it is again transferred by slow grading to strong alcohol and left to the action of sunlight.

The macerating is less than results from the employment of bleaching powder, but the bleaching is not so rapid.

FIXING AND SUSPENDING THE SPECIMEN.

I. General.

In the earliest preparations exhibited in round jars and bottles the specimen was simply placed in the jar, and where necessary loose parts were fastened together and delicate organs supported by tying the specimen with silk thread to glass rods, or the parts of a specimen were pinned together with thin glass rods. Or the specimen was simply suspended by silk thread from the cork or stopper of the jar. One or another or a combination of these methods was used as the requirements of the case seemed to dictate. In this way those morphological features of the specimen that it was desired to direct attention to were brought as much as possible to one side of the jar that they might be more easily seen and less distorted by the convex surface of the glass.

An advance upon this was the method of tying the specimens with silk thread to thin, almost transparent, sheets of mica. Holes were drilled in the mica with a needle and the thread tying the specimen was fastened behind. The mica possessed what proved a great advantage when circular jars were used, considerable flexibility. The mica-sheet was cut as wide or a little wider than the diameter of the jar, so that when placed in position within the jar the specimen attached to it was held by the flexible mica more or less to the one side of the jar and was thus readily seen. Commonly the mouth of the jar was smaller than the body, and in this case by carefully bending the mica a relatively large sheet could he introduced into a comparatively small-necked bottle.

These details are given as the methods are still sometimes resorted to, but as a rule at the present time the specimens are not tied but are fastened by some form of cement, while the adoption of the rectangular form of vessel, in connection with which the support for the specimen need not be flexible—indeed flexibility becomes a disadvantage—has led to mica being replaced by thin sheet glass.

The disadvantages of tying the specimen to the supporting glass are:—1. Great care must be exercised or the specimens are

injured, this particularly so in dealing with material already preserved. 2. The operation takes considerable time. 3. Specimens are liable to be cut through by the thread if they are at all heavy. 4. The thread tying the specimen is visible often, and detracts from the appearance of the preparation.

II. Methods.

I. CEMENTS FOR ATTACHING SPECIMENS TO MOUNTING GLASS.

A. CEMENTS USED WITH ALCOHOL.

1. *For light objects.*

Photoxylin is the cement invariably used with spirit material for light and small objects.

As obtained from Grubler of Leipzig it is a clear, slightly viscid fluid, and is ready without further preparation for use. The advantages attaching to its use are several. Specimens are quickly fastened to the support, and the operation involves little risk of injury to the preparation. Remaining transparent as the cement does, it is practically invisible. Its disadvantages are two. It can only be employed when the preservative used is strong alcohol, and it will not support heavy preparations.

The specimen to be mounted is taken from the alcohol in which it has been hardened and dehydrated, and the excess of surface alcohol is removed with filter paper or blotting paper. It is then placed in position on the glass or mica mount and a small quantity of photoxylin by means of a pipette is dropped upon it at the points at which it is to be fixed. The glass sheet with the specimen attached is then carefully laid in an open trough of 80 per cent. alcohol present in sufficient quantity to cover the specimen. It is left in this for about a minute. The photoxylin sets as a firm transparent jelly, and the mounting glass with the specimen fastened to it is now transferred to a vessel containing 90 per cent. alcohol. From this it may be moved to the exhibition jar containing 90 per cent. alcohol.

After the photoxylin has been applied it must be left to set in the air for a time, varying from a few seconds to as much as a minute, until in fact a slight film forms over its surface. If immersed in alcohol too soon the photoxylin is washed off and it

then congeals in shapeless masses on the surface of the fluid. On the other hand, the specimen removed from the preserving medium is in danger of drying, and a compromise has often to be made between the conflicting requirements of the cement and those of the specimen to be mounted.

2. *For heavy objects.*

Photoxylin will not support heavy specimens, so that resort is had in such cases to gelatine. It is extremely tenacious and will support specimens weighing several pounds if they are glued to the glass support at several points. In alcohol it becomes quite opaque, and its use is limited chiefly to those cases where the fastening cement is hidden behind the specimen. On a white background the cement, even if to a certain extent visible, is not conspicuous. On a black background its conspicuousness is lessened by mixing lamp black with it.

The cement is prepared as follows :—

Gelatine is soaked in water for several hours, the water not absorbed is then poured off and the gelatine heated over hot water. When melted, and of a fairly stiff consistency, it is ready for use.

The specimen should be dried to a certain extent, all excess of alcohol removed, and the glass plate upon which it is to be mounted should be dry and warm. This last condition is secured by holding the glass for a second or two over a gas flame. The cement, used hot, is applied to the specimen, and the latter laid upon the mounting glass so that the cement comes in contact with it and adheres to the warm surface. The cooling of the glass is hastened by running strong alcohol over the specimen from a pipette, which action serves the purpose also of preventing the specimen from drying. When the gelatine has cooled so as to be no longer in a fluid state, the glass plate with the specimen attached is placed in a bath of 90 per cent. alcohol. It is left in this for the gelatine to harden by dehydration, the specimen lying horizontally and putting little strain upon the cement holding it. When quite hardened, the glass with the specimen is lifted out and is transferred to the vessel in which the specimen is to be exhibited.

To fasten with gelatine delicate specimens which would be

liable to be dried by the method just described, resort is had in applying the cement to a pipette surrounded by a hot-water jacket which keeps the gelatine within the pipette in a liquid condition. The specimen is not taken out of the spirit, but is held in position in a dish or trough of alcohol at the bottom of which lies the sheet of glass the specimen is to be fastened to. The pipette, with the surrounding jacket, is brought so that the nose of the pipette touches the mounting glass at the bottom of the trough. Some of the gelatine is pressed out on to the glass and before it coagulates in the alcohol the specimen is placed upon it and is held in position until the gelatine is set firm.

B. CEMENTS USED WITH FORMALIN.

1. *For light objects.*

For light objects, and where the gelatine will be seen, a clear jelly is made from the best French gelatine. The glass plate is warmed and the warm liquid gelatine dropped on the specimen at those points at which it is desired to fix it. It hardens in formalin and remains practically transparent, but readily takes up colouring matters if these have not previously been extracted from the specimen.

2. *For heavy objects.*

Gelatine is used for heavy objects where the cement is hidden behind the object mounted. The gelatine solution employed is the same as is used for heavy specimens in alcohol. The specimen should be dried as completely as possible. Where, as with formalin, the aqueous medium is not inflammable, the glass plate at the points where the cement rests may be heated slightly from below over a gas flame after the specimen has been laid in position

II.—SUPPORTS FOR PREPARATIONS.

Mica is used for round jars, but for rectangular vessels thin sheet glass possesses many advantages. It is cheap, perfectly transparent, can be obtained in any size, and, being rigid, will support specimens of any weight. The mica sheets are of limited size, hardly transparent at the best, and if thin not sufficiently rigid. Opal and blue glass have been used as backgrounds but

not as mounting glasses. With clear glass any background can be used and several may be tried from which to select the best. If opal or blue glasses are used as the support of the specimen, the background becomes part of the preparation, and however unsuited it may subsequently prove cannot be varied. This becomes a disadvantage where the continued bleaching of a preparation already mounted, or its subsequent darkening, makes a change of background desirable.

Where a white or black background is desired, the back of the vessel may be painted the necessary colour. This proves effective, and the cost is considerably less than that which the employment of blue or opal glass as backgrounds involves.

DESCRIPTIVE LABELS.

I. General.

Long descriptive labels are rarely employed, but in every instance an effort is made to indicate concisely the point of biological interest the specimen illustrates.

To facilitate a comparison of the specimens exhibited with the descriptions of text books the names of the different organs are pointed out. This is done in one or the other of the following two ways:—The labels and pointers are attached so that the parts named are pointed out upon the specimen itself, or a photograph or drawing of the specimen is made, and the names of the parts are indicated upon this.

Where the character of the specimen permits its adoption the former method presents the advantage that in a direct manner a distinguishing name is associated with a given organ. The second method, however, where the drawing is made to a certain extent diagrammatic, allows a designated part to be more accurately indicated. Examples of the first method are shown in Plate III. Details of the way in which the method is carried out follow.

II. Methods.

I. Labelling Specimens Preserved in Alcohol or Formalin.

A difficulty which at first prevented the naming of the parts was the want of coloured pointers capable of being bent should the character of the specimen demand it, and which would moreover resist the action of the preserving medium. Thus copper wire, steel wire, and glass rods painted were tried with little success. In time the paint blistered and peeled off. I have now devised a method in which the colouring matter needed to make the pointer conspicuous is protected from the action of the preservative by being placed inside a fine capillary tube. The tubes are made by heating ordinary glass tubing of about $\frac{1}{4}$-inch bore, and when uniformly hot of a dull red colour at the point desired drawing it out to a fine capillary tube. This capillary tubing is broken into suitable lengths, and as required the tubes are filled with any colouring substance that may be considered effective and distinct upon the chosen background.

The backgrounds commonly used are either black or white, and upon these I use vermilion-coloured pointers

Ordinary moist colours mixed with melted gelatine are used to fill the tubes. The mixture, employed warm, flows up the tube for a certain length by capillarity. If pointers of a greater length are required the tubes are filled by means of a rubber pipette sucker fastened to one end of the tube by means of a clamp, or the sucker is held firmly around the tube with the finger and thumb of the left hand while with the right hand the air is expelled. When the rubber sucker is released the colour substance in which the free-end of the tube is steeped is drawn up and fills the tube.

Both the pointers and the labels in the case of specimens preserved in alcohol are attached with photoxylin: when the preservative is formalin they are fastened with the clear dilute gelatine already given as a cement for mounting light specimens in that medium.

II. Labelling Dry Preparations.

In the naming of the parts of dry preparations, the pointers used are the glass tubes already described, or pointers made of

copper wire painted with vermilion paint are employed. The labels and the pointers are attached with a gum made of equal parts of gum-tragacanth and gum-arabic or with the gelatine solution given on page 238.

III. LABELLING MODELS.

The names of the parts of models are attached to pointers made of copper wire. Such pointers, in turn, are fastened to the parts to be named. The cement used for both operations has the following composition :—

Wax cement for attaching names to models.

Beeswax, $\frac{2}{3}$ parts.
Resin, 1 part.

The ingredients are melted together and the cement used warm.

At other times the wire used is pointed and the pointed end driven into the part of the model named. To a small piece of cork or pasteboard fastened at the free end of the wire the name-label is attached with gum or paste.

LUTINGS FOR LIDS OF VESSELS.

I. PERMANENT SEALING.

For permanently sealing the lids to museum jars I have found bichromated gelatine prepared as follows efficacious : —

1 oz. Nelson's Amber Gelatine is soaked in water for several hours ; the water not absorbed by the gelatine is then poured off and the gelatine melted over hot water. When melted, 5 grains. of bichromate of potash are added and the whole stirred.

The melted gelatine is applied with a pipette or glass rod to the rim of the vessel, and the lid, after it has been gently warmed over a Bunsen flame, is laid in position over the mouth of the jar. The gelatine should be fairly stiff ; if too weak when the warm lid is laid on it may run down the inside of the vessel. When the lid has been placed in position, the cement is allowed to cool, and under the action of light it forms a luting insoluble in alcohol or water.

If the lid does not lie evenly on the rim of the vessel the contraction of the gelatine as it dries may crack the lid. To prevent this a cement with more body is prepared by mixing plaster of paris with the gelatine. The plaster fills the interstices between the lid and the rim of the jar. This plaster cement is applied warm in the same manner as the bichromated gelatine cement, excess of cement on the outside in both cases being cleaned off with a knife after it has cooled slightly.

II. FIRM SEALING.

If a firm luting is required, but one which will afterwards permits the removal of the lid, a difficult matter when the lutings given above are employed, the following is used :—

Gelatine,	1 oz.
Paraffin wax,	¼ oz.

The gelatine is melted as described in the preceding case ; to the melted gelatine the wax is added and also melted. The two are then beaten together vigorously so as to form as emulsion. The cement is used warm, a layer of the cement being placed on the rim of the vessel, and the lid as before warmed slightly before being placed in position.

III. TEMPORARY SEALING.

For sealing lids temporarily, and as a luting when the jar is not likely to be handled, vaseline presents the advantage that it is clean and easily applied. It prevents, better than any other temporary luting I have tried, loss of spirit by evaporation and offers no difficulty to the ready removal of the lid should this become necessary.

Either of the first two cements may be used for sealing corked bottles. With spirit material the bichromated gelatine has given excellent results. The corks are dipped in the gelatine solution so as to coat them, and when the gelatine has set the corks are driven into the bottles flush with the top of the neck, or if fitting too tightly to permit this they are pared down flush with the top. Any alcohol present is carefully dried off and the surface of the cork covered with an even layer of cement.

If the jar is likely to be subjected to varying temperatures provision should be made for the expansion and contraction of the alcohol, and at the same time a means found by which the loss of spirit by evaporation—it is practically impossible altogether to prevent this—can be made good. Where the vessel is covered by a glass lid or disk a small hole is drilled in the lid, and this hole in turn is covered by an ordinary microscopic cover glass, luted down with vaseline. This permits expansion of the spirit, and relieves the pressure on the luting of the lid. The loss of alcohol that takes place is periodically made good, a small thistle funnel being used to introduce fresh alcohol into the vessel through the small hole provided. In the case of jars and bottles closed with corks, a hole is made in the centre of the cork and a glass tube of small diameter inserted. This takes the place and answers the purposes of the hole drilled in the glass disks.

BUILDING UP OF GLASS VESSELS.

Many of the preparations in alcohol in the Museum are exhibited in vessels built up of pieces of plate-glass cemented together so as to form rectangular, spirit-proof boxes. These vessels are made as follows:—Pieces of plate-glass of good quality are cut the requisite sizes to form the sides and bottom of the vessel, and are then carefully ground along their edges, so that the component pieces, when the box is put together, will fit evenly against one another, leaving no cracks between the joints. A cement is prepared consisting of Nelson's amber gelatine, with bichromate of potash and plaster of paris. The gelatine is melted and the bichromate of potash and plaster of paris are subsequently added, and are stirred into a fairly firm and homogeneous cement which is used warm. A second cement is also prepared, composed of 1 oz. of Nelson's amber gelatine, 5 grains of bichromate of potash, and a few drops of glycerine. Each piece of glass is gently warmed, the plaster cement is applied evenly along the edges to be joined, and while the cement is still warm the glass is fitted in its place to form one of the sides or the bottom of the vessel as the case may be.

A definite order is observed in fitting the pieces together. First, the glass which is to be the back of the finished vessel is

laid flat on a table; the two sides are next cemented vertically right and left of the back glass; the third glass applied is that which is to be the bottom of the finished vessel; and finally the front glass is cemented in position.

When the plaster cement along the joints has cooled and has set firm enough to allow the vessel to be taken up and handled without risk of the pieces falling apart—this is usually after a few hours—the second cement, that without plaster of paris, is run as a luting around the inner angles of the vessel and is also applied as a thin layer over the outside joints. That this may be done successfully the second cement should not be very stiff. Both cements should be applied as evenly as possible, as the subsequent scraping and cutting away of any surplus cement weakens the joints and militates much against the success of the work.

The vessel is placed in a cool room and the cement allowed slowly to dry for one or two days, after which it is placed in strong sunlight until quite dry and until the gelatine under the action of the light has turned a brownish colour. It is perhaps premature to speak of the vessels so made as permanent, but there are in our Museum vessels which were built up thus five years ago which are to-day perfectly spirit-tight.

Much handling of the vessels would appear to be harmful, for some preparations which have been frequently moved have subsequently leaked, and it should be noted, too, that the strength of the spirit within the vessel should be maintained at 90 per cent. if the vessel is to be kept spirit-proof. The alternate drying and wetting of the cement consequent upon an intermittant use of a vessel also causes the cement in course of time to give way and the vessel to leak. Plate-glass or heavy sheet-glass is used, as I find that the thinner sheet-glass is liable to crack under the binding strain it is subjected to as the cement dries and contracts.

The perfectly plane surface of the plate-glass, and the fact that a vessel can be made any required size, are the great advantages of the method, but owing to the cost of the ground plate-glass and labour of grinding the edges square, vessels so made are not cheaper than the cast-glass rectangular vessels to be obtained at the present day.

Explanation of the Figures in Plate III.

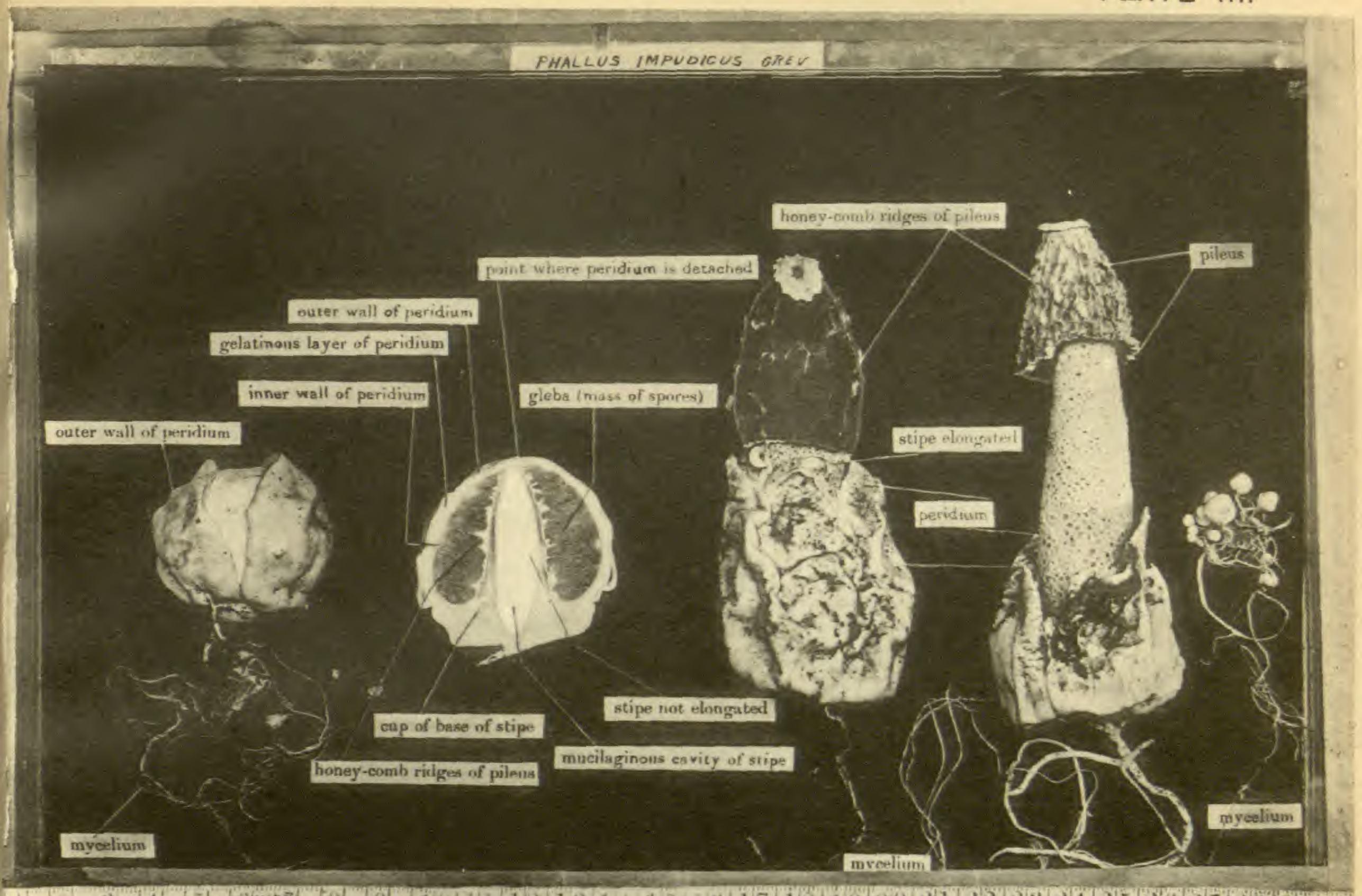
THE FIGURES ARE FROM PHOTOGRAPHS BY MR. T. W. WEST.

Upper figure :—Preparation in 90 per cent. alcohol, exhibited in a rectangular glass vessel. The back of the vessel is painted black, and the names of the parts are attached to a clear glass mount, to which, also, the specimens are fastened. The parts named are pointed out by means of thin glass tubes filled with vermilion injection medium.

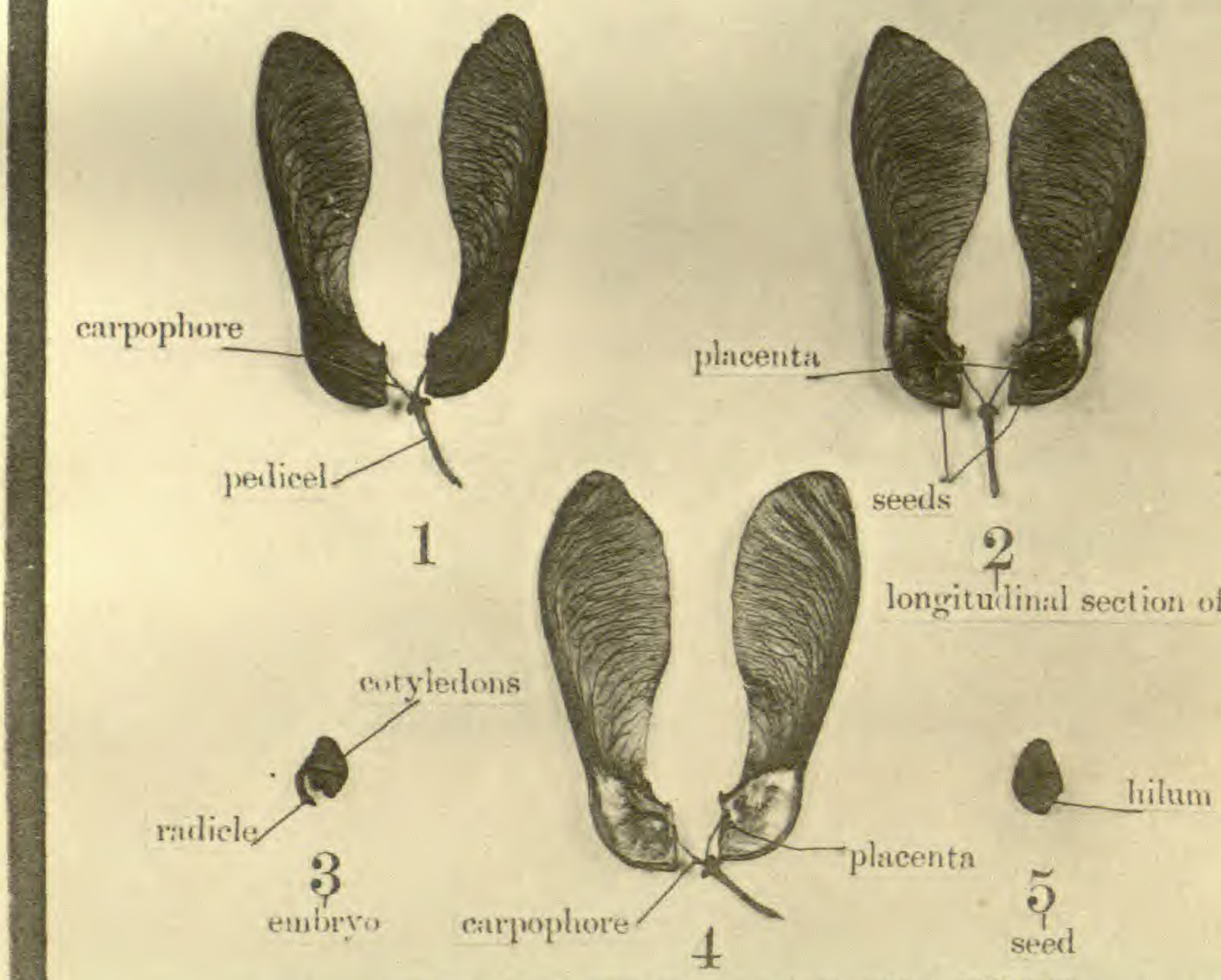
Lower figure :—Dry preparation mounted on white card and enclosed in box with glass lid and sides. The small pointers are made of thin copper wire painted with vermilion oil colour.

The scale at the foot of the preparations has been added temporarily to serve as an index to the size of the specimens.

PHALLUS IMPUDICUS GREV



ACER PSEUDO–PLATANUS, Linn.



LONGITUDINAL SECTION OF FRUIT, SEEDS REMOVED

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

VOL. II.

Including Numbers VI.–X.

1902.

GLASGOW:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from
OLIVER & BOYD, Edinburgh.

[*All rights reserved.*]

Mo. Bot. Garden
1908

Dates of the several Numbers of this Volume.

Part VI., pp. 1-20 for January, 1902.
Part VII., pp. 21-124 for April, 1902.
Part VIII., pp. 125-252 for July, 1902.
Part IX., pp. 253-364 for October, 1902.
Part X., pp. 365-497 for December, 1902.

List of Contents to Vol. II., 1902.

PAGE.

The Royal Botanic Garden - - - - - - - - i

List of Staff - - - - - - - - - ii

Rules and Regulations - - - - - - - iii

Historic Notice - - - - - - - - - v

Features of the Garden. With Key Plan - - - ix

Teaching in the Garden - - - - - - - xi

List of Seeds collected in the Royal Botanic Garden, Edinburgh, during the year 1901 - - - - - - 1

History of the Royal Botanic Garden, Edinburgh. Botanical Excursions made by Professor John Hutton Balfour in the Years 1846–1878 inclusively - - - - - - 21

Title and List of Contents to Vol. II., 1902.

THE ROYAL BOTANIC GARDEN, EDINBURGH.

THE Royal Botanic Garden, Edinburgh, is one of the three Gardens maintained by the State in the United Kingdom, the others being the Royal Gardens at Kew in England, and the Glasnevin Garden at Dublin in Ireland. It occupies an unequally-sided quadrilateral area of 57·648 acres (bounded upon all sides by public roads and dwelling-houses) on the North side of Edinburgh—about a mile from the shore of the Firth of Forth. Its highest point, at Inverleith House (**S**)—the official residence of the Regius Keeper of the Garden—towards the North-west, is 109 feet above sea-level, and thence the ground falls away on all sides. The lowest point—a depression 48 feet above sea-level, with an east and west trend through the middle of the Garden—is the site of an old bog, and the ground rises again to the south of the depression. The surface soil is generally alluvial sand resting on clay at considerable depth. In the lower part of the area the clay comes to the surface.

There are two entrances—one upon the east side from Inverleith Row into the Garden, the other upon the west side from Arboretum Road into the Arboretum. The Garden is open daily from 8 a.m. on Week-days and from 11 a.m. on Sundays until sunset. The Plant-Houses are open from 1 p.m. until 5.30 p.m., or until sunset if this be earlier. The Museum is open on Week-days from 10 a.m. until 5 p.m. and on Sundays from 1 p.m. until 5 p.m The Herbarium and Library are open on Week-days from 10 a.m. until 5 p.m., excepting on Saturday, when they are open until 1 p.m.

Staff of the Royal Botanic Garden, Edinburgh, at December, 1902.

Regius Keeper,	Isaac Bayley Balfour, M.A., M.D., F.R.S.
Assistant in Museum,	Harry Frank Tagg, F.L.S.
Assistant in Herbarium,	John Frederick Jeffrey.
Head Gardener,	Robert Lewis Harrow.
Assistant Head Gardener,	Henry Hastings.
Foreman of Herbaceous Department,	David Sydney Fish.
Foreman of Glass Department,	Laurence Stewart.
Foreman of Arboretum	William Smith.

RULES for the Royal Botanic Garden and Arboretum in connection with the Regulations prescribed by "The Parks Regulation Act, 1872."

---

1. No unauthorised Person may ride or drive in this Garden or in the Arboretum, and no Wheelbarrow, Truck, Bath-chair, Perambulator, Cycle, or other Vehicle or Machine, is allowed to enter, except with the written permission of the Keeper. Children under ten years of age are not admitted unless accompanied by a Parent or suitable Guardian.

2. No Horses, Cattle, Sheep, or Pigs are allowed to enter.

3. No Dogs are admitted.

4. No Bags, Baskets, or Parcels, no Flowers, and no implements for games may be brought in ; Artists and Photographers may not bring in their Apparatus without written permission from the Keeper.

NOTE.—*The foregoing Rules shall not apply to persons going to or leaving Inverleith House by the road leading from the Arboretum Road Gate to the House.*

5. Visitors are to enter and leave the Plant Houses by the Doors according to the Notices affixed thereon.

6. Smoking is not allowed in the Plant Houses.

7. No Person shall touch the Plants or Flowers.

8. Pic-nics and luncheon parties are not allowed.

9. No unauthorised Person shall Drill or practise Military Evolutions or use Arms or play any Game or Music, or practise Gymnastics, or sell or let any Commodity.

10. No unauthorised Public Address may be delivered in the Garden or Arboretum. No Performance or Representation either spoken or in dumb show shall be given in any part of the Garden or Arboretum, unless by permission of the Commissioners

of His Majesty's Works and Public Buildings. No Person shall use any obscene, indecent, or blasphemous words, expressions, or gestures, or do any act calculated to provoke a breach of the Peace, in the course of, or in connexion with, any speech, address, performance, recitation, or representation. No money shall be solicited or collected in connexion with any performance, recitation, or representation, except by permission of the Commissioners of His Majesty's Works and Public Buildings.

11. Large parties must be broken up to prevent crowding.

12. Climbing the Trees, Railings, or Fences is forbidden.

13. Birds'-nesting, and taking, destroying, or injuring Birds or Animals are forbidden.

14. The distribution of Handbills, Advertisements, and other Papers by the Public is forbidden.

Dated the 2nd day of May 1901.

Sealed with the Common Seal of the Commissioners of His Majesty's Works and Public Buildings.

ESHER,
Secretary.

Seal

Historic Notice.

In the year 1670 a portion of the Royal Garden around Holyrood House was occupied by two eminent Edinburgh physicians, Andrew Balfour and Robert Sibbald, for the making of a Physic Garden, and James Sutherland was appointed to the "Care of the Garden." This was the foundation of the Royal Botanic Garden of Edinburgh, which is therefore, after that of Oxford (founded in 1632), the oldest in Great Britain. The stocking of the Garden with plants was effected from the private Garden of Dr Andrew Balfour, in which for some years he had been accumulating medicinal plants, and also in great measure from that at Livingston in West Lothian, the laird of which, Patrick Murray, was much interested in the growing of useful plants.

In 1676 the same physicians acquired from the Town Council of Edinburgh a lease of the Garden of Trinity Hospital and adjacent ground for the purpose of a Physic Garden in addition to the Garden already existing at Holyrood, and they appointed the same James Sutherland (16..-1715) to be "Intendant" of this Garden. The site of this Garden, which for convenience of reference may be called the Town's Botanic Garden, was the ground lying between the base of that portion of the Calton Hill upon which the prison is built and the North Bridge, and it is now occupied by a portion of the Waverley Station of the North British Railway. The name Physic Garden attached to a street in the vicinity is a reminiscence of the existence of the Garden at this spot.

About 1702 another Botanic Garden was established in Edinburgh in the ground immediately adjacent to the College Buildings, apparently on the site of the present South College Street. This was the College Garden, and of it James Sutherland became also custodian.

Thus in the early years of the eighteenth century there were in Edinburgh no less than three distinct Botanic or Physic Gardens—one at Holyrood, the Royal Garden ; one around Trinity Hospital, the Town's Garden ; and one beside the College, the College Garden. All these were at first under the care of James Sutherland.

Sutherland from the first made use of the Royal Garden for giving "instruction in Botany to the Lieges," and received a royal warrant appointing him Botanist to the King in Scotland, and empowering him to "set up a Profession of Botany" in this Garden. When the Town's Garden was created the Town Council appointed him to lecture on Botany as Professor in the Town's College, now the University of Edinburgh. In 1683 he published his "Hortus Medicus Edinburgensis, or a Catalogue of the Plants in the Physical Garden at Edinburgh," from which and from other published notices of the Town's Garden we learn that between two and three thousand plants were in cultivation. There is no means of determining how these plants were distributed between the several Gardens at the date of publication of Sutherland's catalogue.

In 1706 Sutherland resigned the care of the Town's Garden and the College Garden as well as his Professorship in the University, but, remaining King's Botanist, he retained the care of the Royal Garden at Holyrood. Charles Preston was appointed his successor by the Town Council, and there were thus established rival Gardens and rival Professors of Botany in Edinburgh. Charles Preston died in 1712, and was succeeded in his offices by his brother George Preston. Neither of the Prestons had ever the care of the Royal Garden.

In 1715 Sutherland died, and his successor as King's Botanist, Keeper of the Royal Garden, and Regius Professor of Botany was William Arthur, who, however, probably through becoming implicated in an unsuccessful Jacobite plot to seize the Castle, did not hold the offices long, and was succeeded in 1716 by Charles Alston (1683-1760).

In 1724 the College Garden, having fallen into disorder, was turned to other uses ; and in 1729, George Preston having retired, the Town Council appointed, as his successor in the charge of the Town's Garden and as Professor of Botany in the

University, Charles Alston, who as King's Botanist had already the charge of the Royal Garden and was Regius Professor of Botany. Through him, after separation for a quarter of a century, the Royal Garden and the Town's Garden were again combined under one Keeper, and the Regius Professorship of Botany and the University Professorship were similarly united. They have so continued to the present time.

In 1763, the Royal Garden and the Town's Garden proving too small and otherwise unsatisfactory, John Hope (1725-1786), who had succeeded Alston in his offices in 1761, proposed a transference of the two to a more congenial site in which they could be combined. At first it was intended to secure ground to the south of George Watson's Hospital—the area upon which much of the present Royal Infirmary is built—but this not being possible, five acres of ground to the north side of Leith Walk, below the site now occupied by Haddington Place, were chosen. As Hope proposed to transfer the collections in the Royal Garden to the new Garden he was able to secure the support of the Treasury to his scheme, and the selected ground was leased in name of the Barons of Exchequer. At the same time the Town Council agreed to contribute £25 annually to the support of the Garden, this sum being the amount of rent expected from the letting of the old Town's Garden. The plants from both Gardens were transferred to the ground at Leith Walk, and from this date there has been only one Botanic Garden in Edinburgh.

The site thus secured for the Garden proved, however, only a temporary one. Daniel Rutherford (1749-1819), who in 1786 succeeded Hope in his offices, cast about him for a spot in which more ground would be available for the extension of the Garden; and eventually in 1815 nine and a half acres of the land lying to the east of Holyrood Palace, and forming the ground of Belleville or Clockmill, was fixed upon as a site in every way desirable; but Rutherford dying before completion of the arrangements for the transference of the Garden, his successor, Robert Graham (1786-1845), appointed in 1820, preferred the more open site of the Inverleith property which the Garden now occupies, and fourteen acres of the Field or Park of Inverleith, known as Broompark and Quacaplesink, were purchased by the Barons of Exchequer from Mr James Rocheid, its owner, in 1820,

the lease of the Leith Walk Ground being sold. By 1823 all the plants had been transferred to the new Garden.

In 1858, during the Keepership of John Hutton Balfour (1808-1884), who succeeded Graham in 1845, a further addition, by purchase from the proprietor of Inverleith, of a narrow belt of two and a half acres was made to the Garden on the west side; and in 1865 the Caledonian Horticultural Society having resigned to the Crown its lease of the ten acres of adjoining ground which it had occupied since 1824 as an experimental Garden, this ground was also made part of the Botanic Garden. Finally the present area of the Garden was completed in 1876, when the Town Council purchased from the Fettes Trustees twenty-seven and three-quarter acres of Inverleith property on the west side of the Garden and transferred it to the Crown for the purpose of making an Arboretum in connection with the Garden; the Crown at the same time purchased Inverleith House and two and a half acres of additional ground.

In 1879, Alexander Dickson (1836-1887) became Queen's Botanist, Regius Keeper and Professor, and held these appointments until his death in 1887. During his term of office the Arboretum was thrown open to the public.

Surrounded as it now is on all sides by public roads, no further extension of the Garden upon its present site can be made.

Features of the Garden.

The method through which the Garden was built up by successive additions resulted in an absence of combination between its several parts, in great measure a consequence of want of adequate funds to make the necessary alterations in the grounds. During the past fourteen years, in which the Garden has been wholly under the administration of the Commissioners of H.M. Works, the bringing about of this combination has been in progress. The work is not yet completed, and the Plan of the Garden which is attached to this sketch shows the area of the Garden as it is laid out at this date—December, 1902. Future editions will show further changes as the work of reconstruction proceeds.

From its foundation the Botanic Garden has been devoted to the teaching of Botany, and its usefulness in this respect has determined the laying out of its area.

Herbaceous Garden.—A considerable space is occupied by a collection of herbaceous plants arranged for study in natural orders after the "Genera Plantarum" of Bentham and Hooker.

Rock Garden.—There is an extensive rockwork upon which alpine and rarer herbaceous plants are cultivated.

Arboretum.—The whole of the western area of the Garden is in process of arrangement as an Arboretum of trees and shrubs, and the positions of some of the chief genera are indicated on the plan. The Coniferæ are now placed in the ground adjacent to the Rock Garden.

Herbaceous Border.—Along the North Boundary of the Arboretum a mixed Herbaceous Border has been planted.

The **Plant-Houses** are still in process of reconstruction. So far as they have been rearranged at the present time they consist of a long range to the north of the herbaceous collection, composed of a Central Green-house, from the sides of which two Corridors run east and west (**I**). In the Entrance Porch to the Central Green-house is a collection of Insectivorous Plants (**J**).

From the Eastern Corridor two houses project to the south—one occupied by Plants of Dry Regions (**G**), the other containing Economic Plants of both Tropical and Temperate Regions (**H**). The House terminating the Eastern end of this Corridor is one of the old and decayed plant-houses, to which visitors are not admitted pending its reconstruction. To the south side of the Western Corridor are attached two houses—one for Orchids (**K**) and one for Plants of Tropical and Warm Regions (**L**). The house at the western end of the Corridor is another of the old plant-houses to which visitors are not admitted. Behind the western end of the Front Range there is a Temperate House for Palms, Tree-Ferns and Coniferæ (**P**), and a Palm-House (**Q**). Between these and the Front Range at its western end is a suite of houses of which one is devoted to monocotylous Plants of Tropical and Warm Regions, specially Aroids, Scitamineæ, Liliaceæ, and Amaryllidaceæ (**M**); Pitcher Plants are also provided for in this house; another contains Bromeliads (**N**); and a third is used for plants requiring warm, temperate environment (**O**). The central Heating Station (**R**) for the Plant-houses lies behind the Front Range.

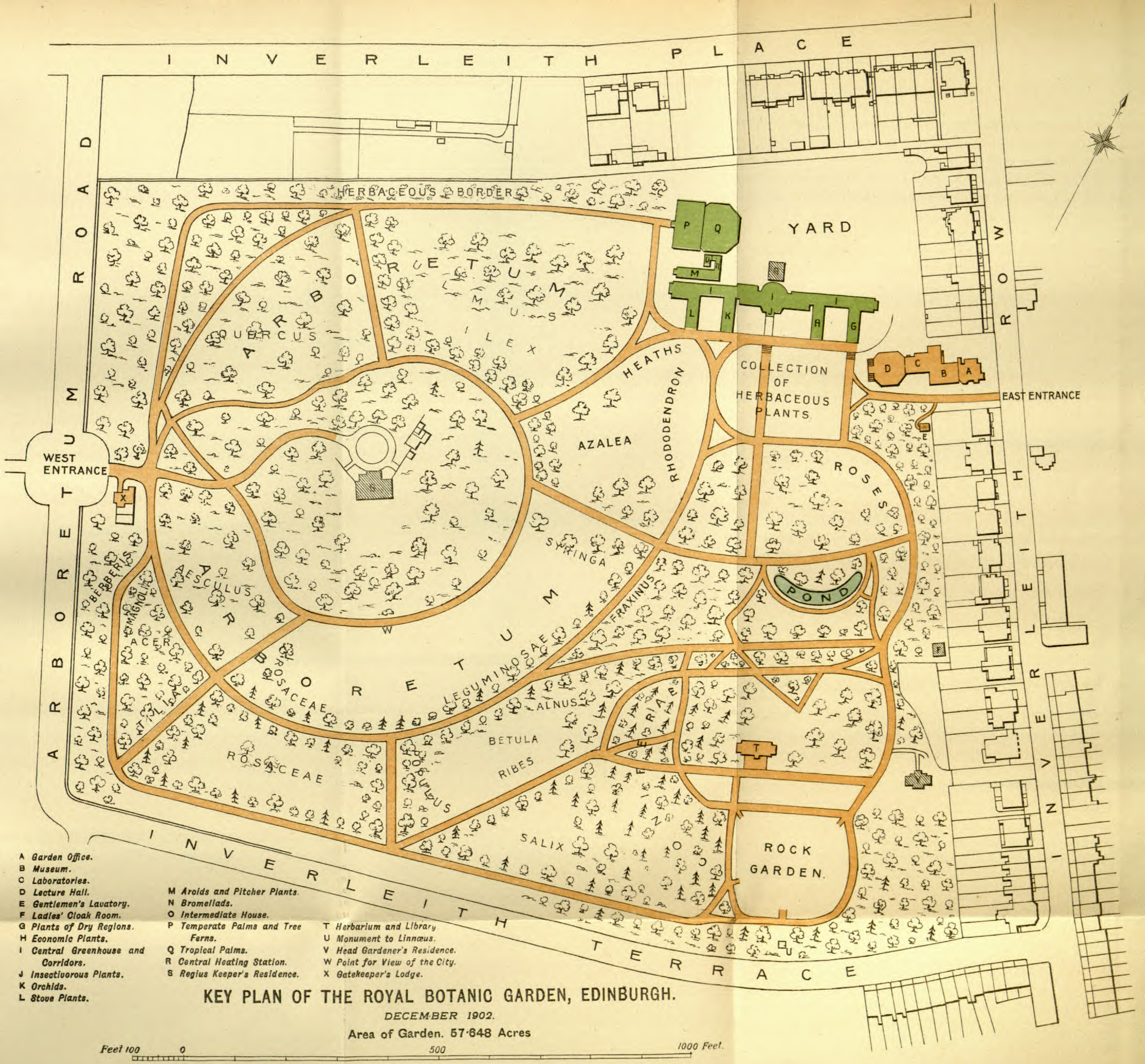
Adjoining the Entrance from Inverleith Row is a group of buildings including the **Office of the Garden (A),** the **Museum** (**B**), the **Laboratories** (**C**), and the **Lecture Hall** (**D**).

The **Museum** contains a series of exhibits illustrating the form and life-history of plants, and these are arranged so as to facilitate their use in teaching.

Herbarium and Library.—In the southern portion of the Garden is the Herbarium and Library (**T**). It contains a fair representation of the Floras of the world, and the herbarium of plants belonging to the University of Edinburgh is deposited here.

The **Ladies' Cloak-Room** is at present on the left hand of the path leading into the Garden from the Entrance from Inverleith Row (**E**). A new one will be erected shortly at (**F**), and a **Gentlemen's Lavatory** will be placed then at (**E**).

From the higher ground of the Arboretum—at the point marked (**W**) on the plan—a fine panoramic view of the City of Edinburgh, flanked on the east by Arthur's Seat, and on the west by the Pentland Hills, is obtained.



A *Garden Office.*
B *Museum.*
C *Laboratories.*
D *Lecture Hall.*
E *Gentlemen's Lavatory.*
F *Ladies' Cloak Room.*
G *Plants of Dry Regions.*
H *Economic Plants.*
I *Central Greenhouse and Corridors.*
J *Insectivorous Plants.*
K *Orchids.*
L *Stove Plants.*
M *Aroids and Pitcher Plants.*
N *Bromeliads.*
O *Intermediate House.*
P *Temperate Palms and Tree Ferns.*
Q *Tropical Palms.*
R *Central Heating Station.*
S *Regius Keeper's Residence.*
T *Herbarium and Library*
U *Monument to Linnæus.*
V *Head Gardener's Residence.*
W *Point for View of the City.*
X *Gatekeeper's Lodge.*

KEY PLAN OF THE ROYAL BOTANIC GARDEN, EDINBURGH.

DECEMBER 1902.

Area of Garden. 57·648 Acres

Feet 100 0 500 *1000 Feet.*

MORRISON & GIBB LT.

Teaching in the Garden.

Special instruction in the sciences underlying the practice of Horticulture and Forestry is provided for the Staff of the Garden. The course of instruction is spread over three years, and consists of lectures upon, and practical instruction in, the sciences taught. A Reading-room and Library is also provided for members of the Staff going through the course. Young Gardeners or Foresters desiring admission to the Staff and the course of instruction should make application to the Regius Keeper.

The Regius Keeper from time to time gives lectures which are open to the Public. The Laboratories are open to anyone desirous of undertaking Botanical Research.

A portion of the botanical teaching of the Edinburgh and East of Scotland College of Agriculture is carried on in the Garden.

For more than a century and a half the offices of Regius Keeper of the Botanic Garden and Professor of Botany in the University of Edinburgh have been held by the same person and it has become the custom that the students of the University come to the Garden for instruction in Botany.

Specimens for private study are supplied, as far as the resources of the Garden will permit, to visitors and students who make written application to the Regius Keeper. Application forms may be obtained at the office of the Garden.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

JANUARY 1902.

CONTENTS.

Page.

List of Seeds collected in the Royal Botanic Garden, Edinburgh, during the Year 1901, - - - - 1

GLASGOW:

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from

OLIVER & BOYD, Edinburgh.

[PRICE NINEPENCE.]

[*All rights reserved.*]

List of Seeds Collected in the Royal Botanic Garden, Edinburgh, during the Year 1901.

The following is a list of plants cultivated in the Royal Botanic Garden, Edinburgh, from which ripened seeds have been collected during the year 1901. The quantity of seed obtained from some of the species is of limited amount. The seeds are available for exchange, but they are not for sale :—

HERBACEOUS PLANTS.

Acacia
- Farnesiana, *Willd.*
- grandis, *Henfr.*
- suaveolens, *Willd.*

Acaena
- argentea, *Ruiz* et *Pav.*
- Novæ-Zelandiæ, *T. Kirk.*
- pinnatifida, *Ruiz* et *Pav.*

Acanthostachys
- strobilacea, *Link, Klotzsch* et *Otto.*

Achillea
- filipendulina, *Lam.*
- grandiflora, *Bieb.*
- Millefolium, *Linn.*
- rupestris, *Huter.*

Aconitum
- Lycoctonum, *Linn.*
- moldavicum, *Hacq.*
- Napellus, *Linn.*
- paniculatum, *Lam.*
- pyrenaicum, *Hort.*
- reclinatum, *A. Gray.*
- truncatum, *Rafin.*

Actæa
- alba, *Mill.*
- spicata, *Linn.*
- — var. rubra, *Ait.*

Adenophora
- stylosa, *Fisch.*
- verticillata, *Fisch.*

Aechmea

bromeliæfolia, *Baker*, var. pulchra.
candida, *E. Morr.*
Makoyana, *Hort. Makoy.*
Weilbachii, *Dietr.*, var. leodiensis.
xiphophylla, *Baker.*

Agave

attenuata, *Salm-Dyck.*

Aglaonema

commutatum, *Schott.*

Agrimonia

agrimonioides, *Linn.*
Eupatoria, *Linn.*
odorata, *Mill.*

Alchemilla

alpina, *Linn.*, var. conjuncta (*Bab.*).

Alisma

Plantago, *Linn.*

Allium

carinatum, *Linn.*
fistulosum, *Linn.*
giganteum, *Regel.*
globosum, *Red.*, var. albidum.
karataviense, *Regel.*
odorum, *Linn.*
polyphyllum, *Kar.* et *Kir.*
sativum, *Linn.*
Schœnoprasum, *Linn.*
senescens, *Linn.*
sphærocephalum, *Linn.*, var. descendens (*Linn.*).

Alnus

cordifolia, *Tenore.*
glutinosa, *Medic.*

Aloe

mitriformis, *Mill.*, var. spinulosa (*Salm-Dyck*).

Alstrœmeria

chilensis, *Lem.*
revoluta, *Ruiz* et *Pav.*

Althæa

kurdica, *Schlecht.*

Alyssum

idæum, *Boiss.* & *Heldr.*
montanum, *Linn.*
saxatile, *Linn.*

Ammobium

alatum, *R. Br.*

Anchusa

altissima, *Desf.*

Androsace

arachnoidea, *Schott.*
lactea, *Linn.*
lanuginosa, *Wall.*
macrantha, *Boiss.* & *Huet.*
septentrionalis, *Linn.*

Anemone

alpina, *Linn.*
— var. sulphurea.
narcissiflora, *Linn.*
pratensis, *Linn.*
rivularis, *Buch.-Ham.*
sulphurea, *Linn.*

Antennaria

dioica, *Gaertn.*, var. tomentosa, *Hort.*

Anthericum

Liliago, *Linn.*

Athamanta
Matthioli, *Wulf.*

Atropa
Belladonna, *Linn.*

Aubrietia
croatica, *Schott.*
deltoidea, *DC.*
— var. grandiflora.
— var. taurica.
— var. olympica.

Avena
sterilis, *Linn.*

Babiana
plicata, *Ker.*

Bellis
sylvestris, *Cyrill.*

Bertolonia
maculata, *DC.*

Beta
vulgaris, *Linn.*

Betula
alba, *Linn.*, var. pendula.

Billbergia
decora-nutans ×, *Baker.*
pyramidalis *Lindl.*
thyrsoidea, *Mart.*, var. longifolia (*C. Koch* et *Bouché*).
zebrina, *Lindl.*

Bomarea
patacocensis, *Herb.*

Brachychilum
Horsfieldii, *Baker.*

Brassica
juncea, *Coss.*

Brodiæa
lactea, *S. Wats.*

Bryonia
dioica, *Jacq.*

Bulbinella
Hookeri, *Benth.* et *Hook f.*

Buphthalmum
speciosum, *Schreb.*

Bupleurum
Candollii, *Wall.*

Butomus
umbellatus, *Linn.*

Calamintha
officinalis, *Mœnch.*

Calandrinia
Menziesii, *Torr.* et *Gray*

Calendula
arvensis, *Linn.*

Callicarpa
purpurea, *Juss.*

Callirhoë
digitata, *Nutt.*

Callistemon
linearis, *DC.*
speciosus, *DC.*

Calochortus
clavatus, *S. Wats.*
venustus, *Benth.*
—var. Eldorado.
—var. oculatus.

Athamanta
Matthioli, *Wulf.*

Atropa
Belladonna, *Linn.*

Aubrietia
croatica, *Schott.*
deltoidea, *DC.*
— var. grandiflora.
— var. taurica.
— var. olympica.

Avena
sterilis, *Linn.*

Babiana
plicata, *Ker.*

Bellis
sylvestris, *Cyrill.*

Bertolonia
maculata, *DC.*

Beta
vulgaris, *Linn.*

Betula
alba, *Linn.*, var. pendula.

Billbergia
decora-nutans ×, *Baker.*
pyramidalis *Lindl.*
thyrsoidea, *Mart.*, var. longifolia (*C. Koch* et *Bouché*).
zebrina, *Lindl.*

Bomarea
patacocensis, *Herb.*

Brachychilum
Horsfieldii, *Baker.*

Brassica
juncea, *Coss.*

Brodiæa
lactea, *S. Wats.*

Bryonia
dioica, *Jacq.*

Bulbinella
Hookeri, *Benth.* et *Hook f.*

Buphthalmum
speciosum, *Schreb.*

Bupleurum
Candollii, *Wall.*

Butomus
umbellatus, *Linn.*

Calamintha
officinalis, *Mænch.*

Calandrinia
Menziesii, *Torr.* et *Gray.*

Calendula
arvensis, *Linn.*

Callicarpa
purpurea, *Juss.*

Callirhoë
digitata, *Nutt.*

Callistemon
linearis, *DC.*
speciosus, *DC.*

Calochortus
clavatus, *S. Wats.*
venustus, *Benth.*
—var. Eldorado.
—var. oculatus.

Camassia

Cusickii, *S. Wats.*
esculenta, *Lindl.*
— var. alba.

Campanula

alliariæfolia, *Willd.*
barbata, *Linn.*
cæspitosa, *Scop.*
carpatica, *Jacq.*
— var. turbinata (*Schott*).
expansa, *Frivald.*
Grossekii, *Heuffl.*
lactiflora, *Bieb.*
latifolia, *Linn.*
—var. macrantha (*Fisch.*)
— var. macrantha alba.
linifolia, *Scop.*
Medium, *Linn.*, var. alba.
mirabilis, *Alboff.*
pyramidalis, *Linn.*
rapunculoides, *Linn.*
Rapunculus, *Linn.*
rotundifolia, *Linn.*
— var. alba.
— var. Baumgartenii (*Becker*).
Scheuchzeri, *Vill.*
Trachelium, *Linn.*
versicolor, *Sibth.* et *Sm.*

Capsicum

annuum, *Linn.*
longum, *Hort.*

Cardamine

bellidifolia, *Linn.*

Carduus

acanthoides, *Linn.*

Carex

atrata, *Linn.*
irrigua, *Sm.*
japonica, *Hort.*
muricata, *Linn.*
punctata, *Gaud.*
Vahlii, *Schkuhr.*

Celosia

cristata, *Linn.*, var. nana.

Centaurea

alpina, *Linn.*
atropurpurea, *Waldst.* et *Kit.* var. calocephala.
axillaris, *Willd.*
cariensis, *Boiss.*
glastifolia, *Linn.*
Jacea, *Linn.*
nigra, *Linn.*
nigrescens, *Willd.*
pectinata, *Linn.*
rutifolia, *Sibth.* et *Sm.*
salmantica, *Linn.*
sphærocephala, *Linn.*

Cephalaria

tatarica, *Schrad.*
— var. minor.

Cerastium

arvense, *Linn.*, var. grandiflorum.
ovatum, *Hoppe.*
purpurascens, *Adams.*
tomentosum, *Linn.*

Cerinthe

alpina, *Kit.*
retorta, *Sibth.* et *Sm.*

Cestrum

aurantiacum, *Lindl.*

Cheiranthus
Senoneri, *Heldr.* et *Sart.*

Chelidonium
majus, *Linn.*
— var. laciniatum (*Mill.*).

Chlorophytum
Orchidastrum, *Lindl.*

Chrysanthemum
arcticum, *Linn.*
Balsamita, *Linn.*
ceratophylloides, *All.*
cinerariæfolium, *Vis.*
coronopifolium, *Masf.*, var. hybridum.
Leucanthemum, *Linn.*
maximum, *Ramond.*
segetum, *Linn.*

Cimicifuga
racemosa, *Nutt.*

Cistus
monspeliensis, *Linn.*

Clematis
heracleæfolia, *DC.*

Clerodendron
splendens, *G. Don.*

Clianthus
puniceus, *Banks* et *Sol.*

Clitoria
Ternatea, *Linn.*

Cnicus
Casabonæ *Roth.*
Diacantha, *Desf.*
eriophorus, *Roth.*
pannonicus, *Host*, var. divaricata.
pratensis, *Willd.*
tartaricus, *Willd.*

Cobæa
scandens, *Cav.*

Cochlearia
glastifolia, *Linn.*

Codonopsis
ovata, *Benth.*
rotundifolia, *Royle.*

Colutea
istria, *Mill.*
melanocalyx, *Boiss.*

Combretum
purpureum, *Vahl.*

Convallaria
majalis, *Linn.*

Coronilla
elegans, *Panč.*
montana, *Scop.*
vaginalis, *Lam.*
varia, *Linn.*

Cortusa
Matthioli, *Linn.*
— var. grandiflora.

Corydalis
glauca, *Pursh.*

Costus
Afer, *Ker.*
igneus, *N. E. Brown.*

Cotoneaster
Nummularia, *Fisch.* et *Mey.*

Cousinia
Hystrix, *C. A. Mey.*

Cratægus
mollis, *Scheele.*

Crocosmia
aurea, *Planch.*

Crocus
pulchellus, *Herb.*

Croton
ciliato-glanduliferus, *Ort.*

Cynoglossum
officinale, *Linn.*
— var. alba.
pictum, *Ait.*

Cytisus
nigricans, *Linn.*
scoparius, *Link.*

Dahlia
Merckii, *Lehm.*

Danaë
Laurus, *Medic.*

Daucus
Carota, *Linn.*
Gingidium, *Linn.*

Delphinium
altissimum, *Wall.*
azureum, *Michx.*
Brunonianum, *Royle.*
californicum, *Torr.* et *Gray.*
cashmirianum, *Royle.*
elatum, *Linn.*
flexuosum, *Rafin.*
formosum, *Boiss.* et *Huet.*
grandiflorum, *Linn.*, var. album.
— var. chinense.
nudicaule, *Torr.* et *Gray.*
palmatifidum, *DC.*
scopulorum, *A. Gray.*
speciosum, *Bieb.*, var. glabratum.
— var. turkestanicum.

Desmodium
gyrans, *DC.*

Dianthus
alpinus, *Linn.*
Armeria, *Linn.*
atrorubens, *All.*
banaticus, *Heuffl.*
cæsius, *Sm.*
chinensis, *Linn.*
cinnabarinus, *Sprun.*
deltoides, *Linn.*
pelviformis, *Heuffl.*
Requienii, *Gren.* et *Godr.*
superbus, *Linn.*
tymphresteus, *Heldr.* et *Sart.*

Dictamnus
albus, *Linn.*
— var. tauricus.

Diervilla
sessilifolia, *Buckl.*

Digitalis
ambigua, *Murr.*
purpurea, *Linn.*

Dionysia
aretioides, *Boiss.*

Diplotaxis
erucoides, *DC.*

Dipsacus
atratus, *Hook. f.* et *Thoms.*
japonicus, *Miq.*

Dodecatheon
Meadia, *Linn.*, var. album.
—, var. integrifolium (*Michx.*).

Draba
- Aizoon, *Wahlenb.*
- arabisans, *Michx.*
- aurea, *Vahl.*
- cuspidata, *Bieb.*
- fladnizensis, *Wulf.*
- hirta, *Linn.*
- incana, *Linn.*
- —var. borealis.
- rupestris, *R. Br.*
- scandinavica, *Lindblom.*

Dracocephalum
- peregrinum, *Linn.*
- Ruprechti, *Regel.*
- speciosum, *Benth.*

Drosera
- longifolia, *Linn.*
- spathulata, *Labill.*

Drosophyllum
- lusitanicum, *Link.*

Dryas
- Drummondii, *Richards.*
- octopetala, *Linn.*

Epilobium
- alpinum, *Linn.*
- angustifolium, *Linn.*
- Billardierianum, *Ser.*
- Dodonæi, *Vill.*
- Lamyi, *Schultz.*
- luteum, *Pursh.*
- parviflorum, *Schreb.*
- repens, *Schlecht.*
- rosmarinifolium, *Hœnke.*
- — var. sericeum.

Eremurus
- himalaicus, *Baker.*
- robustus, *Regel.*

Erigeron
- glabellus, *Nutt.*
- — var. mollis.
- macranthus, *Nutt.*
- Roylei, *DC.*
- speciosus, *DC.*
- — var. superbus.
- Villarsii, *Bell.*

Erinus
- alpinus, *Linn.*

Erophila
- vulgaris, *DC.*

Eryngium
- alpinum, *Linn.*
- Bourgati, *Gouan.*
- dichotomum, *Desf.*
- Oliverianum, *Delar.* var. superbum.
- planum, *Linn.*
- spinalba, *Vill.*

Erysimum
- asperum, *DC.*
- Perofskianum, *Fisch.* et *Mey*

Escallonia
- exoniensis, *Hort.*
- pterocladon, *Hook.*
- rubra, *Pers.*

Eschscholzia
- californica, *Cham.*

Eucalyptus
- ficifolia, *F. Muell.*

Eucharidium
- Breweri, *A. Gray.*

Euphorbia
- Gerardiana, *Jacq.*

Evodia
elegans, *Hort.*

Fraxinus
excelsior, *Linn.*

Fritillaria
camtschatcensis, *Ker-Gawl.*
latifolia, *Willd.*, var. lutea.
Meleagris, *Linn.*

Fuchsia
procumbens, *R. Cunn.*

Funkia
lancifolia, *Spreng.*
Sieboldiana, *Hook.*

Galega
officinalis, *Linn.*
— var. alba.
orientalis, *Lam.*

Galium
coronatum, *Sibth.* et *Sm.*
saccharatum, *All.*

Galtonia
candicans, *Decsne.*

Gasteria
disticha, *Haw.*, var. angustifolia, *Baker.*

Gentiana
asclepiadea, *Linn.*
Saponaria, *Linn.*
septemfida, *Pall.*, var. cordifolia, *Hook. f.*
tibetica, *King.*
verna, *Linn.*

Geonoma
pumila, *Wendl.*

Geranium
argenteum, *Linn.*
Grevilleanum, *Wall.*
ibericum, *Cav.*
— var. platypetalum (*Fisch.* et *Mey.*).
phæum, *Linn.*
pratense, *Linn.*
— var. album.
rhœticum, *Hort.*
roseum, *L'Herit.*
sanguineum, *Linn.*
—var. lancastriense (*Mill.*).

Gerbera
Jamesoni, *Bolus.*
nivea, *Sch. Bip.*

Geum
bulgaricum, *Panč.*
intermedium ×, *Ehrh.*
montanum, *Linn.*
— var. aurantiacum.

Glaucium
flavum, *Crantz.*
— var. fulvum, (*Sm.*).

Globularia
vulgaris, *Linn.*

Gossypium
herbaceum, *Linn.*

Grevillea
glabrata, *Meissn.*

Grindelia
squarrosa, *Dunal.*

Gypsophila
acutifolia, *Fisch.*
elegans, *Bieb.*

Haberlea
rhodopensis, *Frivald.*

Hedysarum
boreale, *Nutt.*
microcalyx, *Baker.*
obscurum, *Linn.*

Helenium
Hoopesii, *A. Gray.*

Helianthemum
ledifolium, *Mill.*
Tuberaria, *Mill.*
umbellatum, *Mill.*
vulgare, *Gaertn.*, var. mutabile roseum.
— var. rhodanthum.
— var. roseum.
— var. venustum.

Heliopsis
lævis, *Pers.*
padula, *Wender.*

Hesperis
matronalis, *Linn.*

Heuchera
Drummondi, *Hort.*
glabra, *Willd.*
macrophylla, *Lodd.*
sanguinea, *Engelm.*

Hibiscus
gossypinus, *Thunb.*
Huegelii, *Endl.*
Manihot, *Linn.*

Hieracium
bupleuroides, *C. C. Gmel.*
cæsium, *Fries.*
cambricum, *F. J. Hanb.*
crinitum, *Sibth.* et *Sm.*
foliosum, *Waldst.* et *Kit.*
gymnocephalum, *Griseb.*
lasiophyllum, *Koch.*
lingulatum, *Backh.*
rupestre, *All.*
sabaudum, *Linn.*
scoticum, *F. J. Hanb.*
tridentatum, *Fries.*

Hyacinthus
romanus, *Linn.*

Hydrolea
spinosa, *Linn.*

Hypericum
Androsæmum, *Linn.*
Ascyron, *Linn.*
crenulatum, *Boiss.*
elodeoides, *Choisy.*
hirsutum, *Linn.*
montanum, *Linn.*
perforatum, *Linn.*
pulchrum, *Linn.*
tetrapterum, *Fries.*

Hypochoeris
radiata, *Linn.*
uniflora, *Vill.*

Hyssopus
officinalis, *Linn.*

Iberis
intermedia, *Guersent.*
sempervirens, *Linn.*, var. commutata (*Schott* et *Kotschy.*).
— var. Garrexiana (*All.*).
— var. superba.
Tenoreana, *DC.*
umbellata, *Linn.*

Ilex
Aquifolium, *Linn.*

Impatiens
cuspidata, *Wight.*
Noli-tangere, *Linn.*
scabrida, *DC.*

Incarvillea
Delavayi, *Bureau* et *Franch.*

Inula
glandulosa, *Puschk.*
Helenium, *Linn.*
Hookeri, *Clarke.*

Iris
Cengialtii, *Ambrosi.*
Pseudacorus, *Linn.*, var. variegata.
sibirica, *Linn.*
—var. alba.
—var. flexuosa (*Murr.*).
virginica, *Linn.*
xiphioides, *Ehrh.*

Isatis
tinctoria, *Linn.*

Itea
virginica, *Linn.*

Jasione
montana, *Linn.*

Juncus
effusus, *Linn.*, var. spiralis (*Hort.*).

Jurinea
glycacantha, *DC.*

Kalanchoe
flammea, *Stapf.*

Kedrostis
africana, *Cogn.*

Kniphofia
Tuckii, *Baker.*

Laburnum
vulgare, *J. S. Presl.*
—var. austriacum.

Lathyrus
hirsutus, *Linn.*
latifolius, *Linn.*
— var. albus.
luteus, *Munby.*
—var. aureus.
macrorrhizus, *Wimm.*
maritimus, *Bigel.*
montanus, *Bernh.*
rotundifolius, *Willd.*
sylvestris, *Willd.*
tingitanus, *Linn.*
vernus, *Linn.*
—var. azureus.

Leontodon
hispidum, *Linn.*

Leontopodium
alpinum, *Cass.*
—var. altaicum (*Spreng.*).

Leonurus
Cardiaca, *Linn.*

Liatris
spicata, *Willd.*

Lilium
pardalinum, *Kellogg.*
Parryi, *S. Wats.*
tigrinum, *Ker-Gawl.*, var. sinense.
— var. splendens (*Baker*).

Linaria
vulgaris, *Mill.*

Linum
austriacum, *Linn.*
— var. album.
hologynum, *Reichb.*
Lewisii, *Pursh.*
narbonense, *Linn.*
perenne, *Linn.*

Lophosciadium
meifolium, *DC.*

Lupinus
aboreus, *Sims.*
—var. violaceus.
nootkatensis, *Don.*
polyphyllus, *Lindl.*, var. albus.
rivularis, *Dougl.*

Lychnis
alba, *Mill.*
alpina, *Linn.*
chalcedonica, *Linn.*
Flos-cuculi, *Linn.*
Flos-jovis, *Desr.*
Haageana ×, *Lem.*
montana, *S. Wats.*
Viscaria, *Linn.*

Lythrum
myrtifolium, *Lodd.*
Salicaria, *Linn.*, var. hirsutum.

Malva
Alcea, *Linn.*
sylvestris, *Linn.*
— var. variegata.

Malvastrum
lateritium, *Nichols.*

Meconopsis
aculeata, *Royle.*
cambrica, *Vig.*
Wallichii, *Hook.*
— var. fusco-purpurea.

Medicago
hispida, *Gaertn.*
sativa, *Linn.*
strumaria, *Hort.*

Melilotus
dentata, *Pers.*
elegans, *Salzm.*
officinalis, *Lam.*

Mimosa
marginata, *Lindl.*

Mimulus
cardinalis, *Dougl.*

Mirabilis
Jalapa, *Linn.*

Momordica
Charantia, *Linn.*
cochinchinensis, *Spreng.*

Morina
longifolia, *Wall.*
persica, *Linn.*

Muscari
Argæi, *Hort.*
armeniacum, *Baker.*
botryoides, *Mill.*
moschatum, *Willd.*

Myosotis
arvensis, *Lam.*
dissitiflora, *Baker.*

Myrrhis
odorata, *Scop.*

Narcissus
Bulbocodium, *Linn.*, var. citrinus, *Baker.*

Nepeta
Mussini, *Spreng.*
Nepetella, *Linn.*
nuda, *Linn.*
Sibthorpii, *Benth.*

Nephthytis
liberica, *N. E. brown.*

Nigella
hispanica, *Linn.*, var. atropurpurea.
—, var. alba.

Noccæa
alpina, *Reichb.*
stylosa, *Reichb.*

Œnanthe
pimpinelloides, *Linn.*

Œnothera
odorata, *Jacq.*

Olearia
Haastii, *Hook. f.*

Onobrychis
viciæfolia, *Scop.*

Ononis
hircina, *Jacq.*
Natrix, *Linn.*
spinosa, *Linn.*

Ornithogalum
tenellum, *Jacq.*

Oryza
sativa, *Linn.*

Oxalis
corniculata, *Linn.*
—var, tropæoloides, *Hort.*
stricta, *Linn.*

Oxypetalum
cœruleum, *Decne.*

Oxytropis
glabra, *DC.*
strobilacea, *Bunge.*

Pæonia
corallina, *Retz.*
officinalis, *Linn.* var. anemonæflora.

Panicum
Crus-galli, *Linn.*

Papaver
alpinum, *Linn.*
glaucum, *Boiss.* et *Haussk.*
Heldreichii, *Boiss.*
lævigatum, *Bieb.*
nudicaule, *Linn.*
pavoninum, *Mey.*
pilosum, *Sibth.* et *Sm.*

Passiflora
quadrangularis, *Linn.*
edulis, *Sims.*

Pentstemon
barbatus, *Roth.*
—var. Torreyi (*Benth.*).
confertus, *Dougl.*
deustus, *Dougl.*
diffusus, *Dougl.*
gentianoides, *Poir.*
humilis, *Nutt.*
ovatus, *Dougl.*
Richardsonii, *Dougl.*

Perezia
multiflora, *Less.*

Peucedanum
coriaceum, *Reichb. f.*
officinale, *Linn.*

Phacelia
tanacetifolia, *Benth.*

Philydrum
lanuginosum, *Banks.*

Phlomis
cashmeriana, *Royle.*

Phyteuma
hemisphæricum, *Linn.*
orbiculare, *Linn.*
Scheuchzeri, *All.*
Sieberi, *Spreng.*

Pimpinella
magna, *Linn.*

Pitcairnia
maidifolia, *Decsne.*
pulverulenta, *Ruiz* et *Pav.*
rubiginosa, *Baker.*

Plantago
Coronopus, *Linn.*
Raoulii, *Decsne.*

Platystemon
californicus, *Benth.*

Polemonium
cœruleum, *Linn.*
—var. album.
confertum, *A. Gray*, var. melitum, *A. Gray.*
himalayanum, *Baker.*
lacteum, *Lehm.*
pauciflorum, *S Wats.*
Richardsoni, *Grah.*

Polyalthia
suberosa, *Benth.* et *Hook. f.*

Polygonum
amplexicaule, *D. Don.*
viviparum, *Linn.*
Weyrichii, *F. Schmidt.*

Potentilla
argyrophylla, *Wall.*
dissecta, *Pursh.*
Friedrichseni, *Hort.*
glandulosa, *Lindl.*
japonica, *Blume.*
malacophylla, *Borb.*
mollis, *Panč.*
nevadensis, *Boiss.*
ontopoda, *Dougl.*
podolica, *Blocki.*
procumbens, *Sibth.*
pseudo-obscura, *Blocki.*
recta, *Linn.*, var. sulphurea.
rupestris, *Linn.*, var. grandiceps.
Sanguisorba, *Willd.*
sericea, *Linn.*
Sibbaldi, *Hall. f.*
Thurberi, *A. Gray.*
tridentata, *Soland.*
umbrosa, *Stev.*
vlasicensis, *Siegfr.*

Poterium
dodecandrum, *Benth.* et *Hook. f.*

Primula
apennina, *Widm.*
Auricula, *Linn.*, var. bellunensis (*Venzo*).
— var. monacensis.

Primula—*continued.*
carniolica, *Jacq.*
elatior, *Hill*, var. carpathica (*Fuss.*).
farinosa, *Linn.*
floribunda, *Wall.*
Forbesi, *Franch.*
frondosa, *Janka.*
involucrata, *Wall.*, var. Munroi (*Lindl.*).
japonica, *A. Gray*, var. lilacina.
longiflora, *All.*
mollis, *Nutt.*
Poissoni, *Franch.*
sibirica, *Jacq.*
sikkimensis, *Hook. f.*
verticillata, *Forsk.*

Prunella
grandiflora, *Jacq.*
—var. alba.
—var. pinnatifida.
vulgaris, *Linn.*
—var. alba.

Pyrus
rotundifolia, *Bechst.*

Ramondia
pyrenaica, *Rich.*
serbica, *Panč.*
— var. Nathaliæ (*Panč.* et *Petrov.*).

Ranunculus
bulbosus, *Linn.*
cuneatus, *Boiss.*
lanuginosus, *Linn.*
montanus, *Willd.*

Reseda
complicata, *Bory.*
lutea, *Linn.*

Rheum
hybridum, *Murr.*
Rhaponticum, *Linn.*
Ribes, *Linn.*

Rhodochiton
volubile, *Zucc.*

Rhododendron
Nuttallii, *Booth.*

Rhynchosia
caribæa, *DC.*

Rodgersia
podophylla, *A. Gray.*

Rondeletia
odorata, *Jacq.*

Ruellia
tuberosa, *Linn.*

Rumex
occidentalis, *S. Wats.*
salicifolius, *Weinm.*
stenophyllus, *Ledeb.*

Ruta
macrophylla, *Soland.*

Sabal
Blackburniana, *Glazeb.*

Salvia
glutinosa, *Linn.*
hians, *Royle.*
nutans, *Linn.*
pratensis, *Linn.*
sylvestris, *Linn.*, var. alba.

Samolus
Valerandi, *Linn.*

Sanicula
europæa, *Linn.*

Saponaria
ocymoides, *Linn.*

Saussurea
alpina *DC.*
serrata, *DC.*

Saxifraga
Aizoon, *Linn.*
aretioides, *Lapeyr.*
aspera, *Linn.*
bronchialis, *Linn.*
cæsia, *Linn.*
cæspitosa, *Linn.*
canaliculata, *Boiss.* et *Reut.*
Cotyledon, *Linn.*
cuneifolia, *Linn.*
geranioides, *Linn.*
Geum, *Linn.*, var. ovalifolium.
granulata, *Linn.*
Hostii, *Tausch.*
hypnoides, *Linn.*
—var. variegata.
integrifolia, *Hook.*
lingulata, *Bell.*
luteo-viridis, *Schott* et *Kotschy.*
muscoides, *Wulf.*, var. atro-purpurea.
mutata, *Linn.*
nivalis, *Linn.*
pedatifida, *Ehrh.*
planifolia, *Lapeyr.*
pseudo-sancta, *Janka.*
retusa, *Gouan.*
rotundifolia, *Linn.*
stellaris, *Linn.*
Stracheyi, *Hook. f.* et *Thoms.*

Saxifraga—*continued.*
tenella, *Wulf.*
umbrosa, *Linn.*, var. Ogilvieana, *Hort.*
— var. serratifolia (*Mackay*).

Scabiosa
amœna, *Jacq.*
caucasica, *Bieb.*
—var. alba.
gramuntia, *Linn.*
lucida, *Vill.*
montana, *Bieb.*
Succisa, *Linn.*
sylvatica, *Linn.*

Schismatoglottis
Roebelini, *Hort.*

Schizanthus
pinnatus, *Ruiz* et *Pav.*

Scilla
festalis, *Salisb.*
—var. carnea.
— var. compacta.
hispanica, *Mill.*
peruviana, *Linn.*

Scirpus
aucklandicus, *Boeck.*

Scolymus
grandiflorus, *Desf.*

Scrophularia
alata, *Gilib.*
nodosa, *Linn.*
vernalis, *Linn.*

Scutellaria
alpina, *Linn.*
altissima, *Linn.*

Sedum
album, *Linn.*
Anacampseros, *Linn.*
asiaticum, *Spreng.*
hybridum, *Linn.*
oppositifolium, *Sims.*
roseum, *Scop.*
stoloniferum, *S. T. Gmel.*

Sempervivum
hirtum, *Linn.*
Pittonii, *Schott, Nym.* et *Kotschy.*
Reginæ-Amaliæ, *Heldr.*
tectorum, *Linn.*
annuum, *C. Sm.*

Senecio
Doria, *Linn.*
Doronicum, *Linn.*
Fuchsii, *C. C. Gmel.*
Greyii, *Hook. f.*
Hodgsoni, *Hort. Kew.*

Serratula
heterophylla, *Desf.*
tinctoria, *Linn.*

Sesbania
ægyptiaca, *Poir.*

Sidalcea
candida, *A. Gray.*
malvæflora, *A. Gray.*

Silene
alpestris, *Jacq.*
caucasica, *Boiss.*
Cucubalus, *Wibel.*
italica, *Pers.*
maritima, *With.*
nicæënsis, *All.*
nocteolens, *Webb* et *Berth.*
Pseudo-atocion, *Desf.*
quadridentata, *Pers.*

Silene—*continued.*
rhynchocarpa, *Boiss.*
Saxifraga, *Linn.*
Schafta, *Gmel.*
Schweinfurthii, *Rohrb.*
stylo a, *Bunge.*
viridiflora, *Linn.*

Siler
trilobum, *Crantz.*

Silphium
trifoliatum, *Linn.*

Sisymbrium
austriacum, *Jacq.*
strictissimum, *Linn.*
tanacetifolium, *Linn.*

Sisyrinchium
angustifolium, *Mill.*, var. mucronatum (*Michx.*).
convolutum, *Nocca.*

Smilacina
racemosa, *Desf.*

Solanum
auriculatum, *Ait.*
Dulcamara, *Linn.*, var. alba.
hybridum, *Jacq.*, var. Hendersonii.
pyracanthum, *Jacq.*
Seaforthianum, *Andr.*

Solidago
multiradiata, *Ait.*, var. scopulorum.
odora, *Ait.*
rigida, *Linn.*
Virgaurea, *Linn.*

Spergula
arvensis, *Linn.*

Spiræa
compacta, *Hort.*, var. coccinea.
Filipendula, *Linn.*
palmata, *Thunb.*, var. alba.
tomentosa, *Linn.*, var. alba.

Stachys
alpina, *Linn.*, var. intermedia.
Betonica, *Benth.*
grandiflora, *Benth.*

Stachytarpheta
indica, *Vahl.*

Stenanthium
angustifolium, *Kunth.*

Succowia
balearica, *Medic.*

Symphoricarpus
racemosus, *Michx.*

Tacca
cristata, *Jack.*

Tacsonia
exoniensis × *Hort.*
Van-Volxemii, *Hook.*

Tanacetum
argenteum, *Willd.*
vulgare, *Linn.*

Tecoma
Smithii, *Hort.*

Tetranema
mexicana, *Benth.*

Teucrium
Botrys, *Linn.*
pyrenaicum, *Linn.*
Scorodonia, *Linn.*

Thalictrum
alpinum, *Linn.*
calabricum, *Spreng.*
glaucum, *Desf.*
laserpitiifolium, *Willd.*
minus, *Linn.*
simplex, *Linn.*

Thermopsis
fabacea, *DC.*
lanceolata, *R. Br.*

Thlaspi
rotundifolium, *Gaud.*

Tillandsia
corallina, *C. Koch.*
splendens, *Brong.*

Tofieldia
glutinosa, *Pers.*
palustris, *Huds.*

Trachelium
cœruleum, *Linn.*

Tradescantia
virginiana, *Linn.*, var. alba.

Trautvetteria
palmata, *Fisch.* et *Mey.*

Trifolium
agrarium, *Linn.*
alpinum, *Linn.*
ambiguum, *Bieb.*
arvense, *Linn.*
minus, *Sm.*
pannonicum, *Jacq.*
repens, *Linn.*
—var. pictum.
rubens, *Linn.*

Trilisa
odoratissima, *Cass.*

Tristania
laurina, *R. Br.*

Trollius
altaicus, *Mey.*
asiaticus, *Linn.*
—var. aurantiacus.
europæus, *Linn.*
—var. pumilus albus.
Ledebourii, *Spr.*

Tulipa
Didieri, *Jord.*

Valeriana
tuberosa, *Linn.*

Verbascum
longifolium, *Tenore.*
malacotrichum, *Boiss.* et *Heldr.*
pyramidatum, *Bieb.*
virgatum, *With.*
Wiedemannianum, *Fisch.* et *Mey.*

Verbena
caroliniana, *Michx.*

Veronica
alpina, *Linn.*
austriaca, *Linn.*
—var. pinnatifida.
Bidwillii, *Hook. f.*
buxifolia, *Benth.*
candida, *Lodd.*
Colensoi, *Hook. f.*
—var. glauca.
crassifolia, *Zeyh.*
decumbens, *Armstr.*
grandis, *Fisch.*
Guthriana ×, *Hort.*

Veronica—*continued.*
neglecta, *Hort.*
pinnata, *Linn.*
Ponæ, *Gouan.*
salicifolia, *Forst.*
saxatilis, *Scop.*, var. rosea.

Viburnum
Opulus, *Linn.*

Vicia
monanthos, *Desv.*
Orobus, *DC.*
oroboides, *Wulf.*
sylvatica, *Linn.*
unijuga, *A. Braun.*
villosa, *Roth.*

Vincetoxicum
nigrum, *Moench.*
officinale, *Moench.*

Viola
canadensis, *Linn.*
—var. alba.
canina, *Linn.*
cornuta, *Linn.*
macedonica, *Boiss.* et *Heldr.*
persicifolia, *Roth.*
pinnata, *Linn.*
primulifolia, *Linn.*
rostrata, *Muhl.*
striata, *Ait.*
sylvestris, *Lam.*

Xerophyllum
asphodeloides, *Nutt.*

Zygadenus
elegans, *Pursh.*

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

APRIL 1902.

CONTENTS.

Page.

History of the Royal Botanic Garden, Edinburgh. Botanical Excursions made by Professor John Hutton Balfour in the Years from 1846 to 1878 inclusively, - - - 21

GLASGOW:

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from

OLIVER & BOYD, EDINBURGH.

[PRICE NINEPENCE.]

[*All rights reserved.*]

History of the Royal Botanic Garden, Edinburgh.

BOTANICAL EXCURSIONS

MADE BY

PROFESSOR JOHN HUTTON BALFOUR,

IN THE YEARS FROM 1846 TO 1878 INCLUSIVELY.

BOTANICAL excursions have always been a prominent feature of the teaching of Botany in Scottish Universities. There is no record of when these were instituted in the case of the Edinburgh Chair of Botany, which is the oldest in Scotland, but Sutherland, who was the first professor, tells us in the dedicatory epistle of his "Catalogue of the Plants in the Physical Garden at Edinburgh," published in 1683, that "by many painful Journeys in all Seasons of the year" he had made it his business to "recover whatever this Kingdom possesseth of Variety, and to cultivate and preserve all of them with all possibie Diligence." It is not unreasonable to suppose that on some of his journeys he may have been accompanied by some of those who attended his lectures in the Garden, and that therefore journeys made in the first instance for the purpose of obtaining plants to stock the Garden, became in time a recognised method by which students of botany in Edinburgh received an insight under guidance to the vegetation and flora of their native country.

To what extent the Prestons, Alston, Hope, and Rutherford, the successive professors following Sutherland, made excursions with their students I have no information. But amongst Professor Hope's papers which are now in the possession of the Royal Botanic Garden, is a "Calendarium of Plants growing in the neighbourhood of Edinburgh collected in flower, 1765, as a

sketch of the Calendarium Floræ of Edinburgh,"* which shows that Hope took special interest in the flora of Edinburgh and its vicinity. James Mackay and George Don, who were Superintendents of the Royal Botanic Garden, during Professor Rutherford's tenure of the Chair, were noted field-botanists.

There are yet alive those who can tell of the enthusiasm of Professor Graham in the excursions he made all over Scotland,† and yet more who will remember a like enthusiasm in his successor, Professor John Hutton Balfour. Both these professors and Keepers of the Royal Botanic Garden made their excursions serve the double purpose of giving instruction to their pupils and of supplying the Botanic Garden with specimens for cultivation, and to their efforts in the latter direction the Garden owes its early and sustained reputation for its collection of herbaceous and alpine plants.

Professor John Hutton Balfour kept a record of the excursions he made with pupils, and extracts from these appeared from time to time in the Transactions of the Botanical Society of Edinburgh and elsewhere, giving a brief resumé of incidents of the excursions, and the names of some of the plants collected. At his death his "Excursion Diaries" passed into the hands of his eldest daughter, now Mrs. Cleland, wife of the Professor of Anatomy in the University of Glasgow. Mrs. Cleland has lent to me these records and I have found them to be of great service in connection with the excursions which are still made throughout the year with students of botany in Edinburgh. As I think the records will have interest for many students of botany now and in the future, extracts from them are here published in these "Notes of the Royal Botanic Garden."

What is given are those portions of the "Excursion Diary" which deal with the excursions made with botanical students from the years 1846 to 1878 inclusively—the years during which Professor John Hutton Balfour was Keeper of the Royal Botanic Garden and occupied the Chair of Botany in the University of

*A copy of this was printed in "The Annals of Scottish Natural History," July and October 1900, and January 1901.

† See, for an account of an excursion with Professor Graham, Spencer Thomson, "Wanderings among the Wild Flowers," London, 1854, p. 127.

Edinburgh. Incidental private matters which are here and there inserted in the Diary have been omitted, but the wording of the extracts is, as a whole, that of the original.

The names of plants in the lists as they occur in the Diary are not arranged in any scientific order. The method in which the Diary was written did not lend itself to this. It was no more than a mere jotting down in the evening after the excursion, or perhaps on a following day, of the names of the chief plants that occurred to the writer as having been seen during the excursion. As the names of flowering plants and ferns are printed here they are, to facilitate reference, arranged in the order of the London Catalogue, 9th edition, but the old nomenclature is retained.

It has been a question with me whether these records should be published or no. Some botanists to whom I have spoken on the subject have suggested a danger that by giving localities of rare plants these might be exterminated. But in these days of free communication between field-botanists and of publication of local floras, the general distribution of plants in Scotland is so well known that I do not think that any stations are likely to suffer from what appears in the following pages. In a few cases, where directions indicating the exact station of a rare species are set forth in the Diary, they have been omitted.* IS. B. B.

EXCURSIONS IN 1846.

Granton, Cramond Bridge, Craigcrook, Ravelston.

Saturday, 16*th May* 1846.

About 10 a.m. walked to Granton, thence by shore to Cramond Bridge, and returned by Craigcrook and Ravelston. Home about 6 p.m. Accompanied by 70 pupils.

Picked :—

Viola odorata	Neottia Nidus-avis
Symphytum officinale	

* An Index to the Excursions will be found at the end.

Dalhousie, Arniston, Fushie Bridge.

Saturday, 23rd May 1846.

Party between 60 and 70 went by train at 8.40 a.m to Dalhousie, proceeded through the woods. Had an order to Mr. Main from H. G. Watson.

Picked :—

Stellaria nemorum
Neottia Nidus-avis

Followed river to Arniston. Had an order from Mr. Trotter to Mr. Brown, forester.

Picked :—

Cardamine amara
Geranium sylvaticum. var. minor, blue and white
Saxifraga umbrosa
" Geum
" hirsuta ?
Chrysosplenium alternifolium
Adoxa Moschatellina
Doronicum Pardalianches
Pulmonaria officinalis
Lathræa Squamaria
Convallaria majalis
" Polygonatum
Lilium Martagon
Arum maculatum
Equisetum Telmateia

Went to Fushie Bridge and returned by train leaving South Esk Station at 6 p.m. Fifty returned in the train.

Castlecary, Dennyloanhead, Dunipace, Larbert, Falkirk.

Saturday, 30th May 1846.

Party of 50 went by Fourth-class train to Castlecary at 7 a.m. Twenty-four took breakfast, then botanized through woods of Cumbernauld, went to Dennyloanhead, thence to Dunipace and Larbert. Visited Carron Iron Works (order from Dawson) and reached Falkirk about 3.45. Party returned to Edinburgh. I went to Glasgow and Dunoon, which I reached at 6.30 p.m.

Amongst plants picked were :—

Ranunculus aquatilis
„ hederaceus
Trollius europæus
Cardamine amara
Stellaria nemorum
Geranium sylvaticum
Geum intermedium
Solanum Dulcamara
Listera Nidus-avis
Paris quadrifolia
Cystopteris fragilis
Polypodium Dryopteris
„ Phegopteris

Burntisland, Pettycur, Kinghorn, Starly Burn.

Saturday, 6th June 1846.

Party of about 60 met at Granton Pier at 9 a.m. and proceeded by steamboat to Burntisland. Visited island, walked by links and rocks near the shore to Pettycur, thence to Kinghorn, returned by a road behind Kinghorn to Burntisland, thence went to Starly Burn and returned by shore in time for 6 o'clock boat.

Picked :—

Senebiera Coronopus
Reseda lutea
Geranium sanguineum
Trifolium scabrum
Agrimonia Eupatoria
Carum Carui
Scandix Pecten-Veneris
Anthriscus vulgaris
Torilis nodosa
Anagallis arvensis
Convolvulus arvensis
Echium vulgare
Solanum Dulcamara, hairy var.
Salvia Verbenaca
Parietaria officinalis, var. erecta
Habenaria viridis
Triticum loliaceum
„ junceum
Botrychium Lunaria

Some went to Seafield and picked :—

Malcolmia maritima
Orobanche rubra

Slateford, Colinton, Woodhall, Currie, Ravelrig, Dalmahoy.

Saturday, 13*th June* 1846.

A party of between 30 and 40 met at Canal and walked by Slateford and Colinton to Woodhall, Currie, and Ravelrig, and returned by Dalmahoy and Ratho. Met train at 6.50 p.m.

Picked :—

Meconopsis cambrica
Geranium phæum
Linnæa borealis
Valeriana pyrenaica
Doronicum Pardalianches
Campanula latifolia (not in flower)
Pyrola minor
Linaria vulgaris
Corallorhiza innata
Listera cordata

Linlithgow, Hopetoun, Blackness Castle, Winchburgh.

Saturday, 20*th June* 1846.

About 30 pupils met at railway at 8 a.m. and went to Linlithgow, visited old church, palace, loch. Walked towards Bo'ness, then to Blackness Castle, then to Hopetoun Woods, Duntarvie and Niddry Castles, and Winchburgh. Returned by train about 7.15 p.m.

Picked :—

Ranunculus aquatilis
Nasturtium terrestre
Dianthus deltoides
Callitriche platycarpa
Epilobium angustifolium
Petroselinum vulgare
Veronica Anagallis
Ceratophyllum submersum
Typha latifolia
Eleocharis multicaulis
Scirpus sylvaticus
Blysmus rufus
Poa aquatica

Holyrood, Salisbury Crags, Duddingston Loch, Lochend.

Saturday, 27th June 1846.

Met at Holyrood at 10 a.m. Present, about 40. Went to station for *Euonymus* on Arthur's Seat, and picked it in fruit. Then proceeded by Salisbury Crags to Samson's Ribs, then to Duddingston Loch. Crossed Arthur's Seat to Parson's Green and went to Lochend. Returned between 4 and 5 p.m.

Plants picked :—

Ranunculus aquatilis (two forms)
Ranunculus Lingua
Dianthus deltoides
Lychnis Viscaria
Arenaria verna
Geranium pyrenaicum
,, sanguineum
Vicia sylvatica
,, hirsuta
Agrimonia Eupatoria
Hippuris vulgaris
Conium maculatum
Æthusa Cynapium
Valeriana officinalis
Carduus acanthoides
Tragopogon minor
Echium vulgare
Hyoscyamus niger
Iris Pseudacorus
Butomus umbellatus
Carex riparia
Asplenium Trichomanes
,, Ruta-muraria
,, septentrionale

Ballencrief, Aberlady, Luffness, Gullan, Drem.

Saturday, 4th July 1846.

Party of about 50 met at the North British Railway Station 8.15 a.m. Proceeded to Ballencrief, thence to Aberlady, Luffness, and Gullan, and returned by Drem.

Picked :—

Fumaria micrantha (Railway at Ballencrieff)
Cerastium arvense
Sagina maritima
Silene noctiflora
Geranium pusillum
Melilotus officinalis (in profusion between Gullan and Drem)
Trifolium fragiferum

Parnassia palustris
Hippuris vulgaris
Hydrocotyle vulgare (fine flower)
Helosciadium repens
Sium angustifolium
Carduus nutans
Centaurea Scabiosa
Campanula rapunculoides
,, hybrida
Anagallis arvensis
,, tenella
Polemonium cæruleum
Cynoglossum officinale
Solanum Dulcamara (all roadsides)
Verbascum Thapsus
Limosella aquatica
Utricularia vulgaris
Hippophaë rhamnoides
Sparganium ramosum
Scirpus lacustris
,, maritimus
Carex intermedia
,, teretiuscula
,, paniculata
Lepturus filiformis var.
Lycopodium selaginoides

Linton, Lawhead, Tantallon Castle, Bass, Canty Bay, Dirleton, Drem.

Saturday, 11*th July* 1846.

Party of 38 met at North British Railway Station at 8.15 a.m. and proceeded to Linton, walked to Lawhead, picking on the way :—

Agrimonia Eupatoria
Æthusa Cynapium
Linaria vulgaris
Ballota nigra
Parietaria officinalis

Mr. Alex. Howden accompanied us through Binning Wood to Whitekirk. Near Lawhead, *Acinos vulgaris* grows.

In Binning Wood :—

Lythrum Salicaria
Rumex sanguineus, var. viridis

Saw some large beeches ; *Castanea*, about 13 or 14 feet in circumference.

Near Whitekirk, picked :—

Sisymbrium Sophia
Potentilla argentea
Sedum anglicum
Sempervivum tectorum
Epilobium hirsutum

Lepidium Smithii grows by roadside, but was not seen by us. Walked to Tantallon Castle, picked :—

Lepidium latifolium
Conium maculatum
Carduus Marianus
Hyoscyamus niger

Then visited the Bass by boat from Canty Bay. On the Bass the plants seen were :—

Cochlearia officinalis
Silene maritima
Lychnis dioica
Cerastium semidecandrum
Lavatera arborea
Geranium molle
Callitriche platycarpa
Peplis Portula
Carduus lanceolatus
Hieracium Pilosella
Beta maritima
Atriplex rosea
Rumex crispus
Urtica dioica
Agrostis alba
„ vulgaris
„ canina
Holcus lanatus
Dactylis glomerata
Poa annua
„ trivialis
Festuca ovina
„ duriuscula
„ glauca, var.
Ramalina scopulorum
Parmelia parietina

On landing from Bass walked by shore to North Berwick, on the way picking :—

Cakile maritima
Eryngium maritimum
Scabiosa Columbaria
Apargia hispida
Hyoscyamus niger
Salsola Kali
Carex arenaria
Ammophila arundinacea

From North Berwick walked by road to Dirleton, visited old castle, and picked :—

Sedum album
Sedum reflexum
Smyrnium Olusatrum

After a hasty dinner at the inn, walked to Drem and returned by train to Edinburgh, which we reached about 7.40 p.m.

Loch Lomond.

Thursday, 16*th July* 1846.

Party consisting of Dr. Balfour, Mr. H. Balfour, Mr. Beveridge, Mr. A. Christison, Mr. David Christison, Dr. A. Douglas, Mr. Keddie, Mr. Littlejohn, Mr. Jas. Mitchell, Dr. Paterson, Mr. A. W. Smith, Mr. T. Spens, and Mr. Tait, made a trip to Loch Lomond and neighbourhood.

Some of the party went early to Glasgow and visited St. Rollox, Lancefield Spinning Co., College. Rest went by train at 1. All proceeded by steamboat at 4 for Dumbarton and thence up Loch Lomond in "Water-Witch." Reached Inverarnan at 10 p.m., and were comfortably accommodated at M'Lellan's Inn.

Friday, 17*th July* 1846.

Started about 8 a.m. for Ben Vorlich and picked numerous good alpine plants, amongst others :—

Trollius europæus
Silene acaulis
Sibbaldia procumbens
Saxifraga stellaris
" aizoides
" hypnoides
Hieracium alpinum
" Lawsoni
Gnaphalium supinum
Lysimachia vulgaris
Salix herbacea
Malaxis paludosa
Carex pauciflora
" saxatilis
Poa Balfourii
Asplenium viride
Lycopodium Selago
" inundatum
" annotinum
" alpinum
" selaginoides
Isoetes lacustris

Saturday, 18*th July* 1846.

Left Inverarnan by steamboat at 5.15 a.m. Breakfasted at Inversnaid. Some went to Loch Katrine and Trossachs, others with Dr. Balfour went to Ben Lomond, and after reaching top walked to Rowardennan. Besides numerous alpine plants picked some peculiar Hieracia on banks of stream at Inversnaid, also:—

Cerastium alpinum
Hypericum Androsæmum
Veronica humifusa

Met boat about 3.30 p.m., and found all the rest of the party on board. Proceeded to Dumbarton, thence by steamboat to Glasgow, and returned to Edinburgh by 10 o'clock train.

Merchiston, Colinton, Bonaly, Habbie's Howe, Currie.

Saturday, 25th July 1846.

Party of 20 met at Bruntsfield Links at 9 a.m. Walked by Merchiston and Colinton to Bonaly, thence by Pentlands to Habbie's Howe, and returned by Black Springs and Currie to Edinburgh about 7.30 p.m.

Picked :—

Sedum villosum
Epilobium angustifolium
Galium pusillum
Solidago Virgaurea
Carduus heterophyllus
Hieracium prenanthoides
„ inuloides ?
Campanula latifolia
Gentiana campestris
Mimulus luteus (in abundance at Bonaly ponds)
Veronica scutellata
Littorella lacustris
Habenaria viridis
Juniperus communis
Lastræa Oreopteris
Botrychium Lunaria
Lycopodium clavatum
Pilularia globulifera

EXCURSIONS IN 1847.

Granton and Cramond.

Saturday, 15th May 1847.

Proceeded to Granton and Cramond, returned about 5.30 p.m. 75 pupils went.

Picked :—

Acer platanoides
Saxifraga granulata
Myrrhis odorata
Symphytum officinale
Neottia Nidus-avis (not in flower)
Orchis mascula
Convallaria multiflora
Carex arenaria
Morchella esculenta
Polyporus squamosus

Dalkeith, Musselburgh.

Saturday, 22nd May 1847.

Met at St. Leonards at 8.30 a.m. A party of upwards of 90 went to Dalkeith. Walked through the grounds and by the banks of Esk to Musselburgh. Returned about 5.30 p.m. by train.

Picked :—

Fumaria officinalis
Stellaria nemorum
Trifolium ornithopodioides
Saxifraga granulata
Myrrhis odorata
Petasites vulgaris
Doronicum Pardalianches
Lithospermum arvense
Lathræa Squamaria
Salix Russelliana
„ purpurea
„ Smithiana
Populus alba
Arum maculatum

Corstorphine, Cramond Bridge, Dalmeny, Queensferry.

Thursday, 27th May 1847. *Queen's Birthday.*

Started at 8 a.m. with party of upwards of 50. Walked to Corstorphine, thence to Cramond Bridge. Through woods of Dalmeny to South Queensferry, crossed to North Ferry. Some returned by Stirling steamer at 5 p.m. Others crossed again and walked to Winchburgh and returned by train at 6.40 p.m.

Picked :—

Viola hirta
„ canina, var. flavicornis
Oxytropis uralensis
Spiræa salicifolia
Myrrhis odorata
Viburnum Opulus
„ Lantana
Lonicera Caprifolium (not in flower)
Symphytum officinale
Neottia Nidus-avis
Ophioglossum vulgatum

Drem, Dirleton, Luffness, Gullan, Aberlady, Longniddry.

Saturday, 29th May 1847.

Party assembled at North British Railway Station at 7.15 a.m. The morning was very wet, and rain was falling copiously without much prospect of clearing. The number who met was about 12. They resolved to put off the trip till 11.30 in the forenoon. By that time the weather was more promising, and a party of 16 started by the train for Drem, thence they walked to Dirleton, visited the castle and grounds, Archerfield, Gullan, Luffness, Aberlady, and returned by train which passed Longniddry about 7 p.m.

Picked :—

At Dirleton :—

Smyrnium Olusatrum
Linaria Cymbalaria
Lamium maculatum, var. album

At Archerfield :—

Rumex sanguineus (leaves)
Listera ovata (not in flower)

At Gullan :—

Viola hirta
Cerastium arvense

At Luffness :—

Hippuris vulgaris
Blysmus rufus
Carex riparia

Near Gosford :—

Geranium sanguineum
Hippophae rhamnoides
Botrychium Lunaria

Near Longniddry :—

Pyrus pinnatifida

Kirkcaldy, Dysart House, Ravenscraig Castle, Raith, Pettycur, Burntisland.

Saturday, 5th June 1847.

Met at stone pier, Newhaven, at 9.30 a.m. Party above 60. Went by steamboat to Kirkcaldy, thence to Earl of Rosslyn's Dysart house. Saw fine rhododendrons, chiefly hybrids between *R. arboreum* and *R. ponticum*, also *R. catawbiense* and some Coniferæ, *Cedrus Deodara* particularly, *Pinus ponderosa*, *Pinus Cembra*, *Picea Webbiana*. Proceeded by shore to Ravenscraig Castle, thence to Raith, visited Raith grounds and loch, saw very fine specimens of *Abies Douglasii*—one in particular past west end of loch—also a form of *Pinus Strobus* called by the gardener *P. monticola*. From Raith walked to Kinghorn and thence to Pettycur and by shore to Burntisland. Returned by boat at 7 p.m.

Picked :—

In Dysart Wood :—

Ranunculus aquatilis
Aquilegia vulgaris
Fumaria micrantha
Montia fontana
Lonicera Caprifolium
Polemonium cæruleum
Veronica polita
Lamium amplexicaule

At Ravenscraig :—

Cheiranthus Cheiri
Silene maritima
Smyrnium Olusatrum
Salvia Verbenaca

At Raith :—

Cardamine amara
Helianthemum vulgare
Viola hirta
Geums (monstrous)
Valeriana pyrenaica
Doronicum Pardalianches
Pteris aquilina
Blechnum Spicant
Asplenium Adiantum-nigrum
Lastrea Filix-fœmina
„ Filix-mas
„ spinulosum
Polypodium vulgare

At Kinghorn :—

Thlaspi arvense
Torilis nodosa
Convolvulus arvensis (not in flower)

Between Pettycur and Burntisland :—

Reseda lutea	Linaria Cymbalaria
Trifolium striatum	Littorella lacustris
Hyoscyamus niger	Phleum arenarium

Burntisland, Starly Burn, Aberdour, St. David's, Inverkeithing, North Queensferry.

Saturday, 12*th June* 1847.

Party of 60 met at Granton at 9 a.m. and went to Burntisland. Thence went to Starly Burn, Aberdour. Entered Donibristle gate, walked by the shore to the house. Thence went to St. David's, Inverkeithing, Ferry Hills, and met Stirling boat at North Queensferry at 5.30 p.m.

At Burntisland :—

Cheiranthus Cheiri	Ballota nigra
Malva sylvestris	Parietaria officinalis
Trifolium scabrum	Sclerochloa maritima
Torilis nodosa	„ loliacea
Salvia Verbenaca	

At Starly Burn :—

Solanum Dulcamara	Listera ovata

At Donibristle :—

Medicago maculata	Atropa Belladonna (in bud)
Centranthus ruber	Allium Scorodoprasum (in bud)
Dipsacus (in leaf)	

At St. David's :—

Diplotaxis tenuifolia	Reseda lutea

At Inverkeithing :—

Thlaspi arvense	Sambucus Ebulus (in bud)
Sedum villosum	Sclerochloa distans

At Queensferry :—

Vicia lutea	

Alloa, Alva, Tillicoultry.

Saturday, 19*th June* 1847.

Party between 50 and 60 met at Granton Railway Terminus at 4.40 a.m. Went on board Stirling steamer at 5. Slight shower at starting. Day cleared. Reached Alloa at 7.30. Breakfasted at Thomas' Royal Oak Hotel. Thence walked towards Alva.

On the way picked :—

Ranunculus aquatilis
Habenaria chlorantha (in bud)
Phalaris canariensis (Mr. Nelson)

In the pond near Alva :—

Sparganium ramosum
Sparganium natans

Roadsides :—

Serrafalcus commutatus

Entered glen to east of Alva House. Four deep ravines, wooded, beautiful ferns, mosses, and *Jungermanniæ.*

Among the ferns were :—

Pteris aquilina
Blechnum boreale
Asplenium Adiantum-nigrum
„ Trichomanes
Athyrum Filix-fœmina
Scolopendrium vulgare
Cystopteris fragilis
Polystichum lobatum
Lastrea Filix-mas
Lastrea spinulosa, var. dilatata
Polypodium vulgare (fronds 2 feet long)

Rocks near the glen :—

Spergula subulata
Astragalus glycyphyllos
Sedum anglicum

After leaving the glen proceeded towards Ben Cleuch—easy but long ascent.

On sides of rivulets 1000 ft. up :—

Saxifraga stellaris
Saxifraga hypnoides

On face of hill near summit :—

Viola palustris	Antennaria dioica
,, canina	Carex præcox

On a high spot :—

Gnaphalium supinum (in plenty)

On summit of hill 2,200 feet :—

Salix herbacea	Lycopodium alpinum
Carex rigida	

On a summit to the north-west marked by a cairn, Mr. James Balfour picked :—

Rubus Chamæmorus

afterwards got by the party (Murchison, Dobie, and Tetley).

Mr. Murchison picked near the summit at upper part of Tillicoultry Glen :—

Trientalis europæa

Descending from the summit by Glen of Tillicoultry abundance of :—

Pyrus Aucuparia	Saxifraga hypnoides
Saxifraga stellaris	Lastrea Oreopteris

Visited woollen works at Tillicoultry and returned to Alloa about 5 p.m. Left by steamboat at 7. Reached Granton about 9.15.

Slateford, Colinton, Woodhall, Currie, Dalmahoy Hills, Ravelrig, and Gogar.

Saturday, 26th June 1847.

Party between 40 and 50 met at 8.30 a.m. at Port Hopetoun (Canal basin). Walked along banks of Canal to Aqueduct, thence to Slateford, Colinton, Woodhall, Currie, Dalmahoy Hill, Ravelrig, Gogar.

In fields near Canal :—

Fumaria micrantha (abundant)
„ officinalis
Fumaria capreolata

At Slateford :—

Corydalis claviculata (old garden wall)
Geranium phæum
„ sylvaticum
Euonymus europæus
Staphylea pinnata
Fragaria elatior
Carpinus Betulus
Bromus asper

In Colinton Woods :—

Epilobium augustifolium (not in flower)
Adoxa Moschatellina
Lonicera Caprifolium
Valeriana officinalis (not in flower)
Valeriana pyrenaica
Scrophularia nodosa
Eleocharis multicaulis
Festuca arundinacea

Woods near Woodhall and banks of river :—

Meconopsis cambrica
Tilia grandifolia
„ parvifolia
Geranium sylvaticum
„ pratense
Geranium dissectum
Rosa spinosissima
„ tomentosa
Avena pratensis
Festuca arundinacea

New mill beyond Currie :—

Trollius europæus

Dalmahoy Hills nearest to Currie :—

Viola lutea
Geranium columbinum (in plenty)

Wood at Ravelrig :—

Linnæa borealis (in full flower).

Ravelrig Bog:—

Comarum palustre
Drosera rotundifolia (not in flower)
Pyrola minor
Pinguicula vulgaris
Corallorhiza innata (plenty)
Listera cordata
Orchis latifolia
„ maculata
Habenaria bifolia

Carex dioica
" pulicaris
" teretiuscula
" acuta
" cæspitosa
" glauca
" pilulifera
Carex panicea
" fulva
" flava
" filiformis
" hirta
" ampullacea

On western Dalmahoy Hill :—

Trientalis europæa (plenty—5 to 6 only in flower, rest beginning to show fruit)

Easter Dalmahoy Hill :—

Ranunculus aquatilis
Saxifraga hypnoides
Digitalis purpurea

Roadside, Dalmahoy :—

Galium erectum

Salisbury Crags, Arthur's Seat, Duddingston.

Thursday, 1st July 1847.

Met between 30 and 40 pupils at 5 p.m. at Holyrood. Walked by Crags to Arthur's Seat and Duddingston. Home about 9 p.m.

Picked :—

Helianthemum vulgare
Lychnis Viscaria
Malva sylvestris
Geranium pyrenaicum
Vicia sylvatica
Conium maculatum
Valeriana officinalis
Veronica Anagallis
Salvia Verbenaca
Stratiotes aloides
Iris Pseudacorus
Butomus umbellatus
Carex acuta ?
" riparia
Asplenium septentrionale

Reston, Coldingham, Fast Castle, Dene, St. Abb's Head.

Saturday, 3rd July 1847.

Party of 35 met at North British Railway Station at 5 a.m. and proceeded to Reston Station. Walked to Coldingham and breakfasted in W. Craig's house. Thence proceeded under direction and guidance of Mr. Alex. Robertson, son of the minister, to Fast Castle, thence by shore to Dene, Lumsdaine, and St. Abb's Head, and returned by train leaving Reston about 6 p.m.

Picked :—

At Fast Castle and in the Dene near it :—

Thalictrum minus
„ majus
Vicia sylvatica
Sedum Rhodiola
Epilobium angustifolium
Orchis mascula

On a knoll in Lumsdaine estate south from Fast Castle :—

Trientalis europæa (picked by Mr. Fraser)

On shore between Fast Castle and St. Abb's :—

Glaucium luteum
Stenhammera maritima
Ligusticum scoticum
Antennaria dioica
Carlina vulgaris

On top of cliffs :—

Dianthus deltoides

In field near a loch not far from St. Abb's Head :—

Poterium Sanguisorba (in profusion)

In the loch :—

Nuphar lutea (in flower)
Lobelia Dortmanna (not in flower)

Rocks near St. Abb's :—

Asplenium marinum

In marshy ground near Coldingham :—

Listera ovata
Orchis latifolia
„ maculata
Gymnadenia Conopsea
Habenaria bifolia
„ chlorantha

On moorish ground not far from Coldingham :—

Pyrola media
Habenaria viridis

Also, both in Reston and Coldingham :—

Geranium sylvaticum
Sempervivum tectorum
Anchusa sempervirens
Linaria Cymbalaria
Veronica agrestis
Festuca bromoides

Dalhousie, Fushie Bridge, Borthwick Castle, Crichton Castle.

Saturday, 10*th July* 1847.

Party of about 40 met at St. Leonards at 9 a.m. Proceeded by train to Dalhousie Bridge, thence walked to Fushie Bridge, Borthwick Castle, Crichton Castle, Roman Camp, and returned by train at 6.30 p.m. Day favourable.

Picked :—

Woods near Dalhousie :—

Milium effusum
Holcus moilis
Melica uniflora
Festuca gigantea ?
Bromus asper

Near Borthwick :—

Epilobium palustre
Veronica scutellata
„ Anagallis
Galeopsis versicolor
Blysmus compressus
Carex intermedia
„ paludosa

At the Castle :—

Agrostemma Githago
Myrrhis odorata
Æthusa Cynapium
Carduus Marianus
Anchusa sempervirens
Verbascum Thapsus
Rumex aquaticus
Parietaria officinalis

Between Borthwick Castle and Crichton :—

In wood :—

Hieracium aurantiacum (by Mr. F. Ivory)

In fields :—

Verbascum nigrum (by Mr. Nelson)

In marshy places :—

Carex paniculata	Carex lævigata
„ Boenninghauseniana ?	

Near Crichton :—

Echium vulgare	Rumex aquaticus

At Roman Camp :—

Silaus pratensis	Epipactis palustris
Valeriana dioica	Orchis latifolia
Lithospermum officinale	„ maculata
Plantago media	Gymnadenia Conopsea
Listera ovata	

In fields near railway :—

Polygonum Fagopyrum (Mr. Gilby)

Arran.

Thursday, 15*th July* 1847.

Party of 24 left by 11 a.m. train for Glasgow, having received second-class tickets for Saturday. On reaching Glasgow at 1.15 visited Model of Arran at Andersonian, then went to the Broomielaw and joined boat for Arran at 2 p.m.

At Greenock party were reinforced by 6 more, including 3 Glasgow pupils (Keddie, Allen, and Connal). The party then consisted of J. H. Balfour, Absolom, John Alexander, Jas. Balfour, Barnes, Theod. Bone, Carrick, Clarke, M. Connal, Donkin, W. B. Duncan, Edgar, Gilby, Gilchrist, C. A. Grant, Dr. Greville,

Hewitson, Ivory, Wm. Johnston, Keddie, Morse, C. Murchison, Nelson, Ogilvy, Rainsford, Stalker, Struthers, Jas. Thomson, Wheatley, John Wilson. Dined on board, and reached Brodick about 8 p.m. After arranging about accommodation visited the beach and picked :—

Sinapis monensis	Aster Tripolium

and a few other plants.

Friday, 16th July 1847.

Party started about 7.30 a.m. after breakfast for Goatfell. This day party were joined by Dr. Blackie, Rev. Dr. Landsborough, and his son. On Goatfell met Grand Duke Constantine of Russia and his suite; the Duke chiselled his name with Mr. Keddie's hammer on granite at summit of Goatfell—"Constantine 1847." The day was propitious, no rain, occasional clouds lighting on summits of hills produced a fine effect. Saw Ireland well and mountains of north Hebrides.

After reaching the summit we proceeded by the rugged crest to the head of Glen Sannox, thence to foot of glen, to Corrie, and returned to Brodick about 7 p.m.

On the ascent picked :—

Alchemilla alpina	Habenaria bifolia
Drosera anglica	Narthecium ossifragum

Many Cryptogamia, some rarer ones seen by Greville.

Summit bare. Crumbling moist rocks on north side gave:—

Thalictrum alpinum	Oxyria reniformis
Saxifraga stellaris	Salix herbacea
Sedum Rhodiola	Juncus trifidus

On summit :—

Andreæa Rothii	Andreæa alpina
„ rupestris	

Searched in Glen Sannox for *Avena planiculmis* in vain.

On the shore :—

Lythrum Salicaria
Œnanthe Lachenalii
Anagallis tenella
Samolus Valerandi
Erythræa compressa (of Link)
Pinguicula lusitanica
Lycopus europæus
Scutellaria galericulata
Habenaria bifolia
„ chlorantha
Blysmus rufus
Schœnus nigricans
Hymenophyllum Wilsoni
Osmunda regalis

The ferns were found on the cliffs of sandstone a little way from the shore.

Saturday, 17th July 1847.

Started at 8 a.m., visited shore at Brodick and woods near the bridge.

Picked :—

In the woods :—

Jungermannia minutissima
Jungermannia cupuliformis

On the shore :—

Sinapis monensis
Carex arenaria
Ammophila arundinacea

At Invercloy :—

Saxifraga Geum

Proceeded by shore to Clachland Point and thence to Lamlash.

Picked :—

Hypericum dubium (near Lamlash)
Cotyledon Umbilicus
Helosciadium repens
Anagallis tenella
Erythræa Centaurium
Pinguicula lusitanica
Juncus maritimus
Carex lævigata
Asplenium marinum
Osmunda regalis
Lichina pygmæa
Asperococcus Turneri
Conferva centralis

Left Lamlash about 4 p.m., sailed to Brodick (where baggage was put on boat), thence to Ardrossan and by rail to Glasgow, where we arrived about 9.30 p.m. (Train late, about 20 carriages,

Glasgow Fair.) Proceeded to Edinburgh by train at 10.15, and reached Edinburgh about 12.45 a.m. in place of midnight.

Linton, Prestonkirk, Tynningham, Tantallon Castle, Bass, Canty Bay, North Berwick.

Saturday, 24th July 1847.

Party of 48 started by North British Railway at 8.45 a.m. for Linton. Thence walked by Prestonkirk to Tynningham, visited banks of the river where it joins the sea, walked by shore to Tantallon Castle and Canty Bay. Reached this bay about 2 p.m., went by two boats to the Bass. Returned to Canty Bay about 5. Some walked, others took omnibus, from North Berwick to Drem Station, and met train at 7.25 p.m.

Picked :—

Near Prestonkirk :—

Potentilla reptans
Conium maculatum
Knautia arvensis
Solanum Dulcamara (in hedges all the way to Tynningham)
Linaria vulgaris
Parietaria officinalis

Visited gardens at Tynningham. Saw field of mummy wheat, holly hedges, fine *Fraxinus Ornus.*

On shore at Tynningham :—

Artemisia maritima var. gallica
Erythræa Centaurium
Cynoglossum officinale
Salicornia herbacea
Schoberia maritima
Salsola Kali
Scirpus maritimus

At Tantallon :—

Lepidium latifolium
Carduus Marianus
Verbascum Thapsus

On the Bass :—

Cochlearia officinalis
Silene maritima
Lychnis diurna
Cerastium atrovirens
Lavatera arborea
Vicia lathyroides
Callitriche verna
Carduus tenuiflorus
„ lanceolatus
Beta maritima
Narcissus poeticus (leaves)
Agrostis vulgaris
Holcus lanatus
Dactylis glomerata
Poa annua
Parmelia saxatilis
„ parietina

Near Drem :—

Helosciadium angustifolium
Anthemis arvensis
Centaurea Cyanus
Barkhausia taraxacifolia
Lithospermum arvense
Euphorbia exigua

Braemar, Clova, Glen Tilt, Dunkeld, Killin, Loch Lomond.

Saturday, 7th August 1847.

Party consisting of J. H. Balfour, Hugh M. Balfour, William Douglas, W. Gilby, B. Hewitson, F. J. Ivory, Henry P. Morse, and C. Murchison, left Aberdeen by Ballater Mail at 11 a.m. Reached Ballater about 4.30 p.m.

After dinner visited the hills near Ballater, and picked :—

Saxifraga stellaris
„ aizoides
Epilobium alpinum
Vaccinium Vitis-Idæa
Arbutus Uva-Ursi
Polygonum viviparum
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides
Equisetum umbrosum (in quantity)

Mr. Morse had picked in the morning *Galium boreale*, *Melica nutans.*

On the hills and in woods were also gathered *Pyrola media*, *Melampyrum sylvaticum.*

On the banks of the Dee a *Hieracium* was picked which appeared to be *H. prenanthoides*, and along with it *Melica nutans.*

The inn at Ballater (Monaltrie Arms, Ross) is a good one, and we were very comfortably accommodated. The charges also are upon the whole moderate. A wooden bridge crosses the river close to the inn. The mountains around are clothed with wood, and in the woods we found very large specimens of *Trientalis europæa* and of *Pyrola media*—a plant which is abundant in the Braemar district, both in woods and on moors.

Monday, 9th August 1847.

The party started early this morning after breakfast and proceeded across the wooden bridge, following the banks of the Muick till the loch came in sight.

In the wood near Ballater abundance of *Melampyrum sylvaticum* was gathered, and on the roadside *Genista anglica* in flower and fruit, besides sundry species of *Hieracium*, *Habenaria viridis*, and other plants.

After passing through a wooded district near Ballater we came to a moorish district yielding few plants of interest. Among the plants picked were — *Drosera anglica*, *Carex pauciflora*, *Marchantia* in a fine state of fruit, and some of the common sub-alpine plants. Near the Falls of the Muick *Carduus heterophyllus* was seen in profusion. *Alchemilla alpina* also made its appearance. On coming to the point where Loch Muick is seen we diverged to the right, crossed the river, and went towards the Hut, whence we ascended the hills, keeping Loch Muick on our left. On the way up *Rubus Chamæmorus*, *Cornus suecica*, and *Vaccinium uliginosum* were gathered in fine fruit. *Epilobium alpinum* and another species were seen. The mist covered the upper part of the hills, and it was impossible to see the summit of Lochnagar. We walked round the mountain towards the Dubh Loch, whence we ascended towards the western side of the hill, reaching a part where snow was lying in quantity, and where *Sibbaldia procumbens*, *Gnaphalium supinum*, and *Azalea procumbens* in flower were picked. When we reached the flat table-land on the western side of the hill we found profusion of *Carex rariflora*, *Sibbaldia procumbens* in flower, as well as *Juncus trifidus* and *Luzula spicata*. The mist continued so thick that we found it impossible to ascend Lochnagar, accordingly we

contented ourselves with examining the marshy ground below the summit, more particularly where the Glassalt Burn rises. We failed in getting *Carex leporina*, which Dr. Dickie found formerly in that situation. We picked *Carex Persoonii*, *C. rigida*, *C. rariflora*, and a few common alpine plants, and then descended towards the woods through which the Braemar road winds, picking on the way *Betula nana*, *Lycopodium annotinum*, *L. clavatum*, *L. Selago*, *L. selaginoides*, *Vaccinium uliginosum* in fruit, *V. Vitis-Idaea*, and other plants. Some of the party feasted on blaeberries. After a long and fatiguing day's work we reached Braemar about 8 p.m., where we found everything comfortably arranged by Mrs. Clark, who had been warned of our approach by the arrival of our baggage by cart. After our usual tea-dinner, and putting our plants in paper, we retired for the evening. We occupied the upper flat, consisting of three rooms, and containing eight beds.

Tuesday, 10*th August* 1847.

The morning was rather gloomy, and did not promise well. After an early breakfast, however, we walked by the banks of the Cluny and Callater as far as Loch Callater, paying a visit as usual to the gamekeeper, whose house is at the end of the loch. He has resided there for many years, and several botanists have received shelter from his hospitable roof. Dr. Barry and myself can bear witness to this. Proceeding by the right side of Loch Callater we picked *Lobelia Dortmanna* and *Subularia aquatica*, and then ascended the hills, on which we gathered *Thalictrum alpinum*, *Saxifraga oppositifolia* in flower, and various species of *Salix*. We examined the rocks to the west side of Loch Callater. On them we found *Salix lanata*, *S. arenaria*, *S. rupestris*, *S. arbutifolia*, *Saussurea alpina*, *Luzula spicata*, *Poa alpina*, various forms of *Hieracium alpinum* and *H. Halleri*, some with rounded broad leaves, others with narrow spathulate leaves, some with leaves on stem, others without them, and we also saw various varieties of *Hieracium murorum* and *H. Lawsoni*. The mist in the course of the day became very thick, and ultimately the rain descended in torrents, so that by the time we reached Loch Candlich all the party had left for Braemar

except Morse, Douglas, Ivory, and myself. The unfavourable nature of the weather prevented us from examining the rocks for *Carex Vahlii.*

After reaching the eastern side of Loch Candlich Mr. Ivory returned to Braemar, and three of us continued our researches along the rocks on the eastern and south-eastern part of the glen, picking *Carex rupestris*, *C. atrata*, *Silene acaulis*, numerous *Hieracia*, and *Thalictrum alpinum.* After getting milk and cakes at the gamekeeper's, we reached Braemar in the evening between 7 and 8, thoroughly soaked with rain.

Wednesday, 11*th August* 1847.

This day we crossed the Dee near the Castle and proceeded through the woods to the road leading to Ben na Bourd. On the way we gathered *Pyrola media*, fine specimens of *Lycopodium clavatum*, *Genista anglica*, *Rubus saxatilis.* On the banks of the stream from Ben na Bourd we found *Epilobium angustifolium* and *Pyrola secunda.* On reaching the gamekeeper's house which has been recently built by the Duke of Leeds, and where his Grace has furnished apartments for himself and party, we found the gamekeeper who had met my party in 1842, when *Astragalus alpinus* was first gathered on Little Craigendal. He is an obliging person, but he informed us that the Duke was very strict, and that he would have to inform him that we had been botanising there. He directed us to Craigendal, but we failed in detecting the astragalus in consequence of keeping too high. Accordingly, leaving Craigendal, we descended into the valley and then ascended Ben Avon, going up the banks of a stream at the head of which snow lay in great quantity. In one place the stream had excavated the snow and formed a fine arch for about 20 yards, under which some of the party passed. Few plants were picked in the immediate vicinity of the snow. On the turfy ground above and near the summit of the mountain *Carex vaginata* grows in profusion. This carex grows abundantly on all the Braemar hills, associated with *C. rigida.*

After visiting the natural cairn on the summit we descended into a corrie near Ben na Bourd, picking *Poa alpina* var. *vivipara*, *Veronica alpina*, and on the grassy part of the hill Mr. Balfour detected *Azalea procumbens* in fine flower.

Numerous deer were seen to-day, as well as ptarmigan and grouse. We returned by the road leading to the gamekeeper's house, and thence along the banks of the river to Braemar, Messrs. Morse and Gilby swimming across the Dee.

Thursday, 12*th August* 1847.

We this day crossed the Dee again, and after walking for about two miles we ascended a stream which leads directly to Craigendal. Here we met the gamekeeper, who conducted us to the place where he had last seen *Astragalus alpinus.* On the way numerous deer were seen. We gathered *Pyrola secunda* in quantity. We found that the astragalus grew in great profusion on the northern side of Little Craigendal, rather lower than we had anticipated. From my recollection of the original spot at which my party picked the plant I was disposed to think that it was close to the summit, and thus we had failed in our previous day's examination. This day we picked the plant in profusion both in flower and fruit in various places. It is generally distributed over one side of the mountain, and there seems to be no chance of the plant being eradicated.

The following is a list of the plants which we picked on Little Craigendal :—

Thalictrum alpinum
Silene acaulis
Geranium sylvaticum
Astragalus alpinus
Rubus Chamæmorus
Dryas octopetala
Potentilla alpestris
Alchemilla alpina
Saxifraga oppositifolia
„ stellaris
„ aizoides
„ hypnoides
Epilobium alpinum
Cornus suecica
Galium boreale
Saussurea alpina
Arctostaphylos Uva-Ursi
Azalea procumbens
Pyrola media
„ secunda
Statice Armeria
Gentiana campestris
Polygonum viviparum
Habenaria viridis
Tofieldia palustris
Juncus trifidus
„ triglumis
Luzula spicata
Carex rupestris
„ rigida
„ præcox
„ vaginata
„ capillaris
Poa alpina
Botrychium Lunaria
Lycopodium annotinum

The hill is at first sight by no means promising and would be easily passed over by botanists as unworthy of examination. It shows us the necessity of not being guided entirely by external appearances and by what seem to be promising rocks. This is also seen in the case of such plants as *Lychnis alpina.*

After examining the side of Craigendal carefully we proceeded towards its summit, and then by its southern side towards Braemar. In the evening we met Professor Allen Thomson and his lady with two Messrs. M'Tear, who had walked from Lochnagar, and reached Braemar in the evening.

Friday, 13th August 1847.

The weather being favourable we this day started between 6 and 7 (after breakfast) with the view of visiting the far-famed Ben na Mac Dhu. We proceeded in conveyances, accompanied by Dr. and Mrs. Thomson and party, to the Linn of Dee, whence we walked up Glen Lui, picking on the way *Arabis petræa*, a plant which occurs both in the dry stony bed of the river and also on the rocks of Ben na Mac Dhu, Cairn Toul, and other hills. After walking several miles the cliffs on the north-eastern side were first examined. On them snow lies in considerable quantity, and thus alpine plants thrive well. Here were gathered—*Veronica alpina* in flower and fruit, *Arabis petræa*, *Stellaria cerastoides*, *Hieracium alpinum* in various states, and *Carex vaginata.* The cliffs are, however, by no means so productive as might have been expected. After visiting the cliffs we proceeded to the summit, observing on the way *Luzula spicata* and *L. arcuata* in profusion, and *Silene acaulis* in beautiful flower. A fine spring exists near the summit. It happened, fortunately, that a party connected with the Government Survey were located on the summit, and as we had previously been made aware of this fact we resolved, if possible, to take up our quarters with them for the night. They received us kindly, and promised to do what they could for us, although it afterwards appeared that they were short of provisions. The day was clear and propitious, and we had an excellent view from the summit; the Survey-party said it was the clearest day that had occurred for six weeks. Ben Nevis, Ben Lawers, the Braemar, Clova, Glen Isla

Mountains, Ben y Gloe, the Moray Firth, the sands of Culbin, the sea at Aberdeen, and the Spey, were seen distinctly. The Survey party had ascertained that Ben Nevis is higher than Ben na Mac Dhu by 70 or 80 feet.

Dr. Thomson and his lady and the Messrs. M'Tear left us at the summit and returned to Braemar, a conveyance meeting them at the Linn of Dee. Mrs. Thomson accomplished the walk easily, notwithstanding her fatigue in ascending Lochnagar the day before, and she was able next day to visit Little Craigendal.

Our party now proceeded from Ben na Mac Dhu to Cairngorm, picking some interesting crystals among the granite. On the summit of Cairngorm we gathered *Luzula arcuata*, a plant met with on all the Braemar hills (as Ben na Mac Dhu, Cairn Toul, Lochnagar), and :—

Silene acaulis
Empetrum nigrum
Salix herbacea
Juncus trifidus
Luzula spicata
Carex rigida
Aira alpina vivipara
Festuca vivipara
Lycopodium Selago
Trichostomum lanuginosum

The same plants were picked on the summit of Ben na Mac Dhu, and they may be looked upon as characterising the vegetation of the summits of the highest hills. With them may be associated also *Azalea procumbens*. We had a fine view from the summit of Cairngorm, and we descended by the rocky and precipitous banks of a mountain torrent to the dark Loch Avon. In its cold waters we bathed, but the temperature was such as to forbid our remaining longer than a few minutes in the water. The shelter-stone was visited—a large mass of rock which has fallen at some distant epoch, and lies slightly supported upon rocks so as to leave a large cave capable of containing a considerable party. Our party were easily accommodated under its shelter, and on several occasions parties have remained under it all night. *Sparganium natans* was picked in a pool, also various *Hieracia* of the alpine form.

The party ascended the cliffs on the west of Loch Avon, and wended their course by Loch Etchachan to the shoulder of Ben na Mac Dhu, reaching it just as the sun set. We were

placed on short allowance after our hard day's work, half a loaf of bread, some coffee, and a little whisky being all that could be procured to satisfy the hunger of eight active botanists. Our accommodation for the night was of a novel kind; six of the party occupied hammocks swung across a wooden building which had been erected near the summit, while two lay on the floor.

Saturday, 14*th August* 1847.

Most of the party rose at four, and proceeded to the summit of the Ben, where the surveying instruments were placed. From this point we contemplated a glorious sunrise, one of the most magnificent I ever saw. Our breakfast consisted of the second half of the loaf and of some coffee. Some of the party were so knocked up with their previous day's work and with the want of food that they resolved to descend the mountain at once and make the best of their way to Braemar. Accordingly Messrs. Ivory, Hewitson, Gilby, and Balfour left, while Messrs. Morse, Murchison, Douglas, and myself continued our botanical researches. The want of refreshment during the day and the scanty allowance at breakfast had a very weakening effect upon all of us. The morning was cold and bracing, and the first part of our journey was accomplished with considerable vigour. After leaving the summit of the mountain we proceeded towards the pass which unites Strathspey and Glen Dee. On the way we descended by a steep declivity which rewarded us with many good plants, such as:—

Cerastium alpinum
Stellaria cerastoides (in a beautiful state)
Sibbaldia procumbens
Veronica alpina
Phleum alpinum

We visited one of the Wells of Dee in the pass, and then proceeded up the Braeriach ridge, gathering on the way—*Cornus suecica* in flower, *Hieracia*, *Luzula arcuata*, and other plants. On reaching the summit of the ridge we skirted along the upper part of the cliffs, which are very precipitous, and seem to be worthy of careful examination. Our time only permitted a hasty glance. On the summit of the ridge there is a great extent of table-land in which there are several sources of the Dee, which we visited. The day was oppressively warm, and these cool springs were most refreshing.

The summits of most of the mountains here are very rocky and stony, and walking on them is very painful and fatiguing, especially on a hot and sultry day. After visiting the Springs of the Dee we proceeded to the rocks near Loch Evnach, which we examined superficially, and deem worthy of careful examination. *Luzula arcuata*, *Aira alpina vivipara*, and many alpine plants were seen on them. Leaving these rocks we bent our steps towards Cairn Toul, and on the ascent we gathered a *Carex* supposed to be *Carex leporina*, associated with *C. curta* var. *alpicola*. After a very fatiguing walk we reached the summit of Cairn Toul, picking *Luzula arcuata* on the way. We then descended by a rocky ravine towards the Dee. The descent was difficult and tedious. Some of the party were nearly knocked up by it. In a corrie of Cairn Toul I found *Veronica alpina*, *Poa alpina*, *Phleum alpinum*, and several other alpine plants. The hill deserves to be examined more thoroughly, and it is easy to reach it by taking a car from Braemar to the bridge on the Glen Tilt road, and then striking off to Glen Dee on the right hand. This is also a way of reaching one side of Ben na Mac Dhu, and it leads directly to the pass which conducts to the Spey. After reaching the Dee we proceeded by Glen Dee along the banks of the river. After walking a few miles we reached a sort of horse-track which conducted us to the Glen Tilt road, and ultimately to the Linn of Dee, where we arrived about 7 in the evening after a most laborious journey. A vehicle was here in waiting for us, and after partaking of a draught of porter and some biscuits, our only meal since 5 a.m., we reached Braemar in safety.

Monday, 16*th August* 1847.

The party walked by Invercauld to Lochnagar, picking on the way—*Vaccinium Vitis-Idæa*, *Betula nana*, and *Parnassia palustris*. We first made for the cliffs on the north-eastern side and examined them carefully. These cliffs surround a little loch, and some of them are very lofty and precipitous. Of late great falls of rocks have taken place. Various species of *Hieracium*, especially *H. alpinum*, *H. villosum*?, *H. Halleri*, were seen in profusion, *Allosorus crispus* in a fine state, *Veronica alpina*. On

the rocks near the snow, which is by no means abundant this season, *Saxifraga rivularis* was found as usual in large quantity. On the sloping green bank among the cliffs to the north of the summit Mr. Douglas saw *Sonchus alpinus*, and the plant was gathered also by myself and Messrs. Ivory and Balfour. A great number of the specimens were only in bud. This discovery confirms another of Don's stations for the plant. The more we examine the Highland hills the more we are satisfied of the correctness of Don's observations, and I have no doubt that the *Potentilla tridentata*, *Ranunculus alpestris*, and other plants not found since his day will ultimately come to light by the researches of botanists. On the cliffs also *Saussurea alpina*, *Poa alpina*, *P. laxa*, *P. flexuosa*, and *P. Balfourii*, with *Cerastium alpinum* and the usual alpine plants, were gathered. The party ascended to the summit by one of the steep ravines, encountering now and then some difficulties from the projecting rocks. On the summit *Carex rigida* was found as usual. From this point we proceeded to examine the ground at the source of the Glassalt Burn and the rocks where Dr. Dickie had found *Carex leporina*, but our time was limited and we did not find the plant. We descended by the rocks to the west, and some of the party attempted to cross the hills directly for Braemar, but they encountered many difficulties—they found the darkness coming on, and therefore were forced to return to the usual route after encountering a large herd of deer.

It was late this evening before we reached our quarters.

Tuesday, 17th August 1847.

We started in a conveyance this day for the Spital Bridge, about eight miles from Castleton. This bridge is situated near the foot of Glasmaol. We ascended towards the rocks at the head of Canlochan, where we spent the day. This is undoubtedly the best way of reaching the upper part of the glen. In moist places near the summit, gathered :—

Juncus castaneus	Alopecurus alpinus
Carex Persoonii	Phleum alpinum

Descending into the glen :—

Potentilla alpestris	Veronica alpina
Epilobium alsinifolium	„ saxatilis
Erigeron alpinus	Salix reticulata
Saussurea alpina	Carex atrata
Veronica serpyllifolia	„ vaginata
„ humifusa	Poa Balfourii

and numerous other alpine species were seen.

On the precipitous rocks at the head of the glen *Gentiana nivalis* was gathered in small quantity. Leaving these rocks and proceeding towards the western side we found *Sonchus alpinus* in two places; unfortunately, however, most of the specimens had their flowers nipped off. The same thing was noticed last year. It is not easy to account for this. Can it be the high winds or the attacks of insects? No withered heads were seen in the place. In one of the stations along with *Sonchus*, *Saussurea* was found in quantity. We ascended Glasmaol by a ravine near the head of Canlochan. In this ravine grows profusion of *Saxifraga nivalis*, *Cystopteris dentata*, *Veronica humifusa*, *V. alpina*. Mist covered the summit of the hill so that our view was intercepted. We descended by compass, and on our way down saw abundance of *Juncus castaneus* and *Alopecurus alpinus*.

Our conveyance met us about five or six miles from Castleton.

Wednesday, 18*th August* 1847.

Got a conveyance as far as Loch Callater and then ascended the hills to the head of Glen Candlich [Ceann-mor?]. At this place there are caverns and a small hut in which travellers may rest for the night. At the head of Glen Candlich there are fine steep cliffs on which we saw *Epilobium alsinifolium* in great profusion along with *Veronica humifusa* and *V. alpina*. Leaving the head of the glen we bent our steps towards Little Gilrannoch, on the way picking *Alopecurus alpinus*, and *Carex aquatilis* in great quantity. On reaching Gilrannoch we were disappointed to find that there were scarcely any specimens of *Lychnis alpina*. Each of us got a specimen in flower, and that was nearly all we gathered. We also found *Cherleria sedoides*. The rock on which these plants grow is peculiar, and specimens of it were taken by the

party. The day was very fine and the rocks of Glen Fee seemed to be very tempting, and after some consultation it was resolved that Mr. Gilby (at his own desire) should return to Glen Callater and meet the conveyance, while the rest of the party, consisting of Messrs. Morse, Murchison, Ivory, Balfour, and myself (Hewitson and Douglas had remained at home), should go to Clova and remain all night. Accordingly we proceeded towards the head of Glen Fee, picking *Carex rariflora* and some alpine plants on the way. On reaching the rocks at the upper part of the glen, we saw *Carex Vahlii* in great profusion, and with it *Salix lanata, S. arenaria.* We looked in vain for *Carex Grahami*; I fear the plant has disappeared from its original station. After examining the cliffs on the western side of the corrie we went to the northern side of Glen Fee and visited the cliffs on which *Oxytropis campestris* grows. There had been recently a great fall of rocks and part of the *Oxytropis* had been carried away—there still, however, remains a considerable quantity, although most of it is inaccessible. After much exertion and some risk we secured a specimen in fruit and Mr. Ivory got one specimen in flower. On the rocks we also got *Woodsia hyperborea.* Descending from the cliffs we made towards Acharne, a farm-house where Mr. Watts resides, whom I had known on previous trips, and in whose house I had formerly attended a patient for smallpox. I asked for hay and a barn and a dish of porridge. After ascertaining who we were the party was kindly received—porridge and tea was supplied and everything was done by the farmer and his sister that could contribute to our comfort.

Thursday, 19*th August* 1847.

Rose early and proceeded to gather some *Hieracia, Malaxis paludosa.* After ablutions in the river and breakfast we proceeded to the rocks in Glen Dole. On these we picked a number of alpine species—especially *Sonchus alpinus* (eight specimens in flower), *Poa alpina, Salix reticulata, Hieracia, Pyrola secunda, Arabis hirsuta*, and many other good plants.

We then reached the summit of the ridge near the astragalus cliff, and proceeded by the banks of the White Water towards the upper part of Glen Callater, in which we saw large specimens

of *Salix lanata.* We proceeded by the eastern side of Loch Callater, which is the easiest for walking, and after refreshment at the gamekeeper's house went on to Castleton.

Friday, 20th August 1847.

This day was occupied chiefly in arranging and drying specimens. We took a short walk by the banks of the Cluny water and the Dee, picking :—

Meum athamanticum
Peucedanum Ostruthium (in Free Churchyard)
Hieracium prenanthoides
Humulus Lupulus (at the Bridge)
Triticum caninum

and some other common species.

Saturday, 21st August 1847.

We this day sent all our baggage by cart to Dunkeld, the man to be at Dunkeld on Monday forenoon. We carried with us our oilskin coats and a change of stockings. The day was misty and unpromising. After settling our bill and taking leave of Mrs. Clark we proceeded by two conveyances to Croachlach, a shooting lodge of General Duff about 12 miles from Castleton. Thence we walked through Glen Tilt, keeping the road nearly the whole time and diverging very little for the purpose of botanising.* We picked at the upper part of the glen *Epilobium angustifolium, Poa nemoralis, Saxifraga oppositifolia.* After entering the woods we picked specimens of *Campanula latifolia alba, Equisetum Drummondii, Melampyrum sylvaticum.*

Monday, 23rd August 1847.

Started early from Bridge of Tilt and walked to Killiecrankie, meaning to join the coach as it passed. The *Orobus niger,*

* The existence of a right-of-way through Glen Tilt was at this time in dispute, and the Botanists when they neared the foot of the Glen found their way barred. Of this incident the Diary contains a full description which need not be reproduced here. The experiences of the Botanists made the question of right-of-way an acute one, and the claim to a public road through Glen Tilt was ultimately declared by the Law Courts to be just.

however, detained us, and we missed the coach. The plant is in great profusion on the banks opposite Mrs. Hay's cottage. Passing through the glen, which we saw to great advantage, the morning being fine, we reached Moulinearn (after making a divergence of four miles by mistake). There we breakfasted. The party got a return car to take them to Dunkeld, while Mr. Murchison and I crossed the Tummel and the Tay and walked to Aberfeldy and Kenmore, picking on the way :—

Radiola Millegrana	Pyrola media
Genista anglica	Quercus sessiliflora
Lysimachia vulgaris	

and a number of common species. The rest of the party (except Mr. Morse and Mr. Douglas) came by coach to Kenmore at night. There we met Mr. John H. Bunten, advocate, who had heard of our adventures in Glen Tilt and to whom we gave the full particulars.

Tuesday, 24th August 1847.

Our baggage having not all arrived, and the day being misty, we visited the gardens at Kenmore superintended by Mr. Murray and saw some curious specimens of grafting, ringing the bark—and afterwards we visited Taymouth Castle, and then walked to the Falls of Acharn. At the latter place we gathered *Festuca calamaria, Poa nemoralis, Campanula latifolia.*

Wednesday, 25th August 1847.

Left Kenmore early and walked by road for four miles towards Killin, then ascended the hills and reached the cliffs at the end of Lochnagat—the cliffs are called Crag na Lochan. There we saw :—

Draba incana	Poa alpina
Cerastium alpinum	„ Balfourii
Erigeron alpinus	Woodsia hyperborea
Saussurea alpina	

In moist places in the corrie—*Juncus triglumis, Carex saxatilis.*

Examined the cliffs of Cragnagat, where we saw *Myosotis alpestris* in profusion, *Veronica alpina* and *V. saxatilis, Sesleria cærulea.* Ascended Ben Lawers in the midst of mist and reached its summit, found *Saxifraga cernua* not in flower, *Draba rupestris*, and on the steep sides of the hill *Alsine rubella.* Mr. Murchison and I alone ascended to the summit, and we met the rest of the party at Lawers Inn for lunch. Walked to Killin, whither our baggage had been sent.

Thursday, 26th August 1847.

Went by coach to Inverarnan—baggage by cart. Picked *Malaxis paludosa* and *Lycopodium inundatum*, also walked along shores of Loch Lomond and saw :—

Hypericum humifusum	Carex vesicaria
Lythrum Salicaria	Hymenophyllum Wilsoni
Lysimachia vulgaris	

The day was unpropitious, and Ben Vorlich could not be examined. Visited a curious large mass of rock which was used as a preaching station.

Friday, 27th August 1847.

Visited Glen Falloch, and picked various forms of *Quercus pedunculata* and *Q. sessiliflora.*

Left Inverarnan by steamboat at 2 p.m., reached Balloch about 6, Dumbarton about 7, and Glasgow about 8.30 p.m. Left Glasgow by 10.30 train, and reached Edinburgh about 12 midnight.

In taking a general review of the nature of the country visited it may be remarked that the rocks which produced the greatest variety of rare species were the crumbling gneiss and mica-slate rocks of Clova, Glen Isla, and Ben Lawers. The granite rocks of the Braemar district often presented large tracts of dry

unproductive stony soil and displayed fertility only where moisture and the atmosphere had been able to pulverise the rocks. It is curious to notice the occurrence of species such as *Oxytropis campestris* and *Lychnis alpina* on single rocks in Britain. The latter we have already stated to be serpentine, and in the case of the former the rock appears in some respects to differ from those in its immediate vicinity.

Luzula arcuata seems to prefer the granite in the district visited, and I have remarked the same thing in Sutherlandshire, where it is found on the granite of Foineven.

Carex Vahlii grows on gneiss, *C. leporina* on granite, while *Astragalus alpinus* is common to both. *Alsine rubella* and *Myosotis suaveolens* occur on mica-slate. The ordinary alpine species appear to grow indifferently on granite, gneiss, and mica-slate.

The range of species in the district will be illustrated by grouping species within divisions representing 1000 feet. Thus commencing at the sea at Aberdeen we have numerous sea-weeds, then *Carex arenaria* and *incurva* and the ordinary plants of the district, common trees, *Goodyera repens*, and *Linnæa borealis* in the woods up the Dee.

Reaching Castleton, Braemar, which is 1000 feet above the level of the sea, we come into a region where *Genista anglica*, *Saxifraga aizoides*, *Alchemilla alpina* begin.

From 1000 to 3000 feet :—

Thalictrum alpinum
Viola lutea
Genista anglica
Rubus saxatilis
„ Chamæmorus
Alchemilla alpina
Saxifraga stellaris
„ aizoides
Sedum villosum
Vaccinium Vitis-Idæa
Arbutus Uva-Ursi
Calluna vulgaris
Erica Tetralix
Erica cinerea
Pyrola media
„ secunda
Melampyrum sylvaticum
Polygonum viviparum
Oxyria reniformis
Listera cordata
Tofieldia palustris
Juncus triglumis
Lycopodium Selago
„ clavatum
„ selaginoides
Pteris aquilina

From 2000 to 3000 feet :—

Sibbaldia procumbens
Saxifraga oppositifolia
,, hypnoides var.
Epilobium alsinifolium
,, alpinum
Gnaphalium supinum
Sonchus alpinus
Vaccinium uliginosum
Veronica humifusa
Betula nana
Salix rupestris
,, lanata
,, arenaria
Empetrum nigrum
Juncus trifidus
,, castaneus
Carex atrata
,, capillaris
,, saxatilis
Alopecurus alpinus
Phleum alpinum
Poa alpina
,, flexuosa
,, Balfourii
Festuca vivipara
Asplenium viridis
Polystichum Lonchitis
Lycopodium annotinum

From 3000 to 4000 feet and upwards :—

Arabis petræa
Draba incana
Cochlearia groenlandica
Silene acaulis
Lychnis alpina
Cerastium alpinum
Cherleria sedoides
Astragalus alpinus
Potentilla alpestris
Saxifraga nivalis
,, rivularis
Erigeron alpinum
Saussurea alpina
Hieracium alpinum
Azalea procumbens
Gentiana nivalis
Veronica alpina
,, saxatilis
Salix herbacea
,, reticulata
Luzula arcuata
,, spicata
Carex rupestris
,, Persoonii
,, leporina
,, rigida
,, vaginata
Aira alpina

At and above 4000 feet. Truly alpine :—

Draba rupestris
Silene acaulis
Stellaria cerastoides
Arenaria rubella
Sagina nivalis
Cherleria sedoides
Saxifraga cernua
Saussurea alpina
Salix herbacea
Empetrum nigrum
Juncus trifidus
Luzula spicata
,, arcuata
Carex leporina
,, rigida
Aira alpina
Festuca ovina

Thus ended a botanical trip of no ordinary kind, whether we regard its extent, the rarity of the plants picked, or the adventures connected with it. Three weeks were spent in visiting the richest alpine districts in Britain, Braemar, Clova, Glen Isla, and Ben Lawers, and there was scarcely an alpine species which was not collected by the party.

The discovery of *Carex leporina* on Cairn Toul and of *Hieracium villosum* on Lochnagar, the gathering of *Sonchus alpinus* on the latter mountain and of *Woodsia hyperborea* in Glen Isla, the finding of *Luzula arcuata* on Ben na Mac Dhu, Cairngorm, Lochnagar, Braeriach, and Cairn Toul, and of *Carex vaginata* on all the Highland hills, thus extending the localities of these rare species—all these are facts which are interesting to botanists.

EXCURSIONS IN 1848.

Gorebridge, Arniston, Kirkhill, Dalhousie.

Saturday, 13th May 1848.

About 80 met at 9 a.m. at North British Railway Station and proceeded by train to Gorebridge. Thence walked to Arniston and along the banks of the river to Kirkhill and Dalhousie Station. Returned about 6 p.m.

Picked :—

Aconitum Napellus (not in flower)
Stellaria nemorum
Prunus Padus (Arniston)
Saxifraga umbrosa (not in flower)
Chrysosplenium alternifolium
Adoxa Moschatellina
Doronicum plantagineum
Pulmonaria officinalis
Lathræa Squamaria
Arum maculatum
Taxus baccata
Scolopendrium vulgare
Equisetum Telmateia

Castlecary, Denning, Larbert, Dunipace, Falkirk.

Saturday, 20*th May* 1848.

Party of about 40 met at 7 a.m. at Edinburgh and Glasgow Railway Station. Proceeded by train to Castlecary to breakfast. Twenty-seven breakfasted. About 15 or 16 more came by 8 o'clock train, making in all between 50 and 60. Visited Castlecary Glen. Thence walked by Denning to Larbert and Dunipace. Bathed in the river near the bridge at Larbert. Visited Carron Iron Works, having an order from Mr. Dawson. Walked to Falkirk Station and returned by the train which reached Edinburgh about 6 p.m.

Picked :—

In Castlecary Glen :—

Anemone nemorosa
Stellaria nemorum
Mercurialis perennis
Neottia Nidus-avis (sparingly and not in full flower)
Paris quadrifolia
Cystopteris fragilis
Polystichum lobatum
Polypodium Dryopteris

Between Denning and Larbert :—

Trollius europæus
Arenaria rubra
Myrrhis odorata
Symphytum officinale
Allium ursinum

Cockburnspath, Dunglass Dene, Pease Dene.

Saturday, 27*th May* 1848.

About 40 met at North British Railway Station at 9 a.m. Proceeded by train to Cockburnspath. Arrangements had been made by which each student received a third class return ticket for 2s. Met Mr. Hepburn of Whittingham at Linton. On reaching Cocksburnspath visited Dunglass Dene, where there was a great profusion of ferns, the vegetation very luxuriant. After leaving the Dene the party proceeded to the sea shore.

Walked along the shore to the foot of the Pease Dene and up the glen. Returned by the train which passed Cockburnspath at 7.52 p.m., and reached Edinburgh about 9.30 p.m.

Picked :—

In Dunglass Dene :—

Cardamine amara
„ hirsuta
„ sylvatica
Geranium Robertianum (28 inches long by 25 across)
Chrysosplenium oppositifolium (18 inches long)
Veronica montana
Allium ursinum (28 inches long)
Athyrium Filix-fœmina (frond measured $3\frac{1}{2}$-feet long)
Scolopendrium vulgare (30 inches long and 3 broad)
Lastrea dilatata ($3\frac{1}{2}$-feet long)

On the shore :—

Glaucium luteum (not in flower)
Cochlearia officinalis
Epilobium hirsutum (not in flower)
Ligusticum scoticum (not in flower)
Armeria maritima

In Pease Dene :—

Polystichum aculeatum, var. angulare (in profusion)

and numerous other fine ferns.

Dysart, Ravenscraig Castle, Kirkcaldy, Seafield, Burntisland.

Saturday, 3rd June 1848.

Party of upwards of 60 went to Dysart, partly by railway and partly by steamboat. Visited woods at Dysart, where there are many introduced and naturalized plants. Walked by the shore to Kirkcaldy, and then to Seafield tower and Burntisland. Returned by boat at 5.30 p.m.

Picked :—

In Dysart woods :—

Aquilegia vulgaris
Saxifraga Geum
„ umbrosa
Doronicum plantagineum
Polemonium cæruleum
Linaria Cymbalaria
Convallaria majalis

At Ravenscraig Castle :—

Cheiranthus Cheiri | Smyrnium Olusatrum

On shore :—

Reseda lutea |

Slateford, Colinton, Woodhall, Ravelrig, Currie.

Saturday, 10*th June* 1848.

Party of about 60 met at Canal Basin, Port Hopetoun, at 8.30 a.m. Walked to Slateford, Colinton, Woodhall, Ravelrig, and returned by train from Currie about 4.30 p.m.

Picked :—

Meconopsis cambrica
Corydalis lutea
Fumaria micrantha
Geranium phæum
„ columbinum
Epilobium angustifolium (not in flower)
Lonicera Caprifolium
Valeriana pyrenaica
Campanula latifolia (not in flower)
Pyrola minor
Trientalis europæa
Scrophularia vernalis
Corallorhiza innata
Listera cordata
„ ovata

Longniddry, Aberlady, Gullan, Drem.

Saturday, 17*th June* 1848.

Party of 40 or 50 met at North British Railway Station at 9.15 a.m., and went to Longniddry, thence to Aberlady, Gullan, and returned by Drem about 5.30 p.m. North British refused third-class return tickets. Lunched at Gullan.

Picked :—

Cerastium arvense
Geranium pusillum
Melilotus officinalis
Saxifraga tridactylites (fine specimens at Gullan)
Hippuris vulgaris
Campanula hybrida
Carex vulpina

Lanark, Cartland Crags, Falls of Clyde.

Saturday, 24th June 1848.

Party of 104 went by Caledonian Railway to Lanark. Third-class return tickets 3s. 6d. Visited Cartland Crags. About 60 breakfasted in the Assembly Rooms at Carrick's Inn. Then proceeded towards the falls. Visited Cora Linn. River not very full, so much so that one of our party was able to climb up by the side of the falls. Proceeded to Bonnington Falls.

Picked :—

At Cartland Crags :—

Geranium sylvaticum
Vicia Orobus
„ sylvatica
Viburnum Opulus
Galium boreale
Jasione montana
Daphne Laureola
Neottia Nidus-avis
Gymnadenia Conopsea
Habenaria bifolia
„ chlorantha
Carex pendula
Melica nutans
„ uniflora

On the way to the falls and Cora Linn :—

Trollius europæus
Aquilegia vulgaris
Carex intermedia
„ paniculata

In the neighbourhood of the falls some subalpine species:—

Geranium lucidum
Saxifraga oppositifolia (covering the rocks)
Galium pusillum
Asplenium viride
„ Trichomanes
Cystopteris fragilis

In the woods on the way to Bonnington Falls:—

Vicia Orobus (in profusion and fine flower)
Rubus saxatilis
Humulus Lupulus
Pteris aquilina
Blechnum boreale
Athyrium Filix-fœmina
Lastrea Filix-mas
Lastrea dilatata
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Equisetum arvense
„ sylvaticum
„ umbrosum

North Queensferry, Inverkeithing, Donibristle, Burntisland.

Saturday, 1*st July* 1848.

About 30 proceeded by steamboat and landed at Queensferry. Thence walked by Ferry Hills to Inverkeithing, Donibristle, and Burntisland.

Gathered :—

Spiræa Filipendula	Glyceria distans
Sedum villosum	Asplenium marinum
Allium Scorodoprasum	

Dunfermline, Knock Hill, Saline Hills, Limekilns, Charleston.

Saturday, 8*th July* 1848.

Twenty-five pupils proceeded by steamboat at 6 a.m. to Charleston. Some proceeded by rail, others walked, to Dunfermline. Met Dr. James Dewar. Breakfasted at the Spire Inn. Visited the abbey, and then walked towards Knock Hill. Thence to the Saline Hills, the banks of the Black Devon. Returned to Dunfermline to dinner. From Dunfermline walked to Limekilns and then to Charleston.

Picked :—

On the way from Dunfermline to Knock Hill :—

Trifolium medium	Habenaria viridis
Anthyllis Vulneraria	„ chlorantha
Comarum palustre	Sparganium ramosum
Pyrola media	Eleocharis multicaulis
Gymnadenia Conopsea	Milium effusum

On the south side of the Knock Hill :—

Botrychium Lunaria (fine specimens)

On the side of Saline Hills :—

Lycopodium Selago

On the banks of Black Devon :—

Geranium sylvaticum
Hieracium sylvaticum
„ rigidum
„ boreale
„ inuloides
Pyrola rotundifolia
Pyrola minor
Polygonum viviparum
Gymnadenia Conopsea
„ albida
Habenaria chlorantha

On the north side of Knock Hill profusion of :—

Trientalis europæa
Gymnadenia albida
Allosorus crispus

On way back from Knock Hill to Dunfermline :—

Trollius europæus (on moist pastures)
Rumex aquaticus (by the roadside)
Sparganium natans (in ditches)

In Broomhall Woods :—

Epipactis latifolia
Lilium Martagon
Luzula nivea

Near Charleston :—

Papaver Argemone
Glaucium luteum
Reseda lutea
Anagallis arvensis
Atriplex littoralis

Montrose, Arbroath, Sands of Barry.

Friday, 14*th July* 1848.

Party consisting of Dr. Balfour, G. Bayley, W. H. Bone, Michael Connal, James M. Cunningham, George Dodd, D. F. Jones, W. Keddie, Gabriel Kerr, W. King, Anthony Mactier, John B. Mactier, Charles Murchison, G. Putnam, Dalhousie Tait, Ll. Thom, started by the earliest train for Montrose, left baggage at Arbroath in passing. On reaching Montrose met Mr. Kerr and visited links. Then proceeded to Rossie Castle. Met Mr. M'Donald, Rev. Mr. Cameron. Lunched at the castle. Then went to rocks on the shore. After reaching sands at Lunan

joined the Arbroath road. On road to Arbroath met Mr. Rait of Annister and Lord Ogilvy, and were invited to Annister ; forced to decline kind invitation. Reached Arbroath to tea.

Picked :—

Thalictrum minus
Iberis amara
Teesdalia nudicaulis
Silene conica
„ nutans
Sterihammera maritima
Lychnis Githago
Trifolium striatum
Astragalus Hypoglottis
„ glycyphyllos
Vicia sylvatica
„ sativa
Potentilla reptans
Epilobium roseum (Abbey, Arbroath)
Eupatorium cannabinum
Pyrethrum Parthenium
Matricaria Chamomilla
Artemisia maritima
Carlina vulgaris
Campanula glomerata
Erica Tetralix
„ var. alba
Euphrasia officinalis
Salix repens
„ fusca
Blysmus rufus
Carex extensa
Ammophila arundinacea
Phleum arenarium
Poa maritima
Triticum junceum
Elymus arenarius
Lycopodium selaginoides

Saturday, 15*th July* 1848.

Before breakfast visited cathedral, then went by train to Carnoustie. Met Gardiner, and botanized Sands of Bay. Dined at Dundee and returned by train at night.

Picked :—

Ranunculus Flammula, var. reptans
Fumaria micrantha
Spergula nodosa
Vicia lathyroides
Parnassia palustris
Erigeron acris
Gentiana Amarella
Lamium amplexicaule
Habenaria viridis
Juncus balticus
Carex incurva
Botrychium Lunaria
Equisetum variegatum
Weissia nigrita
Didymodon inclinatus
Tortula unguiculata
„ rigida
Bryum inclinatum
„ trichodes
Hypnum albicans
„ lutescens (in fruit)

Hypnum dendroides
Jungermannia pusilla (in fruit)
Sticta scrobiculata
Stereocaulon tomentosum
Parmelia physodes
Peltidea polydactyla

Ben Lawers.

Monday, 24th July 1848.

Party consisting of J. H. Balfour, Charles Ashenheim, George Bayley, Spencer Cobbold, James M. Cunningham, John Duncanson, Gabriel Kerr, A. Mactier, John B. Mactier, T. R. Marshall, J. S. Sanderson, A. H. Thomson, G. Townley, Rich. H. Wake, started on an excursion to Ben Lawers. Left Edinburgh by the train at 7 a.m. and reached Stirling about 9. Proceeded immediately by coach to Callander, passing through the beautiful village of Doune. Coach well loaded, road very bad, and on one or two occasions there was some danger of being upset. Reached Callander about 12. Ten of the party breakfasted there, while the remaining four botanized in the neighbourhood. After breakfast the party proceeded in two carriages to Lochearnhead, passing through the Pass of Leny and examining the shore of the Teith and of Loch Lubnaig. In Loch Lubnaig numerous good plants were seen, but few could be procured on account of the swollen state of the waters. A boat aided the party in procuring some plants. On reaching Lochearnhead some of the party proceeded in one of the carriages with all the baggage to Killin, while the rest walked. Reached Killin about 7 p.m.

Picked :—

Near the Falls of the Teith :—

Galium boreale
Solidago Virgaurea
Hieracium sylvaticum
Hieracium inuloides
Poa nemoralis

By the roadside :—

Galium Mollugo

In Loch Lubnaig :—

Nuphar pumilum (leaves)
Nymphæa alba

On the shores of the loch :—

Trollius europæus
Epilobium angustifolium
Circæa alpina
Lysimachia vulgaris

On the way to Killin from Lochearnhead :—

Hypericum humifusum
Saxifraga aizoides
Gnaphalium dioicum
Lobelia Dortmanna
Gentiana campestris (lilac and white)

Tuesday, 25th July 1848.

Twelve of the party proceeded to Craig Chailleach. The day was very misty and wet, and although there were occasional glimpses of sunshine, yet it appeared dubious. On that account a trip to Ben Lawers was postponed. The first ascent was accomplished amidst sunshine, but on reaching the steep rocks the rain began to descend, and after submitting to wet for an hour or two, six of the party turned tail and proceeded to the inn at Killin; the six deserters afterwards had a sail five miles down Loch Tay. Two of the party, Messrs. Wake and Cobbold, engaged in fishing and were tolerably successful. Craig Chailleach is a productive hill. Mass of nettles occurred high on the hill under a projecting rock, which probably had been a spot which had afforded shelter, and might indicate thus the habitation of man.

Among the plants gathered were the following :—

Thalictrum alpinum
Ranunculus acris (alpine form)
Trollius europæus
Draba incana
Cochlearia officinalis vars.
Hesperis matronalis (near Killin Inn)
Silene acaulis (some in flower)
Cerastium alpinum
Alsine rubella (in profusion)
Cherleria sedoides
Spergula subulata
Geranium sylvaticum
Anthyllis Vulneraria
Rubus Chamæmorus
Dryas octopetala (one or two in flower)
Geum rivale
Potentilla alpestris (in flower)
Sibbaldia procumbens
Alchemilla vulgaris, var. minor
„ alpina
Saxifraga oppositifolia
„ nivalis
„ stellaris
„ aizoides
„ hypnoides
Chrysosplenium oppositifolium

Parnassia palustris
Sedum Rhodiola
„ anglicum
Epilobium alpinum
Gnaphalium supinum
Solidago Virgaurea
Leontodon alpinum
Hieracium Lawsoni
Vaccinium Vitis-Idæa
Pyrola rotundifolia
Armeria maritima
Gentiana campestris
Rhinanthus Crista-galli
Mentha rotundifolia,var. velutina (near Inn, Killin)
Oxyria reniformis
Salix venulosa
„ arenaria ?
„ herbacea
„ reticulata
Empetrum nigrum
Habenaria albida
„ chlorantha
Tofieldia palustris
Juncus castaneus
„ biglumis (generally diffused)
„ triglumis
Luzula spicata
Carex dioica
„ atrata
„ rigida
„ vaginata
„ capillaris
„ saxatilis
Avena pratensis (alpine form)
Sesleria cærulea (in profusion)
Poa alpina vivipara
„ Balfourii (2 vars.)
Festuca vivipara
Asplenium viride
„ Trichomanes
Cystopteris fragilis
Polystichum Lonchitis
Lastræa Oreopteris
Polypodium Dryopteris
„ Phegopteris
Botrychium Lunaria
Equisetum palustre, var. alpinum
Lycopodium Selago
„ alpinum
„ selaginoides

Wednesday, 26th July 1848.

Whole party of 14 left Killin in two conveyances for Lawers Inn, which was reached about 9 a.m. Then ascended Ben Lawers, walking in the first instance towards the corrie on the east side and examining rocks near the little loch.

On these rocks were found :—

Cherleria sedoides
Sibbaldia procumbens
Erigeron alpinum
Myosotis suaveolens
Woodsia hyperborea
Polystichum Lonchitis

and many good alpine plants.

Proceeding round the cliffs, gathered :—

Veronica humifusa
Juncus castaneus
Juncus biglumis

thence going to the rocks where *Myosotis suaveolens* occurs in profusion towards the north-east of the summit.

Picked :—

Draba incana
Saxifraga nivalis
Poa Balfourii

Numerous alpine species occur, along with :—

Carex atrata
Cetraria islandica

Reaching the corrie immediately below the summit on the east, the party ascended to the ridge leading to the top. In the corrie they found a profusion of good alpine plants in fine flower, as :—

Cerastium alpinum
Saxifraga oppositifolia

The temperature here was very low. Many good mosses. On reaching the summit mist came on; it occasionally cleared so as to open up a grand view.

On the summit picked *Draba rupestris*. No *Saxifraga cernua*.

East of summit, below :—

Alsine rubella

Descended to west, came to cliffs, where picked :—

Alsine rubella
Erigeron acris
Gentiana nivalis
Myosotis suaveolens

These cliffs are well worthy of examination. Returned to inn by Glen Lyon Road and reached Killin about 8 p.m.

List of plants gathered on Ben Lawers :—

Thalictrum alpinum (fine flower)
Anemone nemorosa
Trollius europæus
Draba incana
„ rupestris (one specimen)
Cochlearia grœnlandica (near summit)
Silene acaulis (in fine flower)
Cerastium alpinum (very fine, on cold cliffs east of summit)
Alsine rubella (east side)
„ „ (west side)

Cherleria sedoides (profusion)
Geranium sylvaticum
Rubus Chamæmorus (fruit, 2 specimens in flower)
Geum rivale
Potentilla alpestris (in flower)
Sibbaldia procumbens (large)
Saxifraga oppositifolia (in fine flower, in cold corrie to east of summit)
Saxifraga nivalis (in quantity near summit)
" " (rocks on west side)
" stellaris
Sedum Rhodiola (in fine flower, near top)
Epilobium alsinifolium (corrie near top)
" alpinum
Angelica sylvestris
Heracleum Sphondylium
Cornus suecica (young fruit)
Erigeron alpinus (rocks near the loch, also on west side)
Gnaphalium supinum
Saussurea alpina
Hieracium Lawsoni
Leontodon (large)
Pyrola rotundifolia
Gentiana nivalis (rocks on west side)
Myosotis suaveolens (on various rocks both east and west side)
Veronica humifusa
" saxatilis
Oxyria reniformis
Salix herbacea
" reticulata
Tofieldia palustris
Juncus castaneus (sparingly)
" biglumis (profusion everywhere on the hill)
" triglumis
Luzula spicata
Carex atrata (plenty)
" rigida
" capillaris (large)
" saxatilis (profusion)
Sesleria cærulea (in flower)
Poa alpina, also vivipara
" Balfourii
" nemoralis (alpine form)
Asplenium viride
Woodsia hyperborea (rocks near the loch)
Polystichum Lonchitis (large, nearly 2 feet long)
Cetraria islandica

Thursday, 27th July 1848.

Morning showery, and the party unable to visit the head of the loch for *Carex vesicaria.*

After breakfast, day cleared, and finding that the hire of two carriages including tolls and driver was cheaper than taking outside seats by the coach, the party adopted that mode of procedure. Half an hour after leaving Killin the rain began to fall, and descended heavily till the time Crianlarich Inn was reached. During the after part of the day there were frequent heavy

showers. The party reached Inverarnan about 1 o'clock. Two of the party, Cobbold and Ashenheim, left, the former for the Trossachs and the latter for Glasgow. The party was thus reduced to 12. Of them 6 went fishing and boating on Loch Lomond and the other 6 botanised in Glen Falloch.

The boating party visited one of the islands in the loch and picked :—

Cordalis claviculata
Hypericum Androsæmum
Lythrum Salicaria
Scutellaria galericulata
Taxus baccata

The other party picked, near the inn :—

Pinguicula lusitanica
Malaxis paludosa
Rhynchospora alba
Lycopodium inundatum

In Glen Falloch were picked :—

Quercus pedunculata, with various forms of leaves and various lengths of peduncles
Quercus intermedia of Martyn Flora rustica
Q. sessiliflora

On moist rocks in Glen Falloch :—

Hymenophyllum Wilsoni (in profusion in fine fruit)

Friday, 28th July 1848.

A beautiful morning. Party divided into two sets. One set, consisting of Wake, Cunningham, Thomson, Bayley, and John Mactier, went boating and fishing. The other 7 proceeded to Ben Vorlich, ascended by east side.

Picked :—

Thalictrum alpinum
Silene acaulis
Cerastium alpinum
Sibbaldia procumbens
Saxifraga oppositifolia (in flower)
Saxifraga stellaris
„ aizoides
Cornus suecica
Gnaphalium supinum
Saussurea alpina
Hieracium alpinum

Hieracium Lawsoni
Vaccinium uliginosum (in fruit)
Plantago maritima (on the first ascent)
Malaxis paludosa
Listera cordata
Orchis mascula (high on west side)
Juncus trifidus
„ castaneus
„ triglumis
Luzula spicata
Carex rigida
„ pilulifera
Carex Œderi
„ saxatilis
Aira cæspitosa, var. alpina
Molinia depauperata
Poa Balfourii
Festuca vivipara
Asplenium viride
Lycopodium Selago
„ annotinum
„ alpinum
„ selaginoides
Isoetes lacustris (in small loch near the top)
Splachnum mnioides
Cetraria islandica

Reached the summit about 2 p.m. and had a fine view from the top, Ailsa Craig in the distance. Descended to Loch Sloy and walked to Inveruglas and thence by shores of Loch Lomond to Inverarnan.

Near the Inn picked :—

Corydalis claviculata
Lythrum Salicaria
Lysimachia vulgaris
Pinguicula lusitanica

Saturday, 29th July 1848.

Left Inverarnan at 5 a.m. by steamboat. Morning beautiful, not a cloud. After reaching Balloch proceeded by steamboat to Glasgow, and reached Edinburgh at 12.30 p.m.

EXCURSIONS IN 1849.

Kirknewton, Dalmahoy, Ravelrig, Currie.

Saturday, 12th May 1849.

About 50 pupils met at Caledonian Railway Station and proceeded to Kirknewton at 7 a.m. Walked to Western Dalmahoy Hill and ascended it. Visited Ravelrig Bog, thence

went to the banks of the Water of Leith, reached Balerno and Currie. Afterwards walked to Woodhall and thence to Edinburgh, which was reached about 4 p.m.

Picked :—

At Dalmahoy :—

Draba verna
Sisymbrium Thalianum
Viola canina
Viola flavicornis
„ lutea

At Ravelrig :—

Viola palustris
Salix (several)

At Balerno :—

Saxifraga granulata
Myrrhis odorata
Anthriscus sylvestris
Asperula odorata
Mercurialis perennis
Orchis mascula
Scilla nutans
Arum maculatum

Near Woodhall. Good fossils, especially *Lepidodendra.*

Gorebridge, Arniston, Dalhousie.

Saturday, 19th May 1849.

Sixty met at the North British Railway Station at 8.15 a.m. and proceeded by the train to Gorebridge, thence walked to Arniston. Met Mr. Veitch, the gardener.

On the way picked several common plants :—

Fragaria vesca
Veronica Chamædrys
Equisetum arvense
Equisetum sylvaticum
„ limosum

Visited gardens at Arniston, where the gardener cultivates many good alpine plants, and a fine collection of mosses in pots.

Proceeded to woods and found :—

Ranunculus auricomus
Lychnis dioica
Stellaria nemorum
,, Holostea
Ulex europæus
Sarothamnus scoparius
Prunus spinosa
,, Avium
,, Cerasus
,, Padus
Fragaria vesca
Potentilla Fragariastrum
Chrysosplenium oppositifolium
Chrysosplenium alternifolium
Myrrhis odorata
Doronicum plantagineum
Pulmonaria officinalis
Lathræa Squamaria, parasitic on roots of Prunus Lauro-cerasus
Scilla nutans
Paris quadrifolia
Arum maculatum (not quite out)
Equisetum Telmateia

After leaving the woods at Arniston passed Kirkhill and entered Dalhousie Woods, where we found profusion of *Viola odorata* in fruit near Prestonholme, also *Arum maculatum* in fine flower.

Ribes alpinum
Adoxa Moschatellina
Viburnum Lantana
Valeriana pyrenaica
Vinca minor (blue and white)
Anchusa sempervirens
Orchis mascula
Convallaria majalis (in bud)

Examined the woods near Dalhousie Station and picked a single specimen of *Neottia Nidus-avis* in bud.

Returned by train which left Dalhousie at 5.15 p.m.

Kirkcaldy, Ravenscraig Castle, Dysart Woods, Pettycur, Burntisland.

Saturday, 26th May 1849.

Party of 50 met at Chain Pier, Newhaven, at 9.45 a.m., and went by steamboat to Kirkcaldy, visited Ravenscraig Castle under the direction of Mr. Laing, gardener to the Earl of Rosslyn.

Picked :—

Cheiranthus Cheiri
Viola odorata (in fruit)
„ tricolor
Lychnis diurna
Conium maculatum (not in flower)
Smyrnium Olusatrum
Anthriscus sylvestris
Armeria maritima
Scilla nutans

Entered Dysart Woods by the west gate and botanised there for some hours.

Picked :—

Aconitum Napellus
Silene maritima
Saxifraga Geum
„ umbrosa
„ granulata (double)
Doronicum Pardalianches
Polemonium cæruleum
Polygonum Bistorta
Daphne Laureola
Ruscus aculeatus
Convallaria majalis

Met the Earl of Rosslyn, who kindly conducted us to see the fine hybrid rhododendrons, pines, deodars, an araucarias. Visited afterwards the greenhouses and kitchen garden. Thence walked through Pathhead and part of Kirkcaldy, reached the sands, and walked to Seafield tower, and then by shore to Kinghorn, Pettycur, and Burntisland.

Picked :—

Barbarea vulgaris
Arabis hirsuta
Cochlearia officinalis
Cochlearia danica (Burntisland)
Sinapis alba
Lepidium Smithii
Thlaspi arvense (fields near Pettycur)
Reseda lutea (side of railway near Burntisland)
Helianthemum vulgare
Silene maritima
Alsine peploides
Geranium sanguineum
Medicago lupulina
Astragalus Hypoglottis
Valerianella olitoria
„ dentata
Primula vulgaris
„ veris
Linaria Cymbalaria (near Seafield tower)
Salvia Verbenaca (near Pettycur)
Parietaria officinalis (Burntisland)
Sclerochloa loliacea (Burntisland)
Botrychium Lunaria

Tranent, Ormiston, Prestonhall Woods, Ford, Crichton, Tynehead.

Saturday, 9th June 1849.

Party of 35 met at the North British Railway Station at 8 a.m. and proceeded by the train to Tranent. Thence walked through the village of Tranent, and immediately after passing it turned to the right to go to Ormiston.

In the wood at the back of the village we picked a considerable quantity of *Convallaria multiflora*, apparently wild, also *Berberis vulgaris* and *Geum intermedium*, along with *G. rivale*. *G. intermedium* occurred on the roadside. Near Ormiston there is abundance of *Acer campestre* and the hirsute form of it, which was in flower and fruit, also *Stellaria graminea*.

After leaving Ormiston, which is a neat village with an old Cross in the centre, we proceeded across a small burn and turned to the left until we reached a toll-house, took the road to the left, and entered Fountainhall Woods, which are very pretty. In them saw a multiplicity of fine ferns growing luxuriantly, the chief species being :—

Pteris aquilina
Blechnum boreale
Athyrium Filix-fœmina
Lastrea Filix-mas
„ spinulosa

In the woods also :—

Fumaria officinalis
Oxalis Acetosella
Asperula odorata
Primula vulgaris (still in flower)
Rhinanthus Crista-galli
Nepeta Glechoma
Ajuga reptans

From Fountainhall proceeded to Ormiston Hall Woods.

In them there was profusion of :—

Alliaria officinalis
Prunus Padus
Lysimachia nemorum
Symphytum tuberosum
Melampyrum pratense
Polygonum Bistorta
Rumex sanguineus
Rumex viridis
Agraphis nutans
Arum maculatum
Milium effusum
Equisetum arvense
„ sylvaticum
„ limosum

Met Mr. Gorrie at the end of the woods and were conducted by him to Prestonhall Woods. Visited the gardens and house, where we were kindly received by Mr. Burn Callender.

Saw a number of interesting specimens of roots which had entered into drains and caused their closure ; many plants seem to do so. One shown was the root of a walnut tree, which had been traced by Mr. Gorrie 24 yards from the bole. Mr. Gorrie states that he has known it occur in the case of the elm, willow, poplar, and ash. A case of the latter kind I saw at Southampton ; it had occurred in drains in Hampshire. and was given to me by Mr. Balloch. Mr. Gorrie states that many herbaceous plants have roots which enter drains ; among them may be noticed *Polygonum Bistorta*, *Equisetum*, *Tussilago Farfara*, which he has seen entering drains three feet deep. The bistort is particularly troublesome, and has caused much injury in the Carse of Gowrie.

In Mr. Callender's hothouse we saw a plant of *Cereus grandiflorus* with 9 or 10 flower buds expanding. We also tasted ripe coffee-berries and figs. Saw a mountain ash, one of the branches of which had been split off so as to leave the centre of the trunk bare ; the tree lived with the main shoot growing and numerous branches ; from some of these roots were sent down which filled the split and broken portions of the bole. These roots were distinctly seen proceeding from the upper branches and forming a distinct covering to the exposed wood. The roots proceeded from the new wood near the bark of the branches. It is proof of the existence of a descending system, and is in favour of Gaudichaud's theory. Saw an elm the main trunk of which had been broken ; a knot existed on the remaining part of the trunk, which gave off a branch. This branch now grows erect and has a peculiar bushy aspect, quite distinct from that of the elm, some of the branches of which in their natural state are seen. On all the branches of the new leader there is a tendency to develop knots, in fact the whole of them are covered with knotty excrescences ; this peculiar tendency, as well as the habit of growth, continues in slips which Mr. Gorrie has taken from the plant.

In the woods of Prestonhall the chief plants found were :—

Berberis vulgaris
Ilex Aquifolium
Staphylea pinnata
Pyrus Aucuparia
Bunium flexuosum
Lonicera Caprifolium
Lonicera Xylosteum
Vinca minor
Ajuga reptans (white flowered, near the pond)
Polygonum Bistorta
Ornithogalum umbellatum

In Prestonhall avenue :—

Anthemis arvensis

Remains of old garden :—

Helleborus fœtidus

Took lunch at the Stair Arms Inn, and then walked to Ford.

In the marsh got :—

Menyanthes trifoliata
Pedicularis palustris
Orchis latifolia
„ maculata
Blysmus compressus
Carex ovalis
„ cæspitosa
„ riparia

In going towards Crichton Castle gathered in the woods :—

Barbarea vulgaris
Chenopodium Bonus-Henricus
Neottia Nidus-avis

Visited Crichton Castle. In the thicket near it saw :—

Geranium sylvaticum
Juniperus communis
Carex sylvatica

On banks of the Tyne :—

Cardamine amara
Pyrola minor (scarcely in flower)
Neottia Nidus-avis
Polypodium Dryopteris
„ . Phegopteris

On a moor near Tynehead :—

Genista anglica (in profusion)
Antennaria dioica
Pedicularis palustris
Pinguicula vulgaris
Lycopodium clavatum

Reached Tynehead Station about 7, and returned to Edinburgh about 8 p.m.

Galashiels, Abbotsford, Melrose, Newtown.

Saturday, 16*th June* 1849.

Party of 100 met at the North British Railway Station at 8 and proceeded by the 8.15 a.m. train to Galashiels. Train very long one and very slow, and the party did not reach Galashiels till 10.30. Walked towards Faldonside and then crossed the Tweed, some in the ferryboat, others by wading.

In consequence of the boat only containing 10 or 12 there was much delay in crossing. Met John Swanston, who had been 32 years forester at Abbotsford, and were conducted by him through the woods. In them there are a number of naturalised plants, such as :—

Aquilegia vulgaris
Saxifraga umbrosa
Convallaria multiflora

Besides these we picked :—

Geranium sylvaticum
Acer campestre
Orobus tuberosus
Geum (many forms)
Ribes Grossularia
Ribes rubrum
Lonicera Caprifolium
Valeriana officinalis (not in flower)
Polygonum Bistorta

Some of the party visited Abbotsford House. Visited the Little Loch, where *Nuphar luteum* was seen—an introduced plant; then proceeded to Huntly Burn, gathering in the woods :—

Geranium sylvaticum
Staphylea pinnata
Cornus sanguinea

Visited Chief's Wood, and called on Professor James D. Forbes. Saw *Meconopsis cambrica* in the woods.

Our walk then lay by the side of the Eildon Hills, which were ascended by some of the party.

On these hills were gathered :—

Gnaphalium dioicum
Vaccinium Vitis-Idæa
Pinguicula vulgaris
Lycopodium alpinum

Melrose was next reached and the Abbey visited.

From Melrose the party went by road to Newtown, then descended to the banks of the river, gathering the following plants :—

Fumaria capreolata
,, officinalis
Barbarea vulgaris
Cardamine sylvatica
Sinapis arvensis
Reseda Luteola
Trifolium procumbens
Anthyllis Vulneraria
Vicia Cracca
Rosa tomentosa
Sedum Telephium (not in flower)
Hieracium Pilosella
,, sylvaticum
Apargia hispida
Echium (partly in flower)
Thymus Serpyllum
Plantago media (abundant)
Orchia mascula
,, latifolia
,, maculata
Briza media

Crossed the ferry to Dryburgh and visited the Abbey, Sir W. Scott's tomb.

Picked :—

Cheiranthus Cheiri
Geranium lucidum
Taxus baccata

Returned by train leaving Newtown at 6 and reaching Edinburgh at 8 p.m.

Longniddry, Gosford, Aberlady, Luffness, Gullan, Dirleton, Drem.

Saturday, 23rd June 1849.

Party of about 30 met at the North British Railway Terminus at 8 a.m. and proceeded to Longniddry (having received third-class return tickets from Drem, 2s.), visited woods at Gosford, and were allowed by Mr. Addison to walk through the grounds and to see the ponds.

Picked :—

In the ponds :—

Nymphæa alba
Myriophyllum spicatum
Chara flexilis

In the woods :—

Geranium pratense
Euonymus europæus
Potentilla fruticosa
Sambucus nigra
Viburnum Opulus
Scrophularia vernalis
Salix pentandra
Iris Pseudacorus

Leaving Gosford we walked to Aberlady, picking on the way :—

Papaver Rhœas
„ dubium
„ Argemone
Solanum Dulcamara
Hippophaë rhamnoides
Listera ovata

On the shore near Aberlady saw :—

Cochlearia officinalis
Aster Tripolium (not in flower)
Armeria maritima
Glaux maritima
Triglochin maritimum
Blysmus rufus
Carex distans
„ extensa
Rottboellia filiformis

At Luffness picked :—

Ranunculus sceleratus
Hippuris vulgaris
Alisma Plantago
Scirpus maritimus
Carex vulpina
„ (paludosa ?)
„ riparia

In fields near Luffness :—

Silene noctiflora (in leaf)
Cerastium arvense
Pastinaca sativa
Anagallis arvensis
Lycopsis arvensis
Lithospermum arvense
Lamium amplexicaule

Gullan Links and Loch supplied the following :—

Sium angustifolium (in leaf)
Gentiana campestris
Menyanthes trifoliata
Cynoglossum officinale
Euphrasia officinalis
Pedicularis palustris
Utricularia vulgaris (not quite in flower)
Orchis latifolia
Scirpus lacustris
Chara hispida

Near the village of Gullan :—

Malva sylvestris
„ rotundifolia
Geranium pusillum
Callitriche platycarpa
Centaurea Scabiosa
„ Cyanus
Convolvulus arvensis
Limosella aquatica (in fine flower)

From Gullan (after refreshment) the route lay towards Dirleton. Visited the castle, gathering :—

Smyrnium Olusatrum
Centranthus ruber
Linaria Cymbalaria
Parietaria officinalis

And on the roadside :—

Galium Mollugo

Reached Drem Station in time for the train at 6.20 p.m. Did not reach Edinburgh until 8 p.m.

North Queensferry, St. Davids, Donibristle, Aberdour, Burntisland.

Saturday, 30th June 1849.

Party of about 30 met at Granton pier at 8.30 a.m. and proceeded by steamboat to North Queensferry. Thence walked towards the *Oxytropis* and *Astragalus* stations, crossed to Inverkeithing Bay, walked to St. Davids, Donibristle, and Aberdour, where we dined. Thence by woods to Burntisland, which was reached in time for the boat at 6.34 in the evening. Had an order from Mr. Philipps, the factor, to see Donibristle; met Mr. Gavin, the gardener, who conducted us through the houses.

The following were some of the plants seen :—

At Queensferry .—

Papaver Argemone
Helianthemum vulgare
Malva sylvestris
„ rotundifolia
Anthyllis Vulneraria
Spiræa Filipendula
Potentilla verna
Rosa spinosissima
Petroselinum vulgare
Carduus tenuiflorus
„ acanthoides
Erica cinerea
Glaux maritima
Echium vulgare
Plantago maritima
„ Coronopus
Kœleria cristata

Near the toll on the Queensferry road :—

Thalictrum minus
„ majus
Thlaspi arvense
Astragalus glycyphyllos
Gnaphalium germanicum
Habenaria viridis

On shore near Inverkeithing :—

Sagina maritima
Alsine marina
Sedum acre
„ villosum
Sambucus Ebulus
Convolvulus arvensis
Parietaria officinalis
Allium Schœnoprasum
Sclerochloa maritima
„ distans

In a quarry at Inverkeithing :—

Saponaria officinalis (very abundant)
Malva sylvestris
Conium maculatum

Near St. David's :—

Diplotaxis tenuifolia
Reseda lutea
Melilotus officinalis
Ligusticum scoticum
Echium vulgare (pink)
Artemisia Absinthium
Senecio sylvaticus

On rocks near St. David's :—

Hypericum perforatum
„ hirsutum
Trifolium arvense
„ striatum
Agrimonia Eupatoria
Lonicera Periclymenum
Anagallis arvensis
Beta maritima
Allium vineale
Asplenium marinum

On the shore near Donibristle :—

Thalictrum flavum
Geranium pratense
Œnanthe crocata
Dipsacus sylvestris
Pyrethrum Parthenium
Hieracium sylvaticum
Cynoglossum officinale
Atropa Belladonna
Hyoscyamus niger
Beta maritima
Listera ovata
Allium Scorodoprasum

Marsh at Donibristle :—

Iris Pseudacorus
Typha latifolia

Woods between Aberdour and Burntisland :—

Iris Pseudacorus
Bromus asper
Triticum caninum

Drem, North Berwick, Canty Bay, Bass, Tantallon Castle.

Saturday, 7th July 1849.

Party of 31 met at the North British Station at 7.45 a.m. The day was rather unpromising as regards wind and rain, nevertheless the party proceeded by rail to Drem. Rain had by this time diminished. Two omnibuses and a dogcart conveyed them to North Berwick, and there the day cleared. Walked by the sandy shore to Canty Bay, gathering :—

Silene inflata
„ maritima
Anthyllis Vulneraria
Astragalus Hypoglottis
Vicia Cracca
„ sylvatica
Eryngium maritimum
Scabiosa Columbaria
Apargia hispida
Chenopodium album
Carex arenaria
Psamma arenaria

On reaching Canty Bay, George Adams, the boatman, was ready with two boats to convey the party to the Bass; difficult landing. On the Bass got :—

Cerastium atrovirens
Lavatera arborea
Beta maritima

Had some tacking in coming back, and some of the party sick.

After landing at Canty Bay proceeded to Tantallon, on the way gathering :—

Habenaria viridis

At the old Castle of Tantallon :—

Papaver somniferum
Lepidium latifolium
Malva sylvestris
Conium maculatum
Torilis Anthriscus

Walked back to the toll near North Berwick and then ascended Berwick Law. Picked a few common plants, as :—

Helianthemum vulgare	Veronica Anagallis (ditches below)
Senecio sylvaticus	

Reached North Berwick about 4.30 p.m., and after dinner came by our omnibuses to Drem, meeting the train at 6.20, and reaching Edinburgh at 7.15.

Colinton, Bonaly, Habbie's Howe, Currie.

Saturday, 14*th July* 1849.

Party of 30 met at Bruntsfield Links Toll at 8.30 a.m. and walked to Colinton, picking on the way a number of common plants, especially grasses. Thence went to Bonaly and ascended the Pentlands, crossed to the compensation pond, where we bathed.

Picked :—

Ranunculus aquatilis	Cystopteris fragilis
Sedum villosum	Lastrea Oreopteris

Walked to Habbie's Howe and there lunched, and got :—

Epilobium angustifolium	Hieracium prenanthoides
Galium pusillum	

Proceeded by the marshy ground to the new reservoir of the Water Company, thence across the river to Currie, gathering on the way :—

Botrychium Lunaria	Pilularia globulifera

Examined banks near Currie and picked :—

Geranium pratense	Anchusa sempervirens
Trifolium medium	Lilium Martagon
Valeriana officinalis	

Returned by railway train which passed Currie about 7.30 p.m.

Gallowshall, Dalkeith, Musselburgh, Portobello.

Saturday, 21st July 1849.

Party of about 30 met at the North British Railway Station at 8 a.m. and proceeded to Gallowshall and thence to Dalkeith, where we met Mr. M'Intosh, who kindly conducted us through the Duke of Buccleuch's garden and grounds. We proceeded by the banks of the Esk as far as Musselburgh, and thence walked to Portobello to meet the train, arriving in Edinburgh about 5 p.m.

The following is a list of the plants gathered in Dalkeith Woods and on the banks of the Esk :—

Papaver somniferum
„ Rhœas
Barbarea vulgaris
Alliaria officinalis
Iberis amara
Silene inflata
Hypericum perforatum
„ hirsutum
Malva sylvestris
„ rotundifolia
Geranium sylvaticum
„ pratense
„ Robertianum
Medicago lupulina
Spiræa Ulmaria
Geum urbanum
Rosa tomentosa
„ canina
Ribes Grossularia
„ rubrum
Epilobium hirsutum
„ parviflorum
Circæa lutetiana
Conium maculatum
Petroselinum sativum
Pimpinella Saxifraga
Myrrhis odorata
Chærophyllum temulentum
Anthriscus vúlgaris
„ sylvestris
Ligusticum vulgare
Heracleum Sphondylium
Torilis Anthriscus
Sambucus nigra
Lonicera Periclymenum
Valeriana officinalis
Doronicum Pardalianches
Senecio sylvaticus
„ Jacobæa
Carduus tenuiflorus
„ acanthoides
Centaurea nigra
Lapsana communis
Crepis paludosa
Hieracium sabaudum
Sonchus arvensis
Tragopogon minor
Campanula latifolia
Campanula rapunculoides (naturalised)
„ rotundifolia
„ persicifolia (on banks of Esk)
„ media (naturalised)

Solanum Dulcamara
Linaria vulgaris
Scrophularia nodosa
Mimulus luteus
Digitalis purpurea
Prunella vulgaris
Stachys sylvatica
„ palustris
Teucrium Scorodonia
Chenopodium album
Polygonum Convolvulus
„ Persicaria
Rumex sanguineus
„ obtusifolius
„ crispus
„ Acetosa
„ Acetosella
Alnus glutinosa
Quercus pedunculata
Salix Smithiana
„ alba
Salix aurita
„ purpurea
„ Helix
Populus alba
Juncus bufonius
„ glaucus
„ lamprocarpus
Luzula sylvatica
Agrostis vulgaris
Aira cæspitosa
Melica uniflora
Festuca bromoides
„ arundinacea
Bromus asper
Brachypodium sylvaticum
Triticum caninum
Polystichum lobatum
„ aculeatum
Lastrea Filix-mas
Polypodium vulgare

On Musselburgh Links :—

Cakile maritima
Sagina maritima
Erodium cicutarium
Ononis arvensis
Trifolium ornithopodioides
„ filiforme
Astragalus Hypoglottis
Scabiosa arvensis
Senecio viscosus
Carduus tenuiflorus
„ nutans (in abundance)
Armeria maritima
Scleranthus annuus
Salsola Kali
Carex arenaria
Triticum junceum

Salisbury Crags, Arthur's Seat, Duddingston, Craigmillar.

Tuesday, 24th July 1849.

Met after Examination at the College at 5 p.m., and party of about 30 proceeded to Holyrood and Salisbury Crags; thence to Arthur's Seat and Duddingston Loch, then to Craigmillar Castle.

Visited Edmonston and saw a large oak which had been struck by lightning. Returned to Edinburgh about 10 p.m.

Among the plants picked were :—

Ranunculus Lingua
Lychnis Viscaria
Alsine verna
Trifolium arvense
Senecio viscosus
Veronica scutellata
„ Anagallis
Iris Bendacorus (in fruit)
Allium vineale
Sparganium ramosum
Carex riparia
Phalaris arundinacea
Asplenium septentrionale

At Craigmillar :—

Knautia arvensis
Anchusa sempervirens

Braemar.

Friday, 3rd August 1849.

Party, consisting of J. H. Balfour, William Brown, Samuel Burd, Robert Christie, D. C. M'Allum, Thomas M'Micking, Alexander S. Melville, Eleazer Sherwood, James Stewart, met at Aberdeen this evening. I went by rail to Montrose, which I reached about 12 noon, and thence by coach to Aberdeen, where I arrived at 4.30. Mr. M'Micking came by Stirling, Perth, and Dundee, and did not arrive till late in the evening. The rest of the party came by the "Queen" steamboat, and owing to a head wind and swell did not land in the harbour till about 8.30 p.m. Many of them had been very sick. Prof. James Forbes came by the same steamer to meet Mr. Airy, Astronomer Royal, and proceed with him to Shetland. The party having left my baggage on board the steamer I had to go on board about 10.30 p.m. when the "Queen" came into harbour in order to get it.

Accommodation of the party at Robertson's Royal Hotel was very comfortable. Seats taken in Braemar coach.

Saturday, 4th August 1849.

Left Aberdeen about 7 a.m., after breakfast, by the Ballater mail, in which we had booked nine outside places.

Reached Ballater about 1 p.m.; met Dr. Dickie and got specimen of *Diphyscium foliosum* collected by Mr. Cruikshank. I lunched with Dickie. Party dined at Monaltrie Arms. I called on Dr. Martin, who with his wife and children was residing at Ballater for his health. From Ballater proceeded by coach to Braemar and reached it about 4.30. After arranging matters and having tea-dinner took a walk along banks of Dee; remarked especially the following plants :—

Genista anglica (in flower and fruit)
Potentilla alpestris (very low down near the Dee)
Saxifraga aizoides
Solidago Virgaurea
Carduus heterophyllus
Hieracium murorum
" prenanthoides
" denticulatum
Hieracium Lawsoni
Pyrola media (in flower)
Trientalis europæa (in flower)
Polygonum viviparum
Rumex aquaticus
Humulus Lupulus (Callater Bridge)
Betula pubescens
Salix venulosa

Monday, 6th August 1849.

This day the whole party except Mr. Stewart, who was laid up with a dysenteric attack, went to Little Craigendal. They crossed the ferry and walked through the fir woods on the banks of the Dee, following the stream which comes from Ben-a-bourd. In the woods are abundance of ant-hills, which when stirred up with a stick give out pungent vapours of formic acid. *Pyrola media*, *Lycopodium clavatum*, and *Genista anglica* were picked on the way.

At the point where the third large stream joins the Ben-a-bourd water the party turned to the right and proceeded towards Craigendal under the guidance of Cattanach, one of the Duke of Leeds' gamekeepers, who is an intelligent person and has acquired some knowledge of the general aspect of the rare plants in the vicinity. William Macintosh, another of the Duke's servants, accompanied the party to carry plants for the Botanic Garden of Edinburgh. Before reaching Craigendal the following specimens were gathered :—

Rubus Chamæmorus
Cornus suecica
Vaccininm uliginosum
Tofieldia palustris

On Craigendal :—

Cerastium alpinum (on rocks facing Ben Avon)
Astragalus alpinus (very sparingly in flower, although the plant is abundant)
Dryas octopetala (in flower)
Potentilla alpestris
Saussurea alpina (not in flower)
Hieracium alpinum (on rocks facing Ben Avon)
Azalea procumbens
Juncus trifidus
„ triglumis
Carex rupestris
„ capillaris

Leaving Craigendal the party proceeded to Ben Avon, where a number of alpine species were seen, such as :—

Silene acaulis
Sibbaldia procumbens
Gnaphalium supinum
Carex vaginata

On the very summit, in a sheltered spot, were picked numerous specimens of *Rubus Chamæmorus* in flower.

Wending our way on between Little and Big Craigendal we saw abundance of deer on the hills. We reached Braemar about 7 p.m. in time for our tea-dinner.

Tuesday, 7th August 1849.

This day the party, with the exception of Mr. Stewart, who was still confined by a dysenteric attack, proceeded by a drag as far as the gamekeeper's house at the foot of Loch Callater. Thence we sailed up the loch and proceeded to the rocks close to the precipitous falls. We were accompanied by William Macintosh.

The plants gathered were :—

Gnaphalium supinum
Saussurea alpina
Hieracium alpinum, and various forms of it
Pyrola rotundifolia
„ secunda
Veronica serpyllifolia
„ humifusa
Veronica alpina
Carex rupestris
„ atrata
„ capillaris
Allosorus crispus
Cystopteris fragilis
Polystichum Lonchitis

We ascended to the top of the cliffs and then descended close to the small loch called Loch Kander. We saw plenty of *Salix reticulata, lanata, arenaria, Myrsinites arbutifolia, herbacea.* After taking lunch on the banks of the loch we examined the rocks surrounding it. On those at the upper part Mr. Brown and Dr. B. picked :—

Epilobium alsinifolium	Alopecurus alpinus
,, alpinum	Phleum alpinum
Carex Vahlii	

On reaching the summit of the hill we were enveloped in mist.

We walked by the small hut on the summit by the slope of the hills towards the north end of Loch Callater, and after partaking of milk and cake in William Stewart's house we met our conveyance and returned to Braemar between 7 and 8 p.m. At Stewart's house one of Dr. Dickie's pupils was residing, but he was too modest to make himself known to us.

Wednesday, 8th August 1849.

Started early this morning for Lochnagar. Walked along the road to the bridge over the Dee near the entrance of Invercauld and then proceeded up the woods. Viewed the waterfall and rustic bridge and then crossed the water so as to reach the rocks below the summit. Examined the steep rocks above the loch, gathering *Cerastium alpinum* and numerous common alpine species, *Hieracium alpinum* and varieties, *Allosorus crispus.*

We then ascended a deep ravine with the view of getting *Mulgedium alpinum*, but the steepness of the cliffs and their slippery nature prevented us from reaching the spot we wished. We then visited the patches of snow near which *Saxifraga rivularis* was seen in profusion. Afterwards we ascended by the *Sonchus* ravine, picking various forms of *Poa* and *Aira alpina*, *Saxifraga rivularis*, and *Cerastium alpinum.*

Ascended to the summit, and after picking *Carex Persoonii* and a few more alpine species the party descended again to the valley, and reached Braemar between 8 and 9 p.m. There was much mist on the summit, so that the view was interrupted.

Thursday, 9th August 1849.

The weather was very unpropitious to-day, and we were unable to move out in the morning. I put up two baskets of plants for the Botanic Garden before breakfast, and despatched them by the mail at 9 a.m. After breakfast, and arranging our plants, some of the party started for Corriemulzie Linn, a deep dell about three or four miles from Braemar, well planted with wood and traversed by a stream which runs into the Dee.

On the road we picked :—

Betula alba	Salix aquatica
„ pubescens	Populus tremula
Salix pentandra	

In the Linn gathered :—

Epilobium angustifolium	Melica nutans
Hieracium (various species)	Triticum caninum
Melampyrum sylvaticum	

The day had been very sultry, and now the thick dark clouds began to collect, thunder rolled, and rain began to descend. After leaving the Linn we passed General Duff's cottage and took refuge in some cottages by the roadside. The storm became terrific, the hills were enveloped in dark clouds, the thunder rolled, and flash after flash came in quick succession. The rain descended like a water-spout, and the hills, whose surface had been previously dry, became covered with a sheet of foam. After two hours' delay we took advantage of a slight cessation of the storm and reached Braemar. During the whole evening the storm raged.

Friday, 10th August 1849.

The weather was still rather unpromising, but in spite of this the party left early and proceeded by means of a conveyance to a bridge about 6½ miles from Braemar on the road to Spital of Glenshee. Thence they walked up the slope of Glasmaol and visited Canlochan.

On the ascent of the hill gathered *Carex Œderi* and *Phleum alpinum*, but could not see *Juncus castaneus* in the place where it abounded in 1847.

At the upper part of Canlochan gathered :—

Carex Persoonii
„ aquatilis
Carex rariflora

On the cliffs looking towards Canlochan Glen :—

Sibbaldia procumbens
Saxifraga oppositifolia
„ nivalis
Erigeron alpinus (in great profusion)
Saussurea alpina
Gentiana nivalis
Carex atrata
„ capillaris (abundant)
Poa alpina
„ vivipara
„ Balfourii
„ nemoralis (alpine form)

On cliffs to the west saw plenty of *Mulgedium alpinum*, but none of it in flower. A purple specimen was picked by Dr. B. approaching to flower, but all the others showed no symptoms of flowering this season. *Draba incana* was also seen. Ascended to top of the hill, and then walked towards the bridge, where the conveyance met the party and conveyed them to Braemar.

Saturday, 11*th August* 1849.

Weather still bad. Six of the party went by a conveyance about three miles beyond the Linn of Dee, on the road to Croachlach. Left the conveyance at the bridge and proceeded on the west side of the Dee as far as the Braeriach ridge. A long walk amidst rain and mist. On the way saw *Arabis petræa*, and in pools *Ranunculus Flammula*, var. *reptans*, and *Littorella lacustris*.

Ascended Braeriach ridge with the view of reaching summit of Cairntoul and picking *Carex leporina*; but the weather was so bad that the party found it impossible to do so.

On the cliffs at Braeriach ridge we gathered :—

Cerastium alpinum (a fine specimen)	Hieracium alpinum Poa alpina vivipara

Returned by the west side of the Dee near the bridge where the conveyance awaited us.

Monday, 13*th August* 1849.

The day was very bad and the party remained at home drying paper and changing their plants. As the rain abated a little towards the afternoon some of the party walked towards the Dee, picking :—

Meum athamanticum Carduus heterophyllus	Hieracium boreale

Walked up the banks of the Clunie to its junction with the Callater, then crossed both the rivers and walked on the opposite bank to Braemar. On the way various species of *Hieracia*, *Crepis*, were seen.

Met the three Messrs. Chancellor and Mr. Young, also saw Mr. Finlay at the inn. Dr. Melville left this day for Edinburgh.

Tuesday, 14*th August* 1849.

The party along with Messrs. Chancellor and Mr. Young proceeded in two conveyances to Wm. Stewart's house at the foot of Loch Callater, thence ascended the hills and walked towards Lochnagar. Examined the moist rocks on west side for *Carex leporina* but found none. Picked a few alpine plants, such as *Carex Persoonii*, *Alopecurus alpina*, and reached the summit of the hill about 12 noon. Had a good view from the top. After lunch our party proceeded to the cliffs, while the Messrs. Chancellor and Young returned to Braemar. Our party descended by a ravine near the summit, in which the following plants grew in profusion :—

Cerastium alpinum	Aira alpina vivipara
Saxifraga rivularis	Poa alpina vivipara
Veronica alpina	

Then descended to the foot of the cliffs, and Dr. B. ascended to the *Mulgedium* station, which he reached with some difficulty and to his disappointment found that none of the plant was in flower. Mr. M'Micking had stationed himself at the upper part of the ravine in order to direct Dr. B. to the spot. Mr. M. afterwards, in attempting to descend the cliff, was precipitated from the top to the bottom and sustained some bruises. Had he rolled a little further than he did, he would have gone over steep cliffs and would in all likelihood have been killed. The fall rendered Mr. M. very nervous, and Dr. B. had some difficulty in conducting him to the bottom of the cliffs where the rest of the party were waiting. Proceeded to the shore of the loch and then ascended by one of the steep ravines to the top of the mountain, whence the party walked across the hills by a tedious route towards Glen Esk. Left Loch Muick on the left hand and Dubh Loch on the right. Descended into Glen Esk not far from the shooting lodge, between it and Capel Mount. Failing to get accommodation at Acharne and at Bradouney there was no alternative but to proceed down Glen Clova.

Reached the Kirkton Clova about 8 p.m. Found the inn full, seven men from Kirriemuir in one of the rooms, and Mr. David Ogilvie, jnr., of Balnaboth, in the other; the latter with great kindness gave up his room to our party, while he himself took up his quarters in the Manse. The party thanked him cordially for his kindness and attention. A tea-dinner and a good peat fire refreshed the party after their long and wet walk. Numerous grouse and ptarmigan were seen to-day. The party slept soundly, some in beds and some in shakedowns on the floor.

It is remarkable to notice that no cloudberry was seen in fruit and on hills few fruits of *Vaccinium Vitis-Idæa* and *V. Myrtillus.*

Wednesday, 15*th August* 1849.

After breakfast walked up Clova Glen, gathering on the way:—

Malaxis paludosa	Avena strigosa
Habenaria albida	

On reaching the White Water the party separated, Mr. Sherwood and Dr. B. proceeded to Glen Fee, while the rest of the party—viz., Mr. M'Micking, Brown, Stewart, Burd—went up Glen Dole. On the rocks at Glen Fee was picked abundance of *Oxytropis campestris*, but no *Woodsia ilvensis*. Saw a fine eagle to-day.

Ascended the cliffs in Glen Fee to the top of Craig Rennett and walked by Craig Maud along the ridge on the side of Glen Dole. Descended some of the ravines; saw *Mulgedium alpinum*, but not in flower, also many good alpine plants.

Reascended to the top of the cliffs, and amidst hail, rain, mist, and wind proceeded to the shepherd's hut at the top of Jock's Road, where we met the rest of the party snugly drying themselves over a peat fire.

After lunch walked by the banks of the White Water, picking *Alopecurus alpinus*, *Phleum alpinum*, and many alpine species, till we reached the upper part of Glen Callater, close to Lochnagar. No *Juncus castaneus* could be seen.

Descended into Glen Callater and walked by the side of the loch and by the banks of the Water to Castleton of Braemar, which we reached about 7 p.m., nearly three hours after Her Majesty had passed on her way to Balmoral.

Thursday, 16*th August* 1849.

Party (with the exception of Messrs. Christie, M'Allum, and Stewart) started this morning in a conveyance for the Linn of Dee, thence they walked up the glen to the gamekeeper's house (M'Hardy's) at the foot of Glen Lui. In place of going up this glen, they turned to the right and ascended the hills near Loch Etchachan. Reached the summit of Ben na Mac Dhu about 2 p.m., and had lunch there. The day fine and splendid prospect, Ben Nevis seen in the distance, the valley of the Spey, the sea on the coast of Morayshire, &c.

Descended along a large wreath of snow about 100 feet in length towards the Shelter Stone and Loch Avon. The party lay under the stone for a time, then ascended towards Loch

Etchachan, from which streams go both to Loch Avon and to the valley of the Derry.

On Ben na Mac Dhu picked :—

Silene acaulis (in fine flower)	Hieracium alpinum
Stellaria cerastoides	Luzula arcuata (in a poor state)

From Loch Etchachan descended to the valley amidst a severe rain, which lasted for two hours. Crossed the Derry and reached the Linn of Dee about 8 p.m., where the conveyance awaited us. Although we were thoroughly soaked, yet no rain had fallen at Ballater or Braemar.

Friday, 17*th August* 1849.

The party sent all their packages and plants and baggage by a cart to Coupar-Angus, for which they agreed to pay the sum of 45s.

Mr. M'Allum, being ill, was left at the inn at Braemar, and Mr. Christie kindly agreed to stay with him until Monday. The remaining six of the party left the inn at 11 a.m. and walked by the banks of the Clunie to the Spital of Glenshee, which they reached about 4 p.m. to dinner. After dinner walked to Bridge of Cally. Arrived there about 10 p.m. Got beds on the floor.

Saturday 18*th August* 1849.

This morning left the Bridge of Cally Inn at 6 a m. and walked to Blairgowrie to breakfast, thence proceeded by omnibus to Coupar-Angus, joined the train at 9.45 a.m. Four of the party proceeded to Edinburgh, which they reached about 1 p.m. The other two went to Bridge of Allan and Stirling.

EXCURSIONS IN 1850.

Kirkcaldy, Seafield Tower, Kinghorn, Pettycur, Burntisland.

Saturday, 18*th May* 1850.

Party of nearly 80 met at Railway Station at 9.45 and proceeded to Granton and Kirkcaldy. Visited Ravenscraig Castle and gathered :—

Ranunculus Ficaria	Ribes rubrum
Berberis vulgaris	Smyrnium Olusatrum
Cheiranthus Cheiri	Armeria maritima
Cochlearia officinalis	Primula vulgaris
Silene maritima	Verbascum Thapsus
Pyrus Malus	Nepeta Glechoma
Ribes Grossularia	Asplenium marinum

Walked through Kirkcaldy to Seafield tower, gathering :—

Viola pusilla	Taraxacum lævigatum

On the tower :—

Linaria Cymbalaria

On the shore numerous sea weeds.

Proceeded to Kinghorn, Pettycur, and Burntisland, gathering:—

Caltha palustris	Fragaria vesca
Cardamine pratensis	Primula veris
„ hirsuta	Borago officinalis (near Kinghorn)
Capsella Bursa-pastoris	Salvia Verbenaca
Lepidium campestre	Orchis mascula
Geranium molle	Botrychium Lunaria
Erodium cicutarium	

Returned by boat at 5.50 p.m.

Gorebridge, Arniston.

Saturday, 25*th May* 1850.

Very wet day, rain and mist all day. Party of 20 met at North British Railway Station and went by train to Gorebridge

(receiving third-class return tickets, 1s. 6d.). Walked to Arniston and botanised in the woods under direction of Mr. Veitch, the gardener.

Plants gathered were :—

Anemone nemorosa
Aconitum Napellus
Lychnis dioica
Stellaria nemorum
„ Holostea
Moehringia trinervis
Oxalis Acetosella
Potentilla Fragariastrum
Pyrus Malus
Saxifraga Geum
Chrysosplenium oppositifolium
„ alternifolium
Ribes alpinum
Sanicula europæa
Adoxa Moschatellina
Asperula odorata
Pyrethrum Parthenium
Petasites vulgaris
Doronicum Pardalianches
Symphytum tuberosum
Pulmonaria officinale
Veronica Chamædrys
„ montana
Lathræa Squamaria
Mercurialis perennis
Salix cinerea
Pinus sylvestris
Scilla nutans
Lilium Martagon
Paris quadrifolia
Luzula sylvatica
Arum maculatum
Carex glauca
Milium effusum

The day being so bad the party returned to Fushie Bridge road, half of the party going home by the train at 12 noon, the other half walked to Edinburgh, and on the way picked :—

Ranunculus auricomus
Fumaria officinalis
Sinapis arvensis
Viola tricolor, var. arvensis
Orobus tuberosus
Pyrus Aucuparia
Cratægus Oxyacantha
Circæa lutetiana
Myrrhis odorata
Anthriscus sylvestris
Viburnum Lantana
Veronica hederæfolia
Veronica arvensis
Lamium amplexicaule
Ulmus montana
Quercus Robur
Allium ursinum
Athyrium Filix-fœmina
Polystichum lobatum
Lastrea Filix-mas
„ dilatata
Equisetum arvense
Marchantia polymorpha

Linlithgow, Blackness Castle, Hopetoun, Niddry Castle, Winchburgh.

Saturday, 1*st June* 1850.

Party of 111 went by train at 8 a.m. to Linlithgow. Visited palace and church under direction of Mr. G. Baird, proceeded by the loch of Linlithgow on the Queensferry road; went to Binns, proceeded through the grounds to Blackness Castle, thence by shore to Hopetoun, were conducted through the grounds and garden by Mr. Gavin. Thence walked to Niddry Castle, and returned from Winchburgh by train at 7.5 p.m.

The whole trip cost 1s.

Near Linlithgow gathered :—

Ranunculus aquatilis
" Flammula
" acris
" repens
" bulbosus
Fumaria micrantha
Sisymbrium officinale
Anthriscus vulgaris
Menyanthes trifoliata
Veronica hederæfolia
" arvensis
" serpyllifolia
" officinalis
" Chamædrys
" Beccabunga
Lamium purpureum
" album

Near Niddry Castle :—

Viola canina
" arvensis
Myrrhis odorata
Chærophyllum Anthriscus
Petasites vulgaris
Iris Pseudacorus (not in flower)

At Binns :—

Barbarea vulgaris
Typha (not in flower)

At Blackness some sea plants, also :—

Aquilegia vulgaris
Cochlearia officinalis
Thlaspi arvense
Arenaria serpyllifolia
Alsine peploides
" marina
Sagina maritima
Armeria maritima
Glaux maritima
Anchusa sempervirens
Triglochin maritimum
Scirpus multicaulis
Blysmus rufus

At Hopetoun :—

Berberis vulgaris
Chelidonium majus
Cardamine sylvatica
Acer campestre
Lonicera Periclymenum
„ Caprifolium
Linaria Cymbalaria
Marrubium vulgare
Quercus Robur
Castanea sativa
Listera ovata
Athyrium Filix-fœmina
Lastrea Filix-mas
„ dilatata
Polypodium Phegopteris

In Hopetoun grounds, saw fine specimens of pines, Abies Douglasii, Cedrus Libani said to have been planted 101 years ago.

Gorebridge, Borthwick Castle, Crichton Castle, Prestonhall, Dalkeith.

Saturday, 8th June 1850.

Party of 70 met at the North British Railway Station at 8 a.m. and proceeded by train at 8.15 to Gorebridge, thence walked to Fushie Bridge, Borthwick Castle, Crichton Castle, Ford, Prestonhall, and Dalkeith, and returned by train passing Gallowshall at 7.30 p.m. Fare going and coming, 1s.

The following were some of the plants gathered :—

In marshy, moorish ground near Borthwick and Crichton :—

Trollius europæus
Cardamine amara
Myrrhis odorata
Valeriana dioica (in great quantity)
Pinguicula vulgaris
Carex dioica
„ intermedia
„ paniculata
„ remota
„ ovalis
„ Goodenovii
Carex glauca
„ pilulifera
„ præcox
„ panicea
„ sylvatica
„ binervis
„ flava
„ hirta
„ paludosa
„ riparia
„ ampullacea

Near Borthwick Castle:—

Alliaria officinale
Geum urbanum
„ rivale
„ intermedium
Verbascum Thapsus
Rhinanthus Crista-galli
Parietaria officinalis
Blechnum boreale

Near Crichton Castle :—

Geranium sylvaticum
Menyanthes trifoliata
Neottia Nidus-avis

Near Ford :—

Orchis latifolia
Blysmus compressus
Bromus commutatus

At Prestonhall :—

Barbarea vulgaris
Staphylea pinnata
Vinca minor
Ajuga reptans (blue and white)
Listera ovata
Ornithogalum umbellatum

Near Cousland :—

Silaus pratensis
Plantago media (in profusion)

Near Dalkeith :—

Acer campestre
Chenopodium Bonus-Henricus

Reston, St. Abb's Head, Coldingham.

Saturday, 15*th June* 1850.

Party of about 50 met at North British Railway Station at 8 and proceeded by train to Reston, having received return tickets, 3s. 6d. At Grants House met Mr. Hepburn of Whittingham; Mr. Hardy, Penmanshiel. Reached Reston about 10.15 a.m. Proceeded direct to St. Abb's Head, which was reached about 12 noon.

On the way gathered :—

Ranunculus aquatilis
„ hederaceus
„ hirsutus
Sinapis arvensis
Raphanus Raphanistrum
Malva sylvestris
Æthusa Cynapium
Filago germanica
Crepis virens
Anchusa sempervirens
Chenopodium Bonus-Henricus

Near the Head, picked :—

Helianthemum vulgare
Alsine verna
Anthyllis Vulneraria
Astragalus Hypoglottis
Armeria maritima
Plantago maritima
„ Coronopus

At the Head:—

Cochlearia officinalis
Silene inflata
Plantago maritima
Plantago Coronopus
Avena pratensis
Agaricus Oreades

Proceeded along the rocks near the Head in the direction of Fast Castle, and reached nearly to Lumsden Bay.

Plants gathered :—

Viola lutea
Cerastium atrovirens
Genista anglica
Poterium Sanguisorba
Rhodiola rosea
Myriophyllum spicatum (in a small lake)
Helosciadium inundatum
Antennaria dioica
Carlina vulgaris
Hieracium murorum
Digitalis purpurea
Alisma ranunculoides (in a ditch)
Briza media

In Coldingham Loch :—

Nuphar luteum
Comarum palustre
Menyanthes trifoliata
Carex intermedia

Returned by moors to Reston, which was reached about 5.15.

On the way gathered :—

Valeriana dioica
Pyrola media
Orchis mascula
„ latifolia
„ maculata
Gymnadenia Conopsea
Habenaria bifolia
Ophioglossum vulgatum
Botrychium Lunaria

Returned by train passing Reston at 5.34 p.m. and reached Edinburgh before 8 p.m.

Kincardine, Culross, Torry, Torryburn, Charleston.

Saturday, 22nd June 1850.

Party of 40 met at Granton at 8.30 a.m. and proceeded by the Stirling steamer to Kincardine, which was reached about 10.30. Mr. Nichol accompanied the party. Mr. Gow, gardener at Tulliallan, met the party and conducted them through Tulliallan grounds. In them ordinary plants picked.

In a loch :—

Nasturtium terrestre
Hydrocotyle vulgaris
Littorella lacustris
Polygonum amphibium
Alisma Plantago

On moors several species of *Carex* and *Iris Pseudacorus.*

Leaving Tulliallan the party proceeded to road near the shore and walked along the coast by Culross, Torry, and Torryburn to Charleston.

The plants gathered were :—

Corydalis claviculata (Blair)
Fumaria capreolata
„ officinalis
Geranium columbinum (field near Tulliallan)
Viburnum Opulus
Solanum Dulcamara (woods near shore at Tulliallan)
Melampyrum pratense
Hippophaë rhamnoides
Corallorhiza innata
Paris bifolia (Blair and also inland a little)
Milium effusum
Osmunda regalis (near sands)
Ophioglossum vulgatum

Near Culross :—

Sinapis alba
Scandix Pecten-Veneris
Stachys sylvatica
Atriplex littoralis
„ rosea
Triglochin palustre
Triglochin maritimum
Scirpus maritimus
Glyceria aquatica
Sclerochloa maritima
„ distans

Near Charleston :—

Papaver Rhœas
„ dubium
„ Argemone
Saponaria officinalis
Sagina maritima
Sedum Telephium
Pimpinella Saxifraga
Myrrhis odorata
Dipsacus sylvestris
Anagallis arvensis
Symphytum officinale
Echium vulgare
Atropa Belladonna
Scrophularia nodosa
Lamium amplexicaule
„ incisum
„ purpureum
„ album
Euphorbia exigua
Carex vulpina
Bromus asper

Reached Charleston about 5 and returned to Granton about 7.

Aberdeen.

Saturday, 29th June 1850.

Party of upwards of 100 started by train at 5 a.m. from the Northern Railway Station, in open seated carriages. Proceeded by Perth and Forfar to Aberdeen, which was reached about 11 (an hour after the time agreed). Omnibuses took the party to Royal Hotel (Robertson's) to breakfast. Fares by train, going and coming, 6s. 6d. Breakfast per agreement, 1s. each. Nearly 90 sat down to breakfast. Dr. Dickie met the party and accompanied them. Some of the party went to see different places near Aberdeen. About 50 went in three omnibuses to Denmore, visiting King's College on the way.

At Denmore gathered :—

Hieracium sylvaticum
Trientalis europæa (in fine flower)
Goodyera repens (scarcely in flower)
Polypodium Dryopteris
Tuburcinia Trientalis
Cylindrosporia deformans

In boggy ground and moors :—

Sedum villosum
Drosera rotundifolia
„ anglica
Heliosciadium inundatum
Pedicularis palustris
Utricularia minor
Orchis latifolia
„ maculata
Gymnadenia Conopsea
Habenaria bifolia (no chlorantha)
Narthecium Ossifragum
Potamogeton oblongus
Schœnus nigricans
Carex pulicaris
„ teretiuscula
„ curta
„ fulva
Nardus stricta
Lycopodium selaginoides
Dicranum glaucum

Listera cordata not found.

In woods (over a wall near Denmore Bog) :—

Linnæa borealis (not in flower)
Pyrola minor

Returned by omnibuses to Aberdeen Links.

On Links gathered :—

Thalictrum minus
Viola tricolor
Myriophyllum spicatum
Tragopogon minor
Potamogeton pectinatus
Scirpus uniglumis
Carex incurva
Koeleria cristata
Poa pratensis

Visited Granite Works of Mr. Macdonald by permission. Saw Marischal College, Medical Society's Rooms, Markets, &c. After dining at Royal Hotel, returned by train leaving Aberdeen at 6, and reached Granton 11.55 p.m.

North Berwick, Bass, Dirleton, Gullan, Drem.

Saturday, 6th July 1850.

Party of 30 met at North British Railway Station at 8 a.m. and proceeded by train to North Berwick. Return tickets 2s. Divided into two parties. One party visited Bass Rock, picking:—

Lavatera arborea (in small quantity, injured by frost last winter).
Beta maritima

Near North Berwick, gathered :—

Ononis arvensis
Astragalus Hypoglottis
Eryngium maritimum
Borago officinalis
Hippophaë rhamnoides (in a hedge)

North Berwick Links :—

Thalictrum minus
Ligusticum scoticum
Thrincia hirta
Erythræa Centaurium
Cynoglossum officinale
Habenaria viridis
Equisetum variegatum

Dirleton Common :—

Anthriscus sylvestris
Veronica Anagallis (in ditch)

On the Common :—

Alyssum calycinum
Silene conica
Acinos vulgaris

Fields near Common :—

Reseda lutea
Galium Mollugo

Dirleton Castle :—

Sedum album
„ reflexum
Smyrnium Olusatrum
Centranthus ruber
Digitalis purpurea, white and purple

Near Gullan :—

Nasturtium terrestre
Melilotus officinalis
Sempervivum tectorum (near Drem)
Centaurea Scabiosa
Centaurea Cyanus
Convolvulus arvensis
Solanum Dulcamara
Hyoscyamus niger
Limosella aquatica

Met train at Drem at 6.50. Reached Edinburgh at 7.40 p.m.

Slateford, Colinton, Woodhall, Currie, Ravelrig, Dalmahoy, Ratho.

Saturday, 13*th July* 1850.

Excursion with 30. Met at Canal Basin at 9.30 a.m. Walked to Slateford, Colinton, Woodhall, Currie, Ravelrig, Dalmahoy, Ratho. Met train at 7.30 p.m.

Picked the usual plants known to grow in the district.

Viola palustris	Pyrola minor
Geranium columbinum	Corallorhiza innata
Epilobium angustifolium	Listera cordata
Linnæa borealis (in flower)	Carex filiformis (not in fruit)
Valeriana pyrenaica	

Trientalis europæa was not seen.

Clova.

Thursday, 18*th July* 1850.

Party consisting of :—J. H. Balfour, John H. Aldrige, Samuel Harris Armitage, Edward Brewis, W. H. Broadbent, J. L. Brown, William Brown, Samuel Burd, W. Menzies Calder, Cuthbert Collingwood, James A. Currie, Charles J. Davenport, Andrew Dewar, Alex. G. Duff, David A. Eisdale, Henry Elliot, George Logan, R. F. Logan, Thomas S. M'Culloch, Valentine M'Master, John U. Matheson, John Matthews, David Milroy, John B. Nasmyth, David Ross, Eleazer Sherwood, David H. Stirling, P. H. Watson, J. Watt, John Wooley, met at the Northern Railway Station at 12 noon on Thursday, 18th July, and proceeded by train to Forfar, which was reached about 5 p.m. owing to delay of half an hour at Perth. Return tickets for each of the party at 6s. 6d. Dined at Wm. Morrison's Inn, Forfar, at 1s. 6d. each—and afterwards started at 6 p.m. for Clova, which was reached at 11 p.m. There were two conveyances hired to go the whole way and remain till Saturday and return. These consisted of a car with two horses, holding 12 with the baggage, and a carriage with two horses holding 8 and some baggage. These two conveyances, holding together 20, were hired from Thursday till Saturday for £7 10s., including tolls, drivers, and everything. Besides these there was a carriage and pair and a drosky which took some of the party half way to Clova.

On reaching Dykehead, near Cortachy, those who had rode in the two latter carriages walked. In all there were 12 or 14 who walked from Dykehead to Clova.

Had tea at Clova, and were accommodated with straw beds on the floor of the large hall lately built for the games which are held at Clova in August. Twenty-five slept on the floor, the remainder in the old inn, partly on beds and partly on the floor. Sleep much disturbed in the hall by noisy and restless members of the party ; some had scarcely two hours' sleep.

Friday, 19*th July* 1850.

Rose at 5 a.m. Breakfasted at 6, and at 7 started for the hills. Crossed Suspension Bridge, met John Ogilvy, walked to Glen Dole as far as astragalus cliff, then ascended to top of hills and came down into Glen Fee by a precipitous descent. Some dry mist during a few hours, but upon the whole the weather was favourable and the success of the party great.

Picked :—

Viola lutea
Oxytropis campestris
Rubus Chamæmorus
Sibbaldia procumbens
Epilobium angustifolium
„ alsinifolium
„ alpinum
Meum athamanticum
Cornus suecica
Erigeron alpinum
Gnaphalium supinum
Hieracium alpinum
„ Lawsoni
Sonchus alpinus
Arctostaphylos Uva-Ursi
Pyrola rotundifolia
„ media
„ secunda
Trientalis europæa
Veronica alpina
„ saxatilis
Salix reticulata
Malaxis paludosa
Habenaria albida
„ viridis
Tofieldia palustris
Juncus triglumis
Luzula spicata
Carex rupestris
„ atrata
„ aquatilis
„ stictocarpa
„ rariflora
„ capillaris
Allosorus crispus
Asplenium viride
Woodsia hyperborea
Polystichum Lonchitis
Lycopodium Selago
„ annotinum
„ clavatum
„ alpinum
„ selaginoides

And all the ordinary alpine plants, as :—

Thalictrum alpinum	Saxifraga stellaris
Alchemilla alpina	„ aizoides
Saxifraga oppositifolia	„ hypnoides
„ nivalis	

Returned to inn at Clova at 8 p.m. after 13 hours' hard walking.

Saturday, 20*th July* 1850.

Rose at 5 a.m., and about 5.30 started with a party of six for Loch Brandy. Thick mist, difficulty in finding loch.

Gathered :—

Lobelia Dortmanna	Isoëtes lacustris
Sparganium natans	

On rocks near loch :—

Cerastium alpinum	Hieracium alpinum
Sibbaldia procumbens	Vaccinium Vitis-Idæa
Gnaphalium supinum	

Returned to the inn about 9.30 a.m., and after bathe had breakfast.

Picked by the Esk :—

Carduus heterophyllus	Rumex aquaticus
Hieracium umbellatum	Carex aquatilis

Some of the party breakfasted early and walked on, the rest went by cars to Dykehead, when those who had walked entered the carriages.

On the way picked :—

Ligustrum vulgare	Lysimachia vulgaris

From Dykehead walked to Forfar, gathering :—

Rubus suberectus	Habenaria chlorantha
Trientalis europæa	

On old house at Forfar were allowed to pick *Sedum album.* Dined at Thomson's Inn at 4 p.m. Dinner, 1s. 6d. each. Joined train at 5.15 and reached Edinburgh at 9.45 p.m.

Salisbury Crags, Duddingston Loch.

Tuesday, 23rd July 1850.

Party of 24 met at Holyrood at 6 p.m., walked by foot of Crags to basaltic columns, gathering :—

Lychnis Viscaria (in fruit)	Asplenium Adiantum-nigrum
Senecio viscosus	„ Ruta-muraria
Allium vineale	„ septentrionale
Arum maculatum	

Visited Duddingston Loch, got Mr. Logan's boat, which held 15, and examined edges of loch, gathering :—

Butomus umbellatus	Sparganium ramosum

Landed at the town and walked round loch. Got :—

Stellaria glauca	Iris Pseudacorus
Galium palustre	Carex riparia

Returned about 9.30 p.m.

Arran.

Tuesday, 13th August 1850.

Left Edinburgh by train at 11 a.m. and joined boat at 2 p.m. at Broomielaw. Reached Lamlash, Arran, about 9 p.m. Took up quarters at Seafield.

Wednesday, 14th August 1850.

Examined beach near Lamlash.

Picked :—

Atriplex Babingtonii (rosea)	Polygonum Raii
„ arenaria (laciniata)	Triticum laxum of Fries
Polygonum aviculare, var. maritimum	„ junceum

Thursday, 15*th August* 1850.

Walked along shore with Mr. Brown to Clachland Point and Corriegills.

Gathered :—

Hypericum Androsæmum
" quadrangulum
" maculatum
Œnanthe Lachenalii
Bidens tripartita
Anagallis arvensis
" tenella
Convolvulus sepium
Pinguicula lusitanica
Scutellaria galericulata
Juncus maritimus
Scirpus maritimus
Osmunda regalis

Friday, 16*th August* 1850.

Visited Holy Isle. Picked abundance of *Arctostaphylos Uva-Ursi*, which here descends to within 50 feet of sea level.

Saturday, 17*th August* 1850.

Boating and fishing; visited glen near Seafield and gathered various ferns and fungi, also *Polypodium Phegopteris*.

Monday, 19*th August* 1850.

Along with Babington and Brown walked by shore to King's Cross Point and returned by road.

Gathered :—

Hypericum maculatum
Rubus Idæus
" nitidus
" incurvatus (new)
" cordifolius
" leucostachys
" corylifolius
Scutellaria galericulata
Athyrium Filix-fœmina
" var. molle
" var. convexum
Lastrea dilatata
Osmunda regalis

Tuesday, 20*th August* 1850.

Along with Babington and Brown walked to shore at Lag, visited rocks, and returned by Kilmorie across the hills to Lamlash.

Plants gathered :—

Same *Rubi* as on 19th, and in addition :—

Brassica monensis
Cakile maritima
Raphanus maritimus ?
Alsine (Arenaria) media of Fries
Geranium sanguineum
Rubus discolor
„ nemorosus
Cotyledon Umbilicus
Eryngium maritimum
Armeria maritima (calyx uniformly hairy)
Armeria pubescens (calyx-hairs in lines)
Atriplex Babingtonii
„ laciniata
Polygonum aviculare, var. maritimum
„ Raii
Triticum laxum (in fine state on sandy shore near Lag)
Asplenium marinum

Thursday, 22nd August 1850.

Went by car with Babington, Brown, and Hunter to Glen Sannox. Day very unpromising. Returned by Corrie. From Corrie walked by the shore to Brodick and Lamlash, gathering :—

Œnanthe Lachenalii
Aster Tripolium
Samolus Valerandi
Erythræa linarifolia
Scutellaria galericulata
Lycopus europæus
Salicornia herbacea
Atriplex angustifolia
„ erecta
Juncus maritimus
Potamogeton plantagineus (ditch near bridge between Brodick and Invercloy)
Scirpus palustris
„ pauciflorus
„ maritimus
Blysmus rufus
Glyceria pedicellata (near Brodick)
Hymenophyllum tunbridgense
Pteris aquilina
Athyrium Filix-fœmina
„ var. molle
„ var, convexum
Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ Foenisecii (on sandstone rocks between Brodick and Corrie)
Polypodium Phegopteris
Osmunda regalis
Equisetum arvense
„ palustre
„ limosum
Lycopodium selaginoides

Friday, 23rd August 1850.

Despatched plants to Mr. M'Nab in Edinburgh.

On examining the rhizome of *Lastrea Foenisecii* and *L. dilatata*, saw a difference in the vertical section of each worth noting. In *L. Foenisecii* there are numerous dark streaks running from the centre upwards, giving a mottled appearance to the section. In *L. dilatata* the dark lines are more scattered and scarcely extend to the base of the fronds. This character enables one to tell at once the species one from the other.

Examined some of the plants on the shore and near Lamlash. Picked *Rubus corylifolius* var. (like *sublustris*) behind the inn. The stem is nearly rounded ; the plant grew in a garden up the lane behind the inn. In the lane leading up to the garden, on the left-hand side going up, *Rubus sylvaticus* occurs, on the stem were seen patent hairs. In the garden beyond *Rubus corylifolius* was seen a glandular *Rubus, R. Koehleri, pallidus.*

On the shore saw *Triticum repens* with upper ribbed surface of leaf having single rows of hairs along the ribs. *Triticum junceum*, short hairs thickly set on upper ribbed surface, all over. *T. laxum*, spikelets five- to eight-flowered, glumes obtuse, about seven-nerved, outer pale obtuse, apiculate—*axis* downy, *rachis* smooth and slightly rough at angles, leaves *scabrous above* with many acute points, involute when dry.

Saturday, 24th August 1850.

Messrs. Babington, Hunter, Brown, and Bayley accompanied me to Goatfell. Left Lamlash about 10, walked to Brodick. Behind the inn gathered *Mentha sylvestris*, var. *velutina.* Ascended Goatfell, and thence proceeded along ridge to Glen Sannox, descended by a deep ravine, and then ascended to the col separating Glen Sannox and Glen Rosa. Returned by Glen Rosa to Brodick and Lamlash.

The plants gathered were :—

Alchemilla alpina
Saxifraga stellaris
Sedum Rhodiola (ravine in Glen Sannox)
Oxyria reniformis (ravine in Glen Sannox)
Juniperus nana
Rhynchospora alba (in Glen Rosa)

Schœnus nigricans (in Glen Rosa)
Festuca vivipara (on Goatfell)
Asplenium Ruta - muraria (large specimen on wall at Brodick)

Monday, 26*th August* 1850.

Walked with Babington to the Manse, old churchyard, and glen near Lamlash; gathered *Hypericum dubium ?*—broad sepals, but denticulate at apex. The characters of *H. maculatum* and *H. dubium* require revision. No species of *Hypericum* has been seen by me having perfectly entire reflexed sepals.

Also gathered :—

Rubus plicatus
„ nitidus
„ carpinifolius
„ cordifolius
„ incurvatus
Rubus sylvaticus
„ macrophyllus
„ corylifolius (typical) and varieties

Found also *Leontodon autumnalis* (*Oporinia*), var. *pratensis*, J. Ball, with leaves pinnatifid-dentate, involucre clothed with long hairs of a dark fuscous colour, scape and leaves hairy (*Apargia pratensis* of Link).

Tuesday, 27*th August* 1850.

Day bad, walked by the back of Lamlash village and gathered specimens of *Rubus corylifolius-macrophyllus*, *R. cordifolius-incurvatus*.

Wednesday, 28*th August* 1850.

Met Dr. Landsborough, Messrs. Keddie and Connal, and dredged in Lamlash Bay. Numerous specimens of animals were gathered. Major Martin was dredging at the same time and got many good things.

Babington left to-day for England.

Monday, 2*nd September* 1850.

David Arnott, G. Bayley, and self left Lamlash about 10 for Lag. Went by shore to Whiting Bay, picked numerous speci-

mens of *Hypericum dubium* ? all with reflexed and broad sepals, all slightly *denticulate* at the apex, and hence apparently not to be distinguished from *H. maculatum* of authors. Babington seems to be satisfied that *H. dubium* and *H. maculatum* must be considered the same. Numerous *Rubi* were seen, species already noticed.

From Whiting Bay I went to Dippen Point, where there are fine cliffs. The following species were collected :—

Rubus (several forms)	Solanum Dulcamara
Agrimonia Eupatoria	Verbascum Thapsus
Ligusticum scoticum	Scutellaria galericulata (very large)
Heracleum Sphondylium	Empetrum nigrum
Hedera Helix	Carex vulpina
Lonicera Periclymenum	„ muricata
Pyrethrum Parthenium	

Verbascum Thapsus seems to be confined to the trap in this district. Proceeded by Kildonan Castle to Benan Head ; there was gathered profusion of *Triticum laxum*, Fries, also *Atriplex laciniata* (*arenaria*) and *A. Babingtonii* in all its forms.

Cakile maritima	Eleocharis palustris
Salsola Kali	

On Benan rocks :—

Verbascum Thapsus was again seen	Asplenium marinum

Reached Lag Inn about 7.30 p.m. The two others fished in the Storsdale and Torraline water and met me at Lag.

Tuesday, 3rd September 1850.

Left Lag after breakfast and proceeded to the shore and walked along it to Blackwater Foot.

On the shore was seen profusion of *Stenhammera*, especially near Black Water. Picked :—

Sinapis monensis
Vicia sylvatica (on stony ground on seashore)
Eryngium maritimum
Apium graveolens (between Storsdale and Blackwater Foot)
Helosciadium nodiflorum (between Storsdale and Blackwater Foot)
Atriplex in all forms (A. erecta in fields near Storsdale)
Polygonum aviculare, var. maritimum
„ Raii

Friday, 6th September 1850.

Left at 10 with D. Arnott and G. Bayley for Goatfell. I proceeded up Glen Rosa to hills to the west of Goatfell and Glen Rosa, went along summits, examined rocks with northern exposure all round until I came to the upper part of Glen Rosa, where I met Arnott and Bayley, who had been at summit of Goatfell. On the hills the plants picked were:—

Alchemilla alpina
Saxifraga stellaris
Drosera longifolia
Carex pauciflora

The mountains, like Goatfell, were very unproductive. Proceeded across the hills to Loch Ranza.

Gathered on the way:—*Pelatonema* in large quantity in declivity of col between Glen Rosa and Tanna river, followed stream to Loch Ranza, gathering *Pyrus pinnatifida.* Reached Loch Ranza at 8 p.m.

Saturday, 7th September 1850.

At 6 a.m. walked to Newton Point, gathering:—

Hypericum Androsæmum
„ elodes
Cotyledon Umbilicus

Saw also fine and numerous specimens of *Osmunda regalis.*

After breakfast walked to Corrie and thence to Brodick. Picked:—

Lastrea Foenisecii
Lastrea dilatata

The sandstone cliffs along the whole shore yield profusion of them and other ferns.

Met steamboat at Brodick at 2 and returned to Lamlash.

EXCURSIONS IN 1851.

Gorebridge, Arniston, Dalhousie.

Saturday, 17th May 1851.

Went to Arniston with about 90 pupils. Train at 11 a.m., special third-class carriage. Tickets to Gorebridge and return from Dalhousie, 1s. Returned to Edinburgh between 7 and 8 p.m. Usual plants seen.

Picked :—

Pulmonaria officinalis	Arum maculatum
Lathræa Squamaria	Bryum roseum
Neottia Nidus-avis (not in flower)	

Canal, Slateford, Colinton, Dreghorn, Pentlands, Morningside.

Saturday, 24th May 1851.

About 70 met at Canal Basin at 10 a.m. Walked along Canal banks, gathering usual plants. Among the rest :—

Ranunculus arvensis	Fumaria micrantha

Visited Slateford and Colinton.

Picked :—

Cardamine amara	Doronicum Pardalianches
Saxifraga Geum	Cystopteris fragilis
Valeriana pyrenaica (not out)	

Walked through grounds at Dreghorn by permission of Col. Cadell. Thence to Pentland Hills.

Picked :—

Juniperus communis	Lycopodium Selago

Returned to Edinburgh by Morningside about 6 p.m.

Granton, Cramond, Almond Bridge, Corstorphine.

Saturday, 31*st May* 1851.

Party of about 60 met at Granton at 11. Walked by coast to Cramond and thence to Almond Bridge, returning by Craigcrook and Corstorphine.

Picked amongst other plants :—

Viola odorata	Polygonum Bistorta
Symphytum officinale	Neottia Nidus-avis

Returned about 6 p.m.

Kirkcaldy, Ravenscroft Castle, Burntisland.

Saturday, *7th June* 1851.

A party of 60 went by steamboat at 10 a.m. to Kirkcaldy. Visited Ravenscroft Castle and walked by shore to Burntisland returning by steamboat at 6.5 p.m.

Reseda lutea	Asplenium marinum
Geranium sanguineum	Botrychium Lunaria
Pyrus Malus	Chara vulgaris
Borago officinalis	

and a number of other plants were gathered.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

JULY 1902.

CONTENTS.

Page.
History of the Royal Botanic Garden, Edinburgh. Botanical Excursions made by Professor John Hutton Balfour in the Years from 1846 to 1878 inclusively, - - - 125

GLASGOW:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By JAMES HEDDERWICK & SONS,
AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,
And to be purchased, either directly or through any Bookseller, from
OLIVER & BOYD, EDINBURGH.

[PRICE NINEPENCE.]

[*All rights reserved.*]

St. Andrews.

Saturday, 21st June 1851.

Party of 51 went to St. Andrews. Started at 8.50 a.m. and proceeded to Leuchars, thence by coach to St. Andrews. Fares going and coming, 5s. 10d.

Visited castle, cathedral, and other places. Walked along shore to the west.

Gathered :—

Sagina maritima
Lepigonum marinum
Sclerochloa maritima (on the pier)
Sclerochloa loliacea
Triticum laxum
Elymus arenarius

Left St. Andrews at 5.7 p.m. and reached Edinburgh at 7.45 p.m.

Charleston, Queensferry.

Saturday, 28th June 1851.

Met at Granton at 9 a.m. and proceeded by Stirling boat to Charleston. Party, 60. Walked by shore to Queensferry. Examined Ferry Hills. Returned by boat and reached Edinburgh at 7 p.m. Fares going and coming, 1s.; pier, Granton, 4d.; pier, Queensferry, 6d.

Plants gathered were :—

Nasturtium sylvestre (Inverkeithing)
Alyssum calycinum (Ferry Hills)
Hesperis matronalis (woods at Limekilns)
Sinapis alba
Diplotaxis tenuifolia (St. Davids)
Viola hirta
Melilotus arvensis (St. Davids)
Vicia lutea (Ferry Hills)
Spiræa Filipendula
Sedum villosum
Haloscias scoticum (Inverkeithing)
Dipsacus sylvestris
Silybum Marianum

Hieracium aurantiacum (woods at Limekilns)
Campanula Rapunculus (churchyard near Limekilns, Mr. Duff)
Anagallis arvensis
Cynoglossum officinale (Rosyth)
Veronica polita (Inverkeithing)
Arum maculatum (woods at Limekilns)
Arundo epigejos (St. Davids)
Serrafalcus commutatus
Lolium italicum
Triticum junceum

No *Oxytropis uralensis* seen.

North Berwick, Dirleton, Gullan, Aberlady, Gosford.

Saturday, 12th July 1851.

Party of 50 met at the North British Railway Station at 8 a.m. and proceeded to North Berwick. Return tickets, 2s.

Walked along common at North Berwick, gathering :—

Helosciadium repens
Thrincia hirta
Erythræa Centaurium
Habenaria viridis
Festuca rubra
Equisetum variegatum
Lycopodium selaginoides

On Dirleton Common :—

Fumaria micrantha
Alyssum calycinum
Reseda lutea
Silene conica
Galium Mollugo
Centaurea Scabiosa
Calamintha Acinos

At Dirleton Castle :—

Sedum reflexum
Smyrnium Olusatrum
Parietaria erecta

At Gullan :—

Ranunculus trichophyllus
„ confusus
Cerastium arvense
Carduus nutans
Utricularia vulgaris
Alisma ranunculoides (Gullan Loch)
Potamogeton plantagineus
„ oblongus
„ pusillus
Carex disticha
„ paniculata

At Luffness :—

Hippuris vulgaris
Scirpus Tabernæmontani
Scirpus maritimus

Near Aberlady :—

Trifolium fragiferum
Lepturus filiformis

Near Gosford :—

Malva moschata
Geranium sanguineum
Inula dysenterica
Hippophaë rhamnoides
Listera ovata
Knappia agrostidea
Botrychium Lunaria

Joined train at Longniddry at 7 and returned to Edinburgh about 8 p.m.

Linlithgow, Blackness, Hopetoun, Niddry Castle, Winchburgh.

Saturday, 19*th July* 1851.

Party of about 30 met at Edinburgh and Glasgow Railway Station at 8 o'clock and proceeded to Linlithgow. Fares to Linlithgow and back from Winchburgh, 1s. After visiting palace and church, walked to Binns, thence to Blackness and Hopetoun and Winchburgh, joining train at 7.15 p.m.

Linlithgow Palace :—

Parietaria officinalis

Linlithgow Loch :—

Ranunculus aquatilis (various forms)
Stellaria glauca

At Binns :—

Hypericum humifusum
Typha latifolia
Sparganium ramosum

Numerous maritime plants near Blackness.

Niddry Castle :—

Dianthus deltoides
Verbascum Thapsus

Banks of Canal near the castle :—

Genista tinctoria

Ben Lomond.

Thursday, 24th July 1851.

Party consisting of J. H. Balfour, Hugh Cowan, William Cunningham, George Drysdale, Alex. E. Duff, Alex. D. Gulland, J. K. Jackson, Charles Jenner, Chris. Kerr, John Kerr, William Liddell, R. M'Dowall, John Matthews, J. Rany, James Robertson, John Ross, John Sibbald, Patrick Heron Watson, Christ. Young, met at the Edinburgh and Glasgow Railway Station at 11 a.m. and proceeded to Glasgow. Left baggage at hotel close to railway, went to St. Rollox and saw Mr. Tennant's works. Then visited the Cathedral and the University, saw the Hunterian Museum through the kindness of Dr. Allen Thomson. Dined at Josez Hotel at 3 p.m. for 1s. 6d. each. Joined the steamboat at the Broomielaw at 4 p.m., and proceeded to Bowling and thence by train to Balloch. At Balloch went on board steamboat on Loch Lomond about 6 p.m. and reached Inverarnan about 9.30 p.m. Return tickets had been granted by the E. & G. Railway, third class 5s., Dumbarton and Loch Lomond Co., first class 4s., total 9s. At Inverarnan the party were comfortably accommodated at M'Lellan's Inn.

Friday, 25th July 1851.

Party rose about 4 a.m. and proceeded to gather :—

Pinguicula lusitanica
Quercus (many forms in Glen Falloch)
Malaxis paludosa
Hymenophyllum Wilsoni
Lycopodium inundatum

Proceeded to the rocks on the northern side of Ben Lomond and thence to the summit.

Gathered :—

Cochlearia alpina
Silene acaulis
Cerastium alpinum
Sibbaldia procumbens
Saxifraga nivalis
Gnaphalium supinum
Poa alpina
Polystichum Lonchitis

Reached Rowardennan in time for the steamboat at 4.30 p.m. Proceeded to Glasgow. Joined train to Edinburgh at 8.30 p.m. and reached Edinburgh about 10.30 p.m.

EXCURSIONS IN 1852.

Canal, Slateford, Colinton, Woodhall, Currie.

Saturday, 15*th May* 1852.

Met at Canal Basin, Port Hopetoun, at 10 a.m. Party about 90. Walked by Canal banks to Slateford, Colinton, Woodhall, and Currie. Returned by train passing Currie at 4.16 p.m.

Picked :—

Ranunculus auricomus
Berberis vulgaris
Meconopsis cambrica
Cardamine amara
Geranium phæum
Prunus Padus
Saxifraga hypnoides (near Colinton)
Scrophularia vernalis
Orchis mascula
Arum maculatum (Colinton Woods, right hand going up)
Bryum capillare
Agaricus campestris
Polyporus squamosus
Lepidodendron (near Currie)

Gorebridge, Arniston, Dalhousie.

Saturday, 22*nd May* 1852.

Party of 100 proceeded by train at 11 to Gorebridge. Return tickets, 1s. Walked to Arniston and thence to Dalhousie. Joined the train at 7.30 p.m.

Among the plants gathered were :—

At Arniston :—

Aconitum Napellus
Cardamine amara
Staphylea pinnata
Spiræa salicifolia
Pyrus Malus
Saxifraga Geum
„ umbrosa
Ribes nigrum
Lilium Martagon
Paris quadrifolia

At Dalhousie :—

Chelidonium majus
Cardamine amara
Stellaria uliginosa
Pyrus Malus
Ribes alpinum
Daphne Laureola
Neottia Nidus-avis
Arum maculatum

Dysart, Wemyss.

Saturday, 29th May 1852.

Party between 80 and 90 met at Northern Railway Station at 9.45 a.m. and proceeded to Dysart. Fare, 1s. 4d.

Met Lord Rosslyn's gardener and walked through Dysart Woods, where we gathered :—

Aconitum Napellus
Saxifraga Geum
„ umbrosa
„ granulata
Doronicum plantagineum
Anchusa sempervirens
Polygonum Bistorta
Listera ovata (in woods near Dysart)
Convallaria majalis
Ornithogalum umbellatum

Several plants have escaped from garden, as :—

Geum agrimonioides
Symphytum tauricum
Narcissus poeticus

Proceeded along the shore to Wemyss, gathering many interesting coal-fossils, as specimens of *Calamites*, *Pecopteris*, *Neuropteris*, and *Sphenopteris ;*

also :—

Fumaria officinalis
Cochlearia officinalis
Reseda Luteola
Silene maritima
Stellaria uliginosa
Honckenya peploides
Erodium cicutarium
Astragalus hypoglottis
Sanicula europæa
Dipsacus sylvestris (not in flower, in great profusion)
Leontodon lævigatus
Armeria maritima
Plantago Coronopus
Triglochin palustre
Carex arenaria
„ hirta
Corallina officinalis

Returned by the road to Dysart, and reached it at 4.20 p.m., in time for the train.

Midcalder, Dalmahoy, Ravelrig, Currie.

Saturday, 5*th June* 1852.

Party of 85 proceeded by train at 7.45 a.m. to Midcalder. Walked to Dalmahoy, Ravelrig, and Currie, and returned by train passing Currie at 4.16 p.m.

Among the plants gathered were :—

Helianthemum vulgare
Viola palustris
„ sylvatica
„ canina
„ tricolor
„ lutea
Drosera rotundifolia
Linnæa borealis
Pyrola minor (not in flower)
Trientalis europæa
Pinguicula vulgaris
Corallorrhiza innata

Cockburnspath, Dunglass Woods and Dene.

Saturday, 12*th June* 1852.

Party of nearly 70 met at the North British Railway Station at 8 and proceeded to Cockburnspath. Return tickets, 2s. 6d. Met Mr. Hardy of Penmanshiel at Cockburnspath Station. Mr. Buist sent the forester to conduct the party through Dunglass Woods. Visited Dunglass Dene, going up on the east and returning on the west side.

Gathered :—

Berberis vulgaris
Cardamine amara
Viola odorata (in fruit)
Hypericum calycinum
Geranium phæum
„ sylvaticum
Ilex Aquifolium
Acer campestre
Circæa lutetiana
Viburnum Lantana
Vinca major
„ minor
Veronica montana
Neottia Nidus-avis
Carex pendula

Various common ferns in great luxuriance.

Eranthis hyemalis
Artemisia Absinthium (in leaf)
Anchusa sempervirens
Luzula pilosa
Scolopendrium vulgare (in great profusion)
Equisetum Telmateia
Polyporus squamosus

Visited the sea-shore and walked along it as far as Pease Burn and ascended the burn picking *Malva rotundifolia*.

In Pease Dene :—

Polystichum angulare (in abundance).

On sea-shore, numerous ordinary sea-weeds :—

Glaucium luteum
Cochlearia officinalis
Silene maritima
Honckenya peploides
Anthyllis Vulneraria
Astragalus hypoglottis
Astragalus Glyciphyllos
Œnanthe crocata
Armeria maritima
Plantago maritima
Equisetum palustre
„ hyemale

Near shore :—

Circæa lutetiana
Carduus tenuiflorus
Chenopodium Bonus-Henricus
Salix Caprea
„ viminalis

Returned by train passing Cockburnspath at 6 and reached Edinburgh at 7.50 p.m.

Dunfermline, Knock Hill, Black Devon, Saline Hill.

Saturday, 19*th June* 1852.

Party of 50 proceeded by the train at 6.30 a.m. by Perth and Dundee Railway to Dunfermline. Arrived about 9 and breakfasted at the Royal Hotel for 1s. a head. Return tickets, 1s. 9d.

Dr. James Dewar met the party and gave directions as to route. About 6 or 8 were too late for the train and joined the party in the after part of the day. Walked north from Dunfermline to Lochend, where *Meum athamanticum* grew, then struck off to the left by a farm-house to a pond, where we found :—

Nuphar luteum
Hippuris vulgaris
Cicuta virosa
Potamogeton natans
„ lanceolatus
Potamogeton crispus
Scirpus Tabernæmontani
Carex teretiuscula
„ curta

Nymphæa alba is also said to grow here.

Then walked through a wet mountain country towards Knock, gathering on the way :—

Vaccinium Oxycoccus
Salix repens
Carex pauciflora
„ irrigua

Went over the eastern part of Knock Hill, where grew :—

Viola lutea (yellow and blue)
Sedum villosum
Antennaria dioica
Trientalis europæa
Botrychium Lunaria

Went to banks of Black Devon and gathered :—

Rubus saxatilis
Epilobium angustifolium (not in flower)
Tanacetum vulgare
Hieracium prenanthoides (not in flower)
Polygonum viviparum
Gymnadenia conopsea
„ albida
Habenaria bifolia
Serrafalcus commutatus

On banks there are also found :—

Pyrola rotundifolia
Pyrola media

Near Knock :—

Trollius europæus (picked in large quantity in several places)
Saxifraga tridactylites

Returned by the eastern (middle) Saline Hill, gathering :—

Allosorus crispus (on its western side)
Botrychium Lunaria
Lycopodium Selago

Came across the country direct to Dunfermline. Picked :— *Lepidium Smithii* on hill where *Asplenium alternifolium* is said to have been found. Dr. Dewar sent *Botrychium Lunaria* and *Genista anglica* from Torryburn.

St Boswells, Dryburgh Abbey, Bemersyde, Gladswood, Eildon Hills, Melrose.

Saturday, 26th June 1852.

Party of about 100 met at the North British Railway Station at 7.45 and proceeded by train to St. Boswells. Return fare to St. Boswells and back from Melrose, third class, 3s. After reaching St. Boswells proceeded to Dryburgh Abbey, crossing the ferry ; 1d. paid at ferry and 3d. to enter Dryburgh. After visiting the ruins, walked along banks of Tweed by Bemersyde and Gladswood as far as the bridge near Melrose. Crossed the bridge and visited the Eildon Hills, then visited the Abbey at Melrose, and returned to Edinburgh by the train at 6.15 p.m.

The following are some of the plants gathered :—

Gladswood :—

Thalictrum minus
Berberis vulgaris
Arabis hirsuta
Viola hirta
Malva moschata
Tilia grandifolia
Geranium sanguineum
„ nodosum
„ sylvaticum
„ lucidum
Euonymus europæus
Vicia sylvatica
Prunus communis
Pyrus Aria
Cornus sanguinea
Galium boreale
„ Mollugo
Galium pusillum
Solidago Virgaurea
Centaurea nigra
Vinca minor
Origanum vulgare
Mentha viridis
Betula alba
Salix fragilis
„ alba
Populus alba
„ tremula
Carex sylvatica
Melica nutans
„ uniflora
Juniperus communis
Asplenium Adiantum-nigrum
„ Trichomanes

Dryburgh :—

Aquilegia vulgaris
Staphylea pinnata
Ononis arvensis
Potentilla reptans
Pyrus communis
Ligustrum vulgare
Polemonium cæruleum
Verbascum Thapsus
Lilium Martagon

Banks of Tweed, near Dryburgh :—

Ranunculus aquatilis
Symphytum officinale
Linaria vulgaris
Mentha viridis

Near Dryburgh :—

Clematis Vitalba
Rosa spinosissima
„ tomentosa
„ rubiginosa
„ canina
Anthemis arvensis
Plantago media
Salix cinerea, var. aquatica
Scirpus sylvaticus

Bemersyde :—

Meconopsis cambrica
Doronicum Pardalianches
Mentha viridis
Buxus sempervirens
Polystichum aculeatum
Lastrea Filix-mas, var. incisa

Near Melrose :—

Lepidium Smithii
Anthemis arvensis

Eildon Hills :—

Sinapis alba (fields near)
Antennaria dioica
Listera cordata
Allosorus crispus
Lycopodium Selago

Melrose Abbey :—

Asplenium Ruta-muraria

Burntisland, Aberdour, Donibristle, St. Davids, Inverkeithing, North Queensferry.

Saturday, 3rd July 1852.

Party of about 50 met at Granton at 10 and proceeded to Burntisland. Dr. Christison and Dr. James Simpson were in the

boat. Walked by the shore to Starly Burn and Aberdour. Entered Donibristle gate (permission given), visited the garden, and then proceeded to St. Davids, Inverkeithing, and Queensferry, meeting the steamboat there at 6.30 p.m. Expenses, 2s. 6d. Amongst plants collected were :—

At Donibristle :—

Thalictrum minus
,, majus
Sagina subulata
Medicago maculata
Dipsacus sylvestris
Allium Scorodoprasum

At North Queensferry :—

Thalictrum minus
,, majus
Astragalus Glyciphyllos
Spiræa Filipendula

At St. Davids :—

Reseda lutea
Geranium pyrenaicum
Melilotus officinalis
Spiræa Filipendula
Potentilla reptans
Haloscias scoticum
Matricaria Chamomilla (field near)
Arundo epigejos

At Inverkeithing :—

Saponaria officinalis
Spiræa Filipendula
Haloscias scoticum
Sambucus Ebulus
Suæda maritima
Sclerochloa maritima
,, distans

In Aberdour Woods :—

Circæa lutetiana
Rumex viridis

At Aberdour :—

Lepigonum marinum
Solanum Dulcamara
Blysmus rufus
Carex distans
,, extensa

At Burntisland :—

Sagina maritima
Sclerochloa maritima
Sclerochloa loliacea

Beattock, Garpol Linn, Beld Crag.

Saturday, 10*th July* 1852.

Party of about 40 met at the Caledonian Railway Station at 7.30 a.m. and proceeded by train at 7.45 to Beattock. Return tickets, including the returning by the express train at night, 4s. (Some went by cheaper train for 2s. 6d., returning at 4.28 by another cheap train.)

At Beattock Station met the Rev. Mr. Little of Kirkpatrick Juxta, who directed us on our way and accompanied us to the Garpol Linn, where we got many good plants. Then we walked across the country to the Beld Crag, a rich locality. On our way back to the station visited the Manse garden, where many good alpines are cultivated by Mr. Little.

Reached the station about 6.45 p.m. in time for tea, and returned by express train at 7.44, reaching Edinburgh at 9.30.

List of the plants got :—

Garpol Linn :—

Aquilegia vulgaris
Rubus carpinifolius
„ saxatilis
Vaccinium Oxycoccus (near)
Gymnadenia conopsea (near)
„ albida (near)
Hymenophyllum Wilsoni
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris

At Beld Crag :—

Pyrola secunda
Carex sylvatica
Holcus mollis
Asplenium viride

Near Beattock :—

Lepigonum rubrum
Genista tinctoria
Spiræa salicifolia
Jasione montana
Ligustrum vulgare
Rumex aquaticus
Potamogeton oblongus
Carex pallescens
„ lævigata
„ fulva
Ophioglossum vulgatum
Lycopodium clavatum

Near Beld Crag :—

Hypericum humifusum
Veronica scutellata
Veronica Anagallis
Allosorus crispus

Mr. Little gave us a specimen of *Woodsia ilvensis* from the hills near Moffat.

North Berwick, Canty Bay, Bass, Tantallon Castle, Dirleton.

Saturday, 17*th July* 1852.

Party of 46 met at North British Railway Station at 8 a.m. and proceeded by train to North Berwick. Return tickets, 2s. From North Berwick walked by Canty Bay. Some (about 34) went to the Bass in G. Adam's boats. Twelve went to Tantallon Castle and walked by the shore and common to Dirleton, where the whole party met about 5.30 p.m. Returned by train at 6.23 p.m.

Some of the plants gathered were :—

At North Berwick :—

Thalictrum minus
Papaver Argemone
Eryngium maritimum
Helosciadium repens
Carduus Marianus
Leontodon lævigatus
Thrincia hirta (common)
Anagallis tenella
Listera ovata
Habenaria viridis
Phleum nodosum
Triticum repens
„ laxum
„ junceum
Equisetum palustre, var. procumbens
Equisetum variegatum

At and near Canty Bay :—

Silene noctiflora
Scabiosa Columbaria
Tragopogon minor
Hyoscyamus niger

At and near Tantallon :—

Lepidium latifolium
Sempervivum tectorum

Dirleton :—

Fumaria micrantha (near)
Reseda lutea
Cerastium arvense
Galium Mollugo
Centaurea Scabiosa
Lamium intermedium

At Dirleton Castle :—

Sedum album	Smyrnium Olusatrum
„ reflexum	Centranthus ruber

Dirleton Common :—

Alyssum calycinum	Calamintha Acinos
Silene conica	

On the Bass :—

Lavatera arborea	Beta maritima

Arran, Largs, Wemyss Bay.

Thursday, 22nd July 1852.

Party consisting of J. H. Balfour, Andrew Beatson Bell, George C. Bell, James N. Bennie, James S. Beveridge, George S. Blackie, William B. Boyd, James T. Brown, William Bryce, Philip Cockold, Alex. Cowan, Alex. Fraser, James Gardner, Frederick Gourlay, Alex. Johnston, W. Keddie, Chris. Kerr, junior, John Locking, James M'Allum, James M. Gregor, Valentine M. M'Master, James Alex. Menzies, Charles Popham Miles, Robert Osborne, James Peddie, junior, David Ross, John Ross, Robert Sharpe, Alex. R. Simpson, John Spittal, Robert L. Stuart, James G. Surenne, J. Sutherland, William B. Turner, E. W. Wakefield, George H. Wakefield, John E. Wakefield, Arch. Young, James Young, proceeded by train at 11 a.m. on Thursday, 22nd (after lecture), to Glasgow, third class. Return tickets, allowing party to return on Saturday or Monday, 5s.

Arrived at Glasgow at one, saw model of Arran in Andersonian. Joined boat at Broomielaw at two, along with Mr. Miles, Keddie, and Jardine. Mr. Connal had a cart waiting for the baggage. Evening fine. Reached Brodick about 8 p.m.

Some difficulty in getting beds, Mrs. Jamieson had been previously written to on the subject. She secured beds in various farm-houses and cottages. Walked along shore to Invercloy in the evening, picking *Brassica monensis*, *Mertensia maritima*, *Triticum laxum*.

Friday, 23rd July 1852.

Breakfasted before 7 a.m. and then started about 7.45 a.m. for Goatfell ; reached the top about 11, gathering:—

Radiola Millegrana
Alchemilla alpina
Saxifraga stellaris
Drosera anglica
Sedum Rhodiola
Oxyria reniformis
Carex rigida
Lycopodium Selago
„ alpinum
„ selaginoides
Batrachospermum vagum
Conferva alpina (below mountain)

Numerous lichens for analysis by Dr. George Wilson were picked.

Descended by a very steep descent into Glen Sannox. Walked to the shore. Gathered :—

Drosera anglica
Rhynchospora alba

Also caught a viper. Bathed at Sannox and walked by shore to Corrie, visited lime-quarries, interesting from quantity of *Productus*, then proceeded by the shore to Brodick, which was reached about 7.30 p.m.

Other plants gathered were :—

Sagina apetala
Hypericum Androsæmum
„ humifusum
Parnassia palustris
Cotyledon Umbilicus
Sedum anglicum
Lythrum Salicaria
Circæa alpina
Œnanthe Lachenalii
Pastinaca sativa (near Corrie)
Petroselinum sativum (near Corrie)
Solidago Virgaurea
Anagallis tenella
Samolus Valerandi
Erythræa Centaurium
Erythræa linarifolia
Lycopus europæus
Scutellaria galericulata
Stachys palustris
„ ambigua
Mentha sylvestris, var. velutina (near Brodick)
Atriplex Babingtonii
Juncus maritimus
„ supinus
Scolopendrium vulgare
Cystopteris fragilis
Lastrea Foenisecii
Polypodium Dryopteris
„ Phegopteris
Osmunda regalis

Saturday, 24th July 1852.

Party left Brodick by steamboat at 6.30 a.m., reached Largs about 8.30. Dr. Greville met the party. Several went on to Glasgow and to other places on the Clyde. Thirty sat down along with Dr. G. in the Brisbane Arms to breakfast. Mr. Cunningham had kindly provided breakfast for the whole party.

After breakfast the party walked by the shore to Wemyss Bay, gathering on the road the following specimens :—

Lepidium Smithii
Raphanus maritimus
Lepigonum marinum
Hypericum dubium
„ maculatum
Malva moschata
Spiræa salicifolia
Cotyledon Umbilicus (abundant at Wemyss Bay)
Sedum anglicum
Lythrum Salicaria
Carum verticillatum
Aster Tripolium
Anagallis tenella
Samolus Valerandi
Erythræa linarifolia
Mertensia maritima
Scutellaria galericulata
Beta maritima
Suæda maritima
Hippophaë rhamnoides
Scirpus pauciflorus
Blysmus compressus
„ rufus
Rhynchospora alba
Carex extensa
Triticum repens
„ laxum
„ junceum
Asplenium marinum (Wemyss Bay)
Scolopendrium vulgare
Osmunda regalis
Ceramium rubrum (various states)
Desmarestia aculeata
Fucus ceranoides (fine specimen)

On reaching Wemyss Bay, party went on board the steamboat and reached Glasgow about 6.30 p.m. Visited college, cathedral, and cemetery, and after getting tea went by train at 8.30 p.m. to Edinburgh.

Ireland.

Friday, 6th August 1852.

A party consisting of J. H. Balfour, John Sutherland, Philip Cockell, Alexander Cowan, P. Neill Fraser, William John

Menzies, D. C. M'Callum, John Sibbald, left Edinburgh this day by the train at 11 for Glasgow, provided with boxes, boards, and paper, and all the apparatus required for a botanical excursion.

Reached Glasgow about one and proceeded to the Broomielaw to join the Dublin steamboat the "Herald," found that the boat had sailed and that they must join it at Greenock, sailed by Arran boat at 2 p.m., met Middleton and Alston and Hussey on board, landed at Greenock about four and got berths on board the "Herald," which sailed at 5.20. Had a good passage in the evening, but when opposite Ailsa Craig a squall came on with rain, and there was a good deal of pitching during the night. Lord and Lady Gough were on board.

Saturday, 7th August 1852.

The wind continued strong this morning, and very few of the party breakfasted on board. We reached Dublin about 9 a.m. and proceeded to the Gresham, where most of us breakfasted. Dr. Mackay called after breakfast and kindly accompanied us to Trinity College; saw the buildings, chapel, dining hall, and then went to the museum, where we met Dr. Robert Ball and Professor Allman. The museum does great credit to Ball's exertions. He gave me hints as to a plan of fastening bottles—viz., to fit a rim of indiarubber, such as that used for letters, to the mouth of the jar, and then put a round piece of glass above it so as to close the mouth, and to hold this firm by means of a bit of brass curved in the centre and worked into the rim on each side. Several preparations were shown well preserved in this way. Visited Ball's fernery at 3 Grange Road, saw many excellent ferns growing well. He gave a suggestion as to the mode of making diagrams and tables, by using oil paint (such as that contained in tin-tubes) with common naphtha (6d. or 1s. per gallon), and lay it on the paper with a brush; the mixture dries soon.

From Ball's proceeded with Dr. Mackay to Glasnevin Garden and visited the houses. Mr. Niven was unfortunately absent. During our visit a thunderstorm came on and we were detained long in the houses. The houses are new and well constructed and contain many good plants. Noticed particularly

the mode of growing bananas in the earth of the house in clusters. It gives a more tropical aspect and shows the habit of the plant. *Cycnoches Loddigesii* was in flower. *Victoria* grown in a small tank, not sufficient to enable it to flower. Fine specimen of *Banksia* in flower. Examined some *Triticum*, one of which seemed to be *Triticum laxum*. After seeing Glasnevin, went down to the College Botanic Garden and saw a number of excellent plants, a fine specimen of *Dracæna Draco*, some good orchids, many interesting plants in the open air. Afterwards went to the hotel with Dr. Mackay, who dined with the party.

Visited various parts of Dublin in the evening and returned to tea.

Monday, 9th August 1852.

At 6.30 a.m. we walked to the Zoological Gardens at Phœnix Park, and saw the collection of animals, which is by no means extensive. Afterwards drove round the whole of the Phœnix Park, and had a fine view of Wicklow Court from the road near the Hibernian School for Soldiers.

Gathered *Linum angustifolium* and *Fœniculum vulgare* in abundance. Breakfasted at 9 at the hotel and then joined the train for Howth at 9.45, accompanied by Professor Allman. Met Dr. Mackay and Mr. Bain at Howth, walked by the rocks to the lighthouse and then to Baldoyle, where Dr. Mackay gave us lunch.

At Howth the plants gathered were :—

Erodium moschatum
„ maritimum
Ulex nanus
Eryngium maritimum
Sium nodiflorum
Crithmum maritimum
Inula dysenterica
Carlina vulgaris
Statice occidentalis
Erythræa littoralis
Beta maritima
Obione portulacoides
Euphorbia Paralias

Many of the plants are those found round Edinburgh, such as:—

Malva sylvestris
„ rotundifolia
Echium vulgare
Salvia Verbenaca

From Baldoyle we sailed across the tongue of sea to Portmarnock, wading a good part of the way.

Plants :—

Convolvulus Soldanella	Orchis pyramidalis
Euphorbia Paralias (abundant)	

Walked to Malahide, where we arrived about 7 p.m. Dined with Ball and returned by the train at 9.38.

Tuesday, 10*th August* 1852.

Breakfasted with Dr. Mackay at 8 and left at 9 in two cars for Bray, accompanied by Professor Allman, Dr. Mackay, and Mr. Bain. Visited the Dargle, gathering cut-leaved variety of *Polypodium vulgare*, also *Hymenophyllum Wilsoni*. Then proceeded to Powerscourt Waterfall, where I gathered *Lastrea Foenisecii*, and *Hymenophyllum Wilsoni*. Dr. Mackay provided lunch, which was taken under the trees during a thunderstorm. After the storm the weather cleared, and we returned to Dublin by the beautiful village of Enniskerry and by the Scalp. Near Enniskerry grow :—

Inula dysenterica	Epipactis palustris
Origanum vulgare	Ophrys apifera
Malaxis paludosa	Scirpus Savii

Took tea with Professor Allman. He noticed a peculiar fact as to the proboscis of the fly sticking among the stamens of *Apocynum androsæmifolium*; the flower thus acting as a fly-catcher, the animal dies. The hygroscopicity of *Carlina vulgaris* was also noticed.

Wednesday, 11*th August* 1852.

Breakfasted at 6 and left by train at 7 a.m. for Cork, which was reached about 2.30. Visited the Exhibition at Cork, which is upon the whole creditable. Then went to Queen's College, visited the halls and museum.

Gathered *Ceterach officinarum* on the walls near the college, along with it were :—

Asplenium Adiantum-nigrum	Scolopendrium vulgare
,, Trichomanes	Polypodium vulgare
,, Ruta-muraria	

Visited different parts of Cork. Called on Dr. J. R. Harvey, who had known me in Edinburgh at the Plinian Society, got directions as to my route, also received a copy of the work on the famous Flora of Cork. Mr. Sibbald joined the party this evening.

Thursday, 12th August 1852.

Dr. Sutherland and I walked to Sommers Town about 6.30 a.m. to see a famous cork tree. The tree is of large dimensions and of great age. It is in an orchard belonging to a Mr. Jeffreys.

In a loch near Sommers Town saw *Œnanthe fistulosa, Bidens cernua, and Typha latifolia.* On roadside *Senebiera didyma.* On walls at Cork *Senecio squalidus.* On wall near Sommers Town *Ceterach officinarum.*

Breakfasted at Cork at 9 a.m., and proceeded by steamboat at 10 to Queenstown. Walked along shore to point opposite Monkstown, gathering :—

Sinapis nigra	Dipsacus sylvestris
Fœniculum vulgare (abundant)	Antirrhinum Orontium
	Euphorbia portlandica

Crossed to Monkstown; behind it there was abundance of *Petasites fragrans*, quite wild in its situation by a roadside. Walked from Monkstown to Passage, where the party had lunch. Then went by rail to Blackrock. From Blackrock crossed to Glanmire Glen, walked along the banks of the Glanmire Burn. On wall near the sea there was abundance of a peculiar *Hypericum* which seems new. On the walls also there was profusion of *Ceterach officinarum.* On the stones by water *Apium graveolens.* From Glanmire walked to Riverstown. Examined banks of water where *Trichomanes* was said to be found. From Riverstown to Cork in the evening.

Friday, 13th August 1852.

At 6 a.m. left Cork by railway for Bandon ; there we called on Professor Allman, who kindly visited some localities with us.

We gathered :—

Hypericum elodes	Pinguicula lusitanica
Linaria repens (on banks of Bandon Water)	Scutellaria galericulata
Pinguicula grandiflora (introduced)	„ minor

After breakfast (the chief hotel is French's) went by coach to Bantry and then walked partly by the shore to Glengariff, which was reached about 8.30 p.m. The inns were all crowded; we went to Rorke's Hotel but could not be accommodated with beds; slept on the floor of a farm-house near the inn. Picked on the way *Calamintha officinalis*. Glengariff is beautifully situated, and requires a residence of a day or two to see its beauties.

Saturday, 14*th August* 1852.

At 6 a.m. went to bathe in Bantry Bay, and gathered in the woods :—

Saxifraga umbrosa	Hymenophyllum tunbridgense
Euphorbia hiberna	

After breakfast the party went in a car to Kenmare, sent baggage by a separate car, passed along a curious road through tunnels, saw *Euphorbia hiberna* and *Saxifraga umbrosa* in abundance.

After reaching Kenmare the party divided in two. Dr. Sutherland, Mr. Cockell, Professor Allman, and Mr. Shaw went in a car, while Messrs. Cowan, Menzies, Sibbald, and Balfour walked.

Numerous interesting plants were seen, especially :—

Saxifraga umbrosa	Lastrea Foenisecii
Hymenophyllum tunbridgense	Osmunda regalis

Visited Turk Waterfall and saw some splendid specimens of ferns. Reached Muckross Hotel about 7 p.m.

Monday, 16*th August* 1852.

This morning was very wet. In spite of it our party went in a two-horse car to the Gap of Dunloe, walked through the Gap, and visited the rocks in it.

Gathered :—

Nuphar luteum
Nymphæa alba
Saxifraga hirsuta
" serratifolia
Saxifraga umbrosa
Lobelia Dortmanna
Lastrea Foenisecii

Leaving the Gap, walked to the Upper Lake, where the four-oared boat was waiting for us.

On the way gathered :—

Ilex Aquifolium
Drosera longifolia
Hieracium prenanthoides
Euphorbia hiberna
Rhynchospora alba

Sailed through the Upper Lake and then through the Long Range, Eagles' Nest, passing Turk Mountain. Passed through the Rapids under the bridge near the Middle Lake. Landed and had lunch. Picked abundance of *Arbutus Unedo* in fruit. One of the prettiest scenes was in the space between the Upper and Middle Lake. A race took place between four of our party in one boat and five of another party in another. Our party, consisting of Balfour, Menzies, Allman, and Sibbald, with Dr. Sutherland as cockswain, beat the other.

Scotch reels and Irish jigs took place in the hall where we had lunch. Returned to the inn about 6 p.m.

Tuesday, 17*th August* 1852.

One of the boatmen having offered to show me a station for *Trichomanes brevisetum* I started at 5 a.m. and went with him to a burn on Turk Mountain beyond the fall. After passing through very wet and entangled ground, thickly beset with thorns, brambles, and hollies, to the no small detriment of clothes and person, we reached the spot. The weather, which had been lowering all morning, now broke up, and by the time I got to the inn there was promise of a fine day. Accordingly at

8.30 we started in a large car to visit M'Gillicuddy's Reeks; we reached the cottages near thé foot of the mountain about 12 and commenced our ascent, followed by guides of various kinds, none of whom were employed by us. On reaching a cottage on the ascent, milk and whisky were offered as usual. From the cottage several boys accompanied us, and were not a little astonished when, in place of taking the usual path, we diverged by the side of a rivulet, which we ascended, picked numerous specimens of *Saxifraga umbrosa* and its varieties, as well as *Saxifraga stellaris*. We ascended by peculiar ragged peaks of red sandstone until we reached the most north-easterly summit, where we had a fine view for a few minutes. Mist came on afterwards and we had only temporary glimpses of the scenery. All the party had followed me except Mr. Cockell, who went up by the beaten track. As the mist was now thick and there was some risk that Mr. Cockell might lose himself, I started with Mr. Menzies and a guide for the summit of Carran Tuohill, the highest point of the Reeks, and indeed the highest part in Ireland. The rest of the party descended under the guidance of a boy by a difficult ravine. Before getting to Carran Tuohill we saw Mr. Cockell attempting to come down by very dangerous cliffs, and we had some difficulty in directing him. After going to the top of Carran Tuohill and having a temporary glimpse towards the west and south, we descended by the usual trail to the bottom of the hill. On the way we gathered abundance of :—

Saxifraga hirta
" umbrosa
Solidago Virgaurea (very small)
Armeria maritima
Aira cæspitosa
" " vivipara and the alpine form
Cystopteris fragilis

On the summit :—

Sedum Rhodiola
Hymenophyllum Wilsoni
Asplenium viride

On the lower ground :—

Pinguicula lusitanica

Returned to the cottages at the foot of the hill about 6.30 and

had lunch, which was brought in the car. Did not get back to the inn till about 10 p.m. owing to the darkness of the night. From Killarney to Muckross the rain descended in torrents, and the road was so dark that the driver had to lead the horses.

Wednesday, 18th August 1852.

This morning about 5.30 a.m. with Messrs. Sutherland, Menzies, and Sibbald, I started for Mangerton, and as the hill was rather misty we took a guide with us. On getting near the summit the mist began to clear off, and ultimately the party had a fine view of the whole lake scenery. The view was heightened by the fleecy clouds floating below and the mist clearing off at different points. Visited the Punch Bowl, the Bachelor's Well, and the Horse Glen. Saw abundance of *Saxifraga umbrosa* in various states, and of *Pinguicula grandiflora*. Near the base gathered *Pimpinella majus, Verbena officinalis, Calamintha officinalis.*

On returning to the inn about 10 had breakfast. I went with Mr. Sprott to visit the Misses Horsley, while the rest of the party went to Ross Castle and Muckross Demesne. Some of them gathered abundance of *Orobanche.*

The Misses Horsley drove me to some stations for *Trichomanes,* one of which was that shown to me by the boatman. Along with it was *Saxifraga Geum.* The stations were on Turk Mountain. Almost all the streams coming from that mountain have *Trichomanes* on their banks. The fern grows in dark, shady places under the drip of water. The stations are difficult of access owing to the prevalence of brambles, and both Mr. Sprott and I suffered in the cause. It was astonishing, however, to see the enthusiasm with which Miss Horsley mastered all difficulties, and, in spite of wet, streams, brambles, hollies, and thorns, pointed out about five stations for the fern. The Misses Horsley are great collectors of ferns, and are anxious to get some of the rarer Scottish species, which were of course promised by me. After leaving the mountain we proceeded on the car to Ross Castle, where there is a fine view, then sailed across to Ross Island and saw great profusion of *Lastrea Thelypteris,* barren and fertile fronds.

From Ross Island sailed to Innisfallen and saw the remains of the old monastery, as well as several spots famous in story. The

herbage of the island is very nutritious, and it is said that sheep fatten very rapidly ; they are only kept on it for six weeks at a time. After walking round the island we sailed for O'Sullivan's Waterfall, a very pretty one in a deep rocky chasm surrounded by ferns of all kinds. *Lastrea Foenisecii* was here, as in all other parts of Killarney, abundant. *Hymenophyllum tunbridgense* was also very luxuriant on the rocks. Found the character of the dark rhizome of *Lastrea Foenisecii* on making a longitudinal section to hold good, thus this plant seems to be distinguished from *L. dilatata.* From the waterfall sailed by Glena to the cottages of Lady Kenmare, which we visited, then sailed on to the point where the waters meet, near Dinish Cottage. Entered the Middle Lake, visited the Wine Cellars or hollowed caves under the limestone rocks, landed at Jack-a-Boys Bay, so called from the appearance of a rock like a boy in the bay. Near the bay, on marshy ground leading to the Muckross Offices, picked :—

Athyrium Filix-fœmina	Lastrea Thelypteris
,, irriguum	Osmunda regalis
Scolopendrium vulgare	

The last mentioned is the common fern here, and is particularly beautiful near the Meeting of the Waters below the Rapids and the Middle Lake.

Near Jack-a-Boys Bay saw :—

Euonymus europæus	Rhamnus Frangula

Landed at Mr. Herbert's Pier and walked by the Muckross Manor and its pretty garden to the Abbey. Muckross Manor is prettily situated on a small eminence commanding a fine view of the Lower and Middle Lakes. The Abbey is very beautiful and tolerably perfect. In it there is an old yew growing. Reached the hotel about 6.30 p.m. to dinner, and was occupied in arranging plants till near 12 p.m.

Thursday, 19*th August* 1852.

After settling Muckross Hotel bill, which was tolerably moderate, we started at 6.30 a.m. for Killarney. Took our seats on the coach to Tralee. Mr. Sprott and Mr. Cockell accompanied us to that place. Mr. Fraser was left at Muckross to go

to Dublin by Mallow. The coach was crowded with passengers and luggage. We had secured tickets for 11s. 6d. each, which took us to Tralee, Dingle, Tarbert and Limerick. Mr. Gallacher kindly granted us this favour. Got to Tralee to breakfast, and, leaving most of our heavy baggage there, proceeded by a car to Dingle by Connor Hill. The road over the hill is a remarkable one; it rises to a great height, not less than 1500 feet above level of sea, and crosses the summit of the mountains. We had to walk a great part of the way. Gathered numerous specimens of *Saxifraga umbrosa*, *S. hirsuta*, *S. stellaris*.

Reached Dingle about 4 p.m. and bathed in the bay. Were comfortably accommodated at Petrie's Hotel. Mr. P. is a Scotchman and was glad to welcome his fellow-countrymen. Charges were moderate.

Friday, 20th August 1852.

After bathing and breakfast left in two cars for the foot of Brandon Mountain. Reached some miserable cottages at the foot of the hill, where we procured a guide, as the mountain-top was covered with mist. The mountain is easily ascended in an hour and a half. We had a good view on the way up, seeing Blasquet Islands, Skellig Rocks, Valentia, Kerry Head, the Atlantic, &c. On the top, however, mist prevailed, and we had no view. We gathered abundance of:—

Ranunculus acris (alpine form)	Saxifraga umbrosa
Saxifraga affinis	Sedum Rhodiola
„ hirta	Cystopteris fragilis
	Polystichum Lonchitis

Waited in vain for a clear view. Descended and drove to the rocks near Ballinahow, where there is a lead mine. Rocks fine. Peculiar rocky bay, where the boats of the fishermen are kept. Proceeded along the shore of Smerwick harbour, where the ship "Ben Nevis" was wrecked last Christmas. Saw the tower of Ballidavid, old castle called Galerus, and an ancient oratory said to be the most perfect in Ireland; the stones were placed so as to form a gothic arch, but it was not built on the principle of the arch. Near Smerwick harbour gathered abundance of *Althæa officinalis*. After lunch started by our car about 7 p.m. for

Tralee, going by the old road which avoids Connor Hill. It was so dark that we did not pick *Sibthorpia*, which grows along the road. Reached Tralee about 11 p.m. after a long and tiresome drive. The road winds in a remarkable way, and is by no means safe in a dark night; it goes along the edges of many very steep banks, and the turns are often very rapid. The whole county of Kerry abounds in *Cotyledon*.

Saturday, 21st August 1852.

Left Tralee at 11 a.m., partly by coach and partly by car. Passed through a bleak, peaty, and uncultivated country to Listowel. Near Listowel there is a fine property of the Knight of Kerry (Fitzgerald). There is also one belonging to a Mr. Palmer called Banmore, which might be made very productive and beautiful.

The fine river of the Fale passes Listowel, and we crossed it by a good bridge. At Listowel the car party got a new car and proceeded to Tarbert, where we had lunch, thence coach and car. Went to the moveable pier which conveys the passengers to a moored pier, whence they embark on board the steamers on the Shannon. The Shannon is a noble expanse of water below Limerick, but its banks are very tame and uninteresting. It does not exhibit the beautiful scenery of the Clyde.

We reached Limerick about 8 p.m. and took up our quarters in Cruise's Hotel, Grey Street.

Monday, 23rd August 1852.

At 6 a.m. party of five went by coach to Killaloe, distant 12 Irish miles from Limerick. Mr. Sibbald left the party here and returned home. Our drive was through an undulated country, and the roads were often steep and the turns sharp so that we were nearly overturned by our bad driver. Some of the baggage was shaken off, while we escaped. Another car which started at the same time with us and which was driven equally badly broke down at Ballina Lodge, so that we had to wait some time for the passengers and baggage at Killaloe. Went on board the steam-boat on the Shannon and sailed about 9. The scenery on this upper part of the Shannon, and especially of Lough Derg, is

interesting, and much less tame than that of the lower Shannon. We enjoyed our sail much. On board I met an old classfellow, Archibald Cockburn, from 60 Mark Lane, London; there was also Dr. Forbes and his brother. At Shannon harbour canal crosses to Ballinasloe. Shannon Bridge is a well fortified place; numerous troops are landed there. Near it are curious ruins of round towers and churches. One of the towers is very perfect.

Reached Athlone about 5 p.m. Here Mr. Sutherland and Mr. M'Allum left for Dublin by train at 6.3 p.m. Mr. Cowan, Mr. Menzies, and self dined at Haire's Hotel, along with Dr. Forbes and his brother (Rourke's Hotel seems to be the best and cleanest). Visited fortifications of Athlone before dinner. There is a beautiful railway bridge here.

Left Athlone by train at 10.22 p.m. for Galway and took up our quarters at the Railway Hotel at 12.30. This hotel is on a splendid scale and has just been opened. During the cattle show at Galway on the 20th it was opened and received the Lord Lieutenant and the visitors.

Tuesday, 24th August 1852.

This morning visited part of Galway. Went to Queen's College and heard that Dr. Melville was gone on a yacht to the island of Aran, and that another boat was about to follow him containing Mr. Bilston, the Curator. We accordingly, with Mr. Bilston's permission, embarked on board this boat with certain part of our baggage and sailed down Galway Bay. The wind was rather adverse, but by tacking we got down about 20 or 25 miles; after this the wind lulled and we were unable to make Aran, accordingly we proceeded, partly by sailing and partly by rowing, to Cortello Bay, where we arrived about 8 p.m. and took up our quarters in a small hut, where we got potatoes and milk, as well as some tea and bread, which the boatman provided for us.

We contrived to pass the night tolerably well on beds provided for us, but we did not take off our clothes. The cottagers were very attentive and did all in their power to promote our comfort.

Wednesday, 25th August 1852.

As the wind was favourable and the day fine we started at 5 a.m. and proceeded to the boat, gathering on the way plants of *Dabeocia polifolia*. We sailed about 6. We hailed a fishing boat and got some crabs and lobsters, some of which we boiled on board. We also fished for mackerel and got about a dozen excellent fish, which served us for breakfast and dinner on the island. Landed at Kilronan, in the larger island of Aran, about 9 and went to the house of the boatman, Michael Gill, where we had breakfast. Afterwards proceeded with a guide called Pat Mullen to visit the island. It is a remarkable limestone island, literally paved with stone, with scanty vegetation here and there. Crevices between the rocks in which many good plants, especially ferns, grow. Walked towards the lighthouse and then went to a sandy bay, where we bathed in the Atlantic, crossed the island to visit splendid limestone cliffs, about 400 feet high, and the old fortification of Dunaengus. Limestone hollowed out in a remarkable way into caverns and deep pools. Visited the Seven Churches, the ruins of which are seen at a part about 6 miles from Kilronan. We had a fine view of County Clare, Galway Bay, Connemara, &c.

Plants gathered were :—

Cerastium arvense
Arenaria verna
Malva sylvestris
Geranium sanguineum
Ulex nanus
Poterium Sanguisorba
Saxifraga affinis? (in abundance on all the rocks)
Smyrnium Olusatrum
Haloscias scoticum
Torilis Anthriscus
„ nodosa
Asperula cynanchica
Senecio Jacobæa (without a ray)
Carlina vulgaris
Lycopus europæus
Marrubium vulgare
Plantago Coronopus (hairy var.)
Neottia spiralis (abundant on turfy and sandy soil)
Sesleria cærulea
Juniperus nana
Ceterach officinarum

Adiantum Capillus-Veneris
Asplenium marinum
„ Trichomanes
„ Ruta-muraria
Scolopendrium vulgare
Sambucus Ebulus

All these ferns were in profusion in the limestone crevices.

Ergot of rye was also abundant.

Returned about 7 p.m. and partook of hot dinner consisting of mackerel, bream, and rock fish.

Saw numerous patients, for whom I prescribed. Among the rest were the brother-in-law of our landlord, a person named Martin Hernan, and another, Michael Haharty.

Visited a cottage near the Seven Churches, where we had milk and potheen.

Thursday, 26th August 1852.

This morning was very fine, and we rose at 5 a.m., but as there was not a breath of wind we had to delay our journey by boat. After breakfast a breeze began to spring up, and we started about 8 a.m. with a fair wind for Roundstone, which we reached in $3\frac{1}{2}$ hours. The distance is about 20 miles. The breeze sprang up very quickly, and the Atlantic waves were rather high to be comfortable for bad sailors. The strength of the breeze kept the boat tolerably steady. On reaching Roundstone we proceeded to the inn kept by Mr. Macaulay, the postmaster, the father of Wm. M'Call, who died of cholera in 1849, and who did so much to promote our knowledge of Irish seaweeds; his name is constantly mentioned by Harvey in his Phycologia. The father has taken the name of Macaulay, which he says is his correct family name. He is a Scotchman by birth, and was delighted to see Mr. Menzies in his kilt. The old man was constantly speaking of the merits of his son, to whose memory he has erected a monument in the churchyard of the Presbyterian Chapel. He took us to see it.

We then walked over the gap in the hill behind Roundstone and gathered :—

Nymphæa alba	Eriocaulon septangulare
Erica mediterranea	

After lunch we went by car to Clifden, which we reached about 6.30 p.m. Mr. Macaulay accompanied us in the car about a mile to show us a station for *Erica Mackaii.* On the road to Clifden we passed abundance of this heath, and at Craggiemore, in marshy ground on the left-hand side of the road, and in hollow ground, we gathered *Erica ciliaris.*

We took up our quarters in Hart's Hotel, which does not, however, appear to be the best in Clifden. Kerr's Hotel seems to be the cleanest and most comfortable.

We were occupied all evening putting our plants in paper.

Friday, 27th August 1852.

After breakfast left by a private car for Kylemore, where we gathered abundance of *Dabeocia polifolia*, both pink and white. The scenery here reminded us much of Scotland. Kylemore Lough is like one of those in our Highlands. The hills around are worthy of examination. We then proceeded to Leenane, where there is a high hill deserving notice. Near Leenane we picked *Carduus pratensis.*

We then walked up the hill on the way to Maam, and after joining our car we reached the hotel about 2.30 p.m. After bathing in the river, and lunching at Mr. Rourke's inn, we proceeded by the mail car to the point where we join the car for Clifden, and we reached Galway about 8.30 p.m., passing through Oughterard. Mr. Rourke at Maam is an amusing man, and occupied our attention during lunch by tales of Irish and other botanists who had visited his hotel.

We took up our quarters in the Railway Hotel, Galway. Met there Lord Oranmore, who seemed to be much interested in our account of our trip.

Saturday, 28th August 1852.

This day was the last botanising day of the party. After breakfast we visited Queen's College, and then proceeded to the shore of Lough Corrib. Our time was very limited, as we had to start for Dublin in the afternoon. Hence we were not able to reach the station for *Rhynchospora fusca* and *Eriocaulon septangulare.*

We gathered :—

Nasturtium palustre	Nepeta Cataria
Bidens cernua	Alisma ranunculoides
„ tripartita	Ceterach officinarum

along with numerous other ferns in the limestone rocks. A canal is being made, and communication between Lough Corrib and Galway is being fully opened up for vessels.

At 4 p.m. we left by train for Dublin and arrived at Anderson's Hotel at 10.30 p.m. Here the botanical trip ended; the parties who remained to the last being — J. H. Balfour, Alexander Cowan, William John Menzies.

EXCURSIONS IN 1853.

Granton, Cramond, Craigcrook.

Saturday, 14*th May* 1853.

Party of about 100 met at Granton at 11 and walked by shore to Cramond, up the Almond. Returned by Craigcrook, and reached Edinburgh about 5.30 p.m. Return ticket 1s.

Ordinary sea-side plants, gathered :—

Cochlearia officinalis
Acer platanoides (plantations)
Vicia sativa
„ lathyroides (Cramond Island)
Potentilla verna
Armeria maritima
Primula vulgaris, var.
Symphytum officinale (not in flower)
Linaria Cymbalaria (Ravelston)
Euphorbia Lathyris (banks of Almond)
Convallaria multiflora (banks of Almond)
Equisetum limosum

Gorebridge, Arniston, Dalhousie.

Saturday, 21*st May* 1853.

Party of 128 met at North British Railway Station at 11 a.m. and proceeded to Gorebridge; walked to Arniston, and then by the banks of the water to Dalhousie and met train there at 7.31 p.m. Return ticket, 1s.

Plants gathered :—

Ranunculus auricomus
„ Ficaria
Aconitum Napellus
Stellaria nemorum
Prunus Avium
Chrysosplenium alternifolium
Adoxa Moschatellina
Asperula taurina
Doronicum plantagineum
Pulmonaria officinalis
Lathræa Squamaria
Neottia Nidus-avis (old spikes)
Arum maculatum
Scolopendrium vulgare
Equisetum Telmateia
Morchella esculenta

Specimen of stem of mountain ash, with twining honeysuckle much compressed.

Dysart, Ravenscraig Castle, Wemyss.

Saturday, 28th May 1853.

Party of 126 met at the Northern Railway Station at 9.45 a.m. and proceeded to Dysart. Walked to Ravenscraig Castle, and gathered :—

Pyrus Malus
Smyrnium Olusatrum
Salvia Verbenaca

Many sea-weeds along shore.

Entered woods at Dysart and walked through them.

Plants gathered :—

Aconitum Napellus
Berberis vulgaris
Geum agrimonioides (naturalised in woods)
Saxifraga Geum
„ umbrosa
„ granulata
Viburnum Lantana
Doronicum plantagineum
Symphytum tuberosum
Lamium maculatum
Convallaria majalis
Ruscus aculeatus
Ornithogalum umbellatum
Lilium Martagon

Saw fine Rhododendrons, particularly a new species, *R. salignum*, from Sikkim. Also saw *Fuchsia syringæflora.*

From Dysart walked by shore to Western and Eastern Wemyss amidst rain, which continued from 2.30 p.m. till evening.

Near Wemyss Castle, gathered :—

Lepidium latifolium
Humulus Lupulus

In caves at Wemyss :—

Asplenium marinum

North Queensferry, Inverkeithing, Donibristle, Aberdour, Burntisland.

Saturday, 4th June 1853.

Party of between 80 and 90 proceeded to Granton, went by steamboat to Queensferry—fares 4d. each, besides 2d. at Granton Pier. Landed at Queensferry for 3d. each.

Examined the Ferry hills on the eastern side.
Picked :—

Thlaspi arvense	Spiræa Filipendula (not in flower)
Vicia lutea	

Near Inverkeithing :—

Sagina maritima	Sedum villosum
Geranium sanguineum	Anthriscus vulgaris

From Inverkeithing walked to St. David's and gathered :—

Diplotaxis tenuifolia	Leonurus Cardiaca
Reseda lutea	

Entered Donibristle Woods, and were accompanied to the garden and grounds by Mr. Gavin and the under-keeper. Walked to Aberdour, picking :—

Viola hirta (in fruit)	Atropa Belladonna (not in flower)
Medicago maculata	Hyoscyamus niger
Dipsacus sylvestris	Listera ovata (not expanded)
Cynoglossum officinale	Allium Scorodoprasum

Passed through Aberdour woods to Burntisland.
At Burntisland, gathered :—

Salvia Verbenaca	Sclerochloa maritima
Parietaria officinalis	,, loliacea
Carex distans	

Returned by boat at 6.15.

Midcalder, Meadowbank, Dalmahoy, Ravelrig, Currie, Woodhall.

Saturday, 11*th June* 1853.

Morning very unpromising. A party of about 75 met at the Caledonian Railway Station at 7.45 a.m. and proceeded to Midcalder, thence walked to Meadowbank, Western Dalmahoy Hill, Ravelrig, Eastern Dalmahoy Hill, Currie, and Woodhall, and returned about 6 p.m. Return tickets 8d. The evening was so bad and the party so thoroughly drenched that the greater part walked home.

Plants gathered :—

Meconopsis cambrica
Hesperis matronalis
Viola palustris
,, canina
,, flavicornis
,, sylvatica
,, lutea
Geranium phæum
,, columbinum
Drosera rotundifolia
Pyrola minor (in bud)
Trientalis europæa
Myosotis palustris
Pinguicula vulgaris
Corallorrhiza innata
Listera cordata
Arum maculatum
Carex filiformis

Cockburnspath, Dunglass, Pease Dene.

Saturday, 18*th June* 1853.

Party of 84 met at the North British Railway Station at 8 a.m., and proceeded to Cockburnspath. Return tickets 2s. each. From Cockburnspath, after visiting the factor, Mr. Smith, proceeded to Dunglass woods and there gathered :—

Eranthis hyemalis
Berberis vulgaris
Cardamine amara
,, sylvatica
Alliaria officinalis
Hypericum calycinum
Geranium phæum
Chrysosplenium oppositifolium
,, alternifolium
Ribes alpinum
Viburnum Lantana
Ligustrum vulgare
Anchusa sempervirens
Veronica montana
Lamium Galeobdolon
Neottia Nidus-avis
Carex pendula
Equisetum Telmateia

Proceeded towards the shore, picking :—

Malva sylvestris
Potentilla reptans
Artemisia Absinthium

Walked along the shore to the opening of Pease Dene and gathered :—

Glaucium luteum
Haloscias scoticum
Hippophaë rhamnoides
Carex arenaria
Carex vulpina
Psamma arenaria
Triticum junceum
Equisetum Telmateia

Walked up Pease Dene to the bridge, picking :—

Geranium sylvaticum
Digitalis purpurea
Polystichum angulare

Returned by train, passing Cockburnspath at 6 p.m.

Kincardine, Tulliallan, Culross, Torryburn, Charleston.

Saturday, 25th June 1853.

Party of about 80 met at Granton Pier at 7 a.m. and proceeded by the Stirling boat to Kincardine. Fares, going and coming, 1s. Breakfasted at Dewar's Inn, then walked along the embankment, where good plants were gathered. Mr. Robert Carr picked *Hordeum maritimum*; this plant is in great quantity on the embankment. Mr. John Cunningham gathered *Hordeum pratense*, which is less abundant. *Festuca arundinacea* was very luxuriant, and a number of common grasses.

After leaving the embankment proceeded to station for *Osmunda regalis*, which was gathered partially in fruit.

On the shore there was abundance of *Scirpus maritimus* and *Aster Tripolium* (not in flower).

In woods at Tulliallan, Dr. James Dewar gathered *Corallorrhiza innata*; did not find *Paris quadrifolia*. Also picked *Pyrola minor*, *Aquilegia vulgaris*, *Rumex sanguineus*.

On the shore, between Kincardine and Culross, gathered :—

Ranunculus aquatilis
„ sceleratus (with fasciated stem)
Lepigonum marinum
Melilotus officinalis
Rosa tomentosa
„ canina
Myriophyllum spicatum
Hydrocotyle vulgaris
Apium graveolens
Helosciadium inundatum
Œnanthe crocata
Centranthus ruber
Aster Tripolium (with fasciated stem)
Matricaria Parthenium
Hypochæris glabra (Mr. Tate)
Vinca major
Lithospermum officinale
Echium vulgare (fasciated stem)
Solanum Dulcamara
Iris Pseudacorus
Sparganium ramosum
Glyceria aquatica
Carex intermedia
„ paniculata

In the woods at Torryburn :—

Epipactis latifolia
Orchids (various)
Holcus mollis
Ophioglossum vulgatum

At Torryburn, kindly entertained by Dr. Dewar.

Between Torryburn and Charleston :—

Papaver Rhœas
„ dubium
„ Argemone
Sinapis alba
Viola palustris
Saponaria officinalis
Lychnis Agrostemma
Malva sylvestris
„ rotundifolia
Geranium pratense
Melilotus leucantha (vulgaris)
Potentilla argentea (near Charleston)
Æthusa Cynapium
Valerianella dentata
Dipsacus sylvestris
Hieracium vulgatum
Erythræa Centaurium
Atropa Belladonna
Verbascum Thapsus
Atriplex littoralis
„ Babingtonii
Habenaria bifolia
„ chlorantha
Sclerochloa maritima
„ distans

Returned by boat from Charleston about 7 p.m. and reached Granton about 8.

Lanark, Cora Linn, Bonnington, Cartland Crags.

Saturday, 2nd July 1853.

Party of 140 met at the Caledonian Railway Station at 8 a.m. and proceeded to Lanark. Return tickets 2s.; pupils also allowed to return on Monday.

On reaching the station walked to Lanark, gathering on the way :—

Aconitum Napellus
Epilobium angustifolium
Carum Carui
Rumex aquaticus
Carex aquatilis ?
Equisetum palustre
„ limosum

Got five guides at the inn and went to Cora Linn and Bonnington.

Plants gathered were :—

Trollius europæus
Aquilegia vulgaris
Vicia Orobus
Orchis latifolia
„ maculata
Carex dioica
„ ulicaris
Carex disticha
„ paniculata
„ remota
„ glauca
„ sylvatica
„ binervis
„ fulva

Carex flava
„ ampullacea
Polystichum aculeatum
Polypodium Dryopteris
Polypodium Phegopteris
Equisetum arvense
„ umbrosum
„ sylvaticum

Near Cora Linn :—

Aquilegia vulgaris
Rubus saxatilis
Saxifraga oppositifolia
Circæa alpina
Asplenium viride

At Bonnington :—

Spiræa salicifolia
Humulus Lupulus
Poa nemoralis (and var. like Balfourii)

On the road from Lanark to station, returning :—

Antennaria dioica
Mimulus luteus
Gymnadenia conopsea
Habenaria chlorantha

Some of the party picked at Stonebyres :—

Solidago Virgaurea
Milium effusum

At Cartland Crags :—

Jasione montana

Returned by train at 3.45 and reached Edinburgh before 6 p.m.

North Berwick, Canty Bay, Bass, Tantallon, Dirleton.

Saturday, 9th July 1853.

Party of 80 or 85 met at the North British Railway Station and proceeded by the 8.10 a.m. train to North Berwick. Return tickets 2s. each.

On reaching North Berwick, walked by the shore to Canty Bay, gathering :—

Vicia sylvatica
Eryngium maritimum
Haloscias scoticum
Scabiosa Columbaria
Habenaria viridis
Alopecurus agrestis (in abundance near the station)

Visited the Bass in four boats provided by Adams (6d. each person).

Picked :—

Lavatera arborea	Beta maritima
Hyoscyamus niger	Narcissus biflorus

On returning some visited Tantallon and got :—

Lepidium latifolium	Silybum Marianum

Others went to Berwick Law, others walked by road to North Berwick, and picked :—

Silene noctiflora	Hippophaë rhamnoides
Convolvulus sepium (not in flower)	

Abundance of *Petasites fragrans* in a wood close to North Berwick. Afterwards went to the Common and walked by it to Dirleton.

Plants gathered were :—

Ayssum calycinum	Anagallis tenella
Reseda lutea	Cynoglossum officinale
Silene conica	Calamintha Acinos
Galium Mollugo	Equisetum variegatum
Thrincia hirta	

Between Dirleton and railway station :—

Fumaria parviflora

And near the station :—

Iberis amara	Anthemis Cotula

Returned by train, reaching Edinburgh at 7.45 p.m.

Overtown, Wishaw.

Saturday, 16th July 1853.

Party of 24 met at Caledonian Railway Station—day very wet—and proceeded to Overtown. Return ticket from Wishaw 2s. 6d.

On reaching Overtown the rain was falling very heavily, nevertheless the party visited the banks of Garrion Burn, which was much swollen. A number of ordinary plants were gathered. Ferns and grasses large and abundant.

From the Garrion Burn went to banks of Clyde.
Plants gathered were :—

Hypericum perforatum
„ hirsutum
Tilia grandifolia
„ parvifolia
Geranium sylvaticum
„ pratense
Epilobium angustifolium
Circæa lutetiana
„ alpina
Campanula latifolia
Scirpus sylvaticus

Followed banks of Clyde below Garrion Bridge, gathering :—

Origanum vulgare
Calamintha Clinopodium
Equisetum umbrosum (Mr. Ross)

Went to Wemyss Hill Farm and were hospitably entertained by Mr. Paterson, the farmer.
Returned by train, reaching Edinburgh at 5.30 p m.

Cumberland Lakes.

Thursday, 21st July 1853.

Party consisting of J. H. Balfour, Mohammed Badre, Thomas Barclay, Sheriff-Clerk of Fife, Claudius W. Bell, George C. Bell, George Birdwood, W. Weddel Bizzett, Patrick Blair, Frederick Cock, Philip Cockell, Francis Collins, Charles W. Cowan, Hugh Cowan, John Cowan, Emile W. Dubuc, William P. Falla, Robert Farquharson, Patrick Graham, M. A. Katib, Harold Hanson, Thomas Hardie, Wm. Henderson, T. H. James, C. Webster Kerr, James Landall, G. S. Lawson, George Lindsay, Frederick E. Martyn, John Matthews, Wm. John Menzies, David Milroy, William D. Murison, Albert C. Peggram, D. Pisani, Robert Pringle, William O. Roberts, David Ross, M. A. Soubki, Samuel Smith, James Tod, jun., J. B. Tuke, Walter Williamson, W. Blackburn Wood, James Young, left Edinburgh on Thursday, 21st July, by train at 12 noon, having received return tickets for Windermere for 15s. each. The party proceeded to Carlisle, which they reached about 4.18 p.m., then they went by train at 4.33 to Kendal Junction, where they met Mr. Wakefield, who regretted that his brother George could not accompany the party. At Kendal Ormskirk gingerbread had an extensive

sale among the party. On reaching Kendal there was a detention of more than half an hour, during which some of the party visited the town. Afterwards the party went to the Windermere station, where a cart, sent from Ambleside, was ready for the luggage. Some of the party walked, others rode, and others went by boat to Ambleside.

On the way there was gathered abundance of :—

Sanguisorba officinalis	Stachys Betonica
Lactuca muralis	

Reached Donaldson's Salutation Hotel about 10 p.m. Excellent arrangements made for the tea-dinner and for beds, so that all were well accommodated.

Friday, 22nd July 1853.

Some of the party were up this morning at 4.30 a.m. and visited Stock Gill. Fine waterfall.

The plants picked were :—

Impatiens Noli-me-tangere	Scolopendrium vulgare
Campanula latifolia	Polystichum aculeatum
Festuca sylvatica	Polypodium Dryopteris
Hymenophyllum Wilsoni	,, Phegopteris

The morning was misty and wet, the atmosphere being close and warm. After breakfast and paying the bill, amounting to 5s. 6d. each, 39 of the party started for Rydal. Six remained—Graham, Badre, Tuke, Roberts, Lawson, and Landall; they took boats, and resolved to come to Patterdale by coach.

The walking party proceeded to Rydal, picking on the way :—

Meconopsis cambrica	Sedum album
Tilia parvifolia	,, reflexum
Sedum Telephium	Sempervivum tectorum

Visited Rydal Waterfall and Rydal Mount, and gathered :—

Carpinus Betulus	Lastrea Oreopteris
Quercus sessiliflora	

and a variety of *Lastrea Filix-mas* with singularly contorted fronds.

In Rydal Lake :—

Nuphar luteum	Lobelia Dortmanna
Nymphæa alba	Potamogeton natans
Myriophyllum spicatum	,, oblongus

On banks of Rydal Lake :—

Berberis vulgaris
Hypericum Androsæmum
Lythrum Salicaria
Rhynchospora alba
Carex dioica
„ vesicaria

On the roadside :—

Staphylea pinnata
Parnassia palustris
Drosera rotundifolia
Anagallis tenella
Narthecium ossifragum

On the hills near Rydal :—

Sedum anglicum
Jasione montana
Allosorus crispus (the fern of the district)

Walked to Grasmere ; some visited Wordsworth's tomb. Near Dunmail Raise *Saxifraga umbrosa* was seen, and near by the burn *Solanum Dulcamara.* Reached Wythburn a little after 12 to lunch. Engaged a guide for 5s. to go to Helvellyn, as the hill was covered with mist.

On the way up the hill the following plants were gathered :—

Alchemilla alpina
Saxifraga stellaris
„ aizoides
„ hypnoides
Oxyria reniformis
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides

When a considerable height had been gained the party entered a thick cloud. It was cold and wet. When they reached the summit the cold was very intense.

The party prepared to descend, and had proceeded a short way down Swirrel Edge, when the mist suddenly began to clear away; nearly all of them again ascended to the summit. The mist gradually rose like a curtain, displaying hill after hill, until the whole became beautifully clear, with scarcely a cloud in the sky. The view was splendid, and for at least an hour the party enjoyed it. Scawfell, Bowfell, Borrowdale, Honister Crag, Skiddaw, Saddleback, Windermere, Coniston, Esthwaite, Morecambe Bay and its islands, the Solway, the hills of Northumberland, &c., were distinctly clear. It was truly splendid, and the guide said that he had very rarely seen such a view from Helvellyn.

The party next examined the rocks above the Red Tarn.

The following were some of the plants gathered :—

Anemone nemorosa
Cochlearia officinalis
Viola sylvatica
Cerastium alpinum
Malachium aquaticum
Alsine verna (Bizzet)
Rubus saxatilis
Alchemilla alpina
Saxifraga oppositifolia
,, nivalis (C. Cowan)
,, stellaris
,, aizoides
,, hypnoides
Sedum Rhodiola
Solidago Virgaurea
Saussurea alpina
Hieracium alpinum
,, Lawsoni (Soubki)
Vaccinium Vitis-Idæa
Armeria maritima
Veronica serpyllifolia
,, humifusa
Polygonum viviparum
Oxyria reniformis
Salix herbacea
Juniperus nana
Juncus triglumis
Carex rigida (on the summit)
Poa alpina
Festuca ovina vivipara
Polytrichum alpinum
Splachnum mnioides

Descended below Striding Edge in a fine evening to Patterdale, and were comfortably entertained at Guelderd's Hotel, where everything was ready for us in the way of tea-dinner and beds. Sir Walter and Lady Trevelyan were staying at the hotel. Visited the son of a Mr. Mortimer from Manchester, who was in delicate health, and prescribed for him.

The six who remained at Ambleside, finding that the day cleared up, had walked by Rydal and Grasmere and came over the lower part of Helvellyn, reaching Patterdale late in the evening. Mr. Soubki remained behind the party on Helvellyn and lost his way, but reached the inn late in the evening.

The evening was remarkably fine, and it was with difficulty that the party was induced to retire to rest.

Some continued boating and walking till 12 at night, others put their plants into paper.

Saturday, 23rd July 1853.

Breakfasted at Guelderd's Inn at 7 a.m., and after paying the bill, 6s. 2d. each, started for the shores of Ulleswater. Many took to boats, others to the coach, only 19 walked by Gowbarrow Park to Pooley Bridge and Penrith.

On the shores of Ulleswater the following plants were gathered :—

Thalictrum majus
Aquilegia vulgaris
Papaver somniferum
Hypericum perforatum
„ maculatum
„ humifusum
„ hirsutum
Geranium nodosum (near a cottage)
„ phæum
Genista tinctoria
Prunus Padus
Spiræa salicifolia
Sanguisorba officinalis
Circæa lutetiana
Galium boreale
Galium Mollugo (near Pooley Bridge)
Senecio aquaticus
Serratula tinctoria (near Pooley Bridge)
Hieracium boreale
Lactuca muralis
Jasione montana
Ligustrum vulgare
Linaria vulgaris
Mentha rotundifolia
Calamintha Clinopodium
Stachys Betonica
Quercus pedunculata
„ sessiliflora (at Gowbarrow Park)

The best plants were gathered between Gowbarrow Park and Pooley Bridge, within two miles from the latter place. In Ulleswater *Nymphæa alba* occurs. *Plantago media* was gathered abundantly after passing Pooley Bridge.

Between Pooley Bridge and Penrith:—

Malva moschata
Potentilla reptans
Galium Mollugo
Plantago media

Walked by Brougham Hall to the Round Table, and reached Penrith about 3 p.m.

At Penrith Castle *Diplotaxis tenuifolia* was picked.

Left Penrith by express train at 3.20, and reached Edinburgh at 7.15 p.m. Mr. Barclay, Mr. Menzies, and C. Cowan remained at Carlisle; Claud Bell at Carstairs. The weather during this trip was upon the whole good, and all seemed to enjoy the excursion.

Clova.

Thursday, 4th August 1853.

A party consisting of J. H. Balfour, Thomas Barclay, George Bayley, Alexander Cowan, Charles W. Cowan, E. W. Cropper, John G. Cunningham, James Gilchrist, William M. Ogilvie, Charles Jenner, M. A. Katib, G. Lawson, Mostapha Mostapha,

David Ross, M. A. Soubki, William B. Wood, Peter Young, left Edinburgh on Thursday, 4th August, at 6.30 a.m. by the Northern Railway, having taken second-class return tickets for Glammis at the fare of 9s. 2d. Proceeded by Perth to Glammis, and reached the latter place about 11.30 a.m., where Findlay's cart was waiting for the baggage. Rev. W. Balfour of Holyrood and Master Harry White met the party there and walked with them to Kirriemuir, where they had lunch in Robb's Commercial Inn. Walked thence to Cortachy and Clova, reaching the latter about 8 p.m.

On the way picked the following plants :—

Woods near Kirriemuir :—

Pyrola minor	Listera cordata
Trientalis europæa	

Roadside, Clova :—

Alchemilla alpina	Pyrola media
Saxifraga aizoides	Plantago maritima
Meum athamanticum	Polygonum viviparum

Were all accommodated in the inn and hall. Eleven slept in the hay in the hall, the rest at the inn.

Friday, 5*th August* 1853.

Mr. Bayley went to fish in the Esk, while the rest of the party, after bathing and breakfasting, crossed the Esk and walked past Ogilvy's House towards Glen Dole.

On the way gathered :—

Meum athamanticum	Tofieldia palustris
Carduus heterophyllus	Carex aquatilis (near the bridge)
Malaxis paludosa	
Gymnadenia albida	

Afterwards went towards Craig Rennet, at the foot of Glen Fee.

Gathered :—

Arctostaphylos Uva-ursi	Pyrola media

Cliffs on right side of Glen Fee yielded :—

Draba incana	Epilobium angustifolium
Oxytropis campestris	Woodsia ilvensis
Saxifraga nivalis	

Crossed from these cliffs to opposite side and gathered abundance of:—

Polypodium alpestre

At the upper part of Glen Fee:—

Thalictrum alpinum
Silene acaulis
Sibbaldia procumbens
Saxifraga oppositifolia
Epilobium alsinifolium
Gnaphalium supinum
Veronica alpina
Salix Myrsinites
Salix arbutifolia
Carex Vahlii
„ atrata
„ rigida
„ vaginata
„ capillaris
Polystichum Lonchitis

On reaching rocks at the top of Glen Fee, walked along the summit, gathering *Azalea procumbens.* Had a glorious view of all the mountains—plenty of snow on some. Reached Clova about 8 p.m. thoroughly tired.

Saturday, 6th August 1853.

This morning several of the party were knocked up and remained at home. George Bayley went up Glenesk to fish. The rest of the party went to Glen Dole, and visited the rocks near the top.

There we picked:—

Dryas octopetala
Erigeron alpinus
Vaccinium uliginosum
Veronica saxatilis
Poa Balfourii
Asplenum viride

Could not get any *Astragalus alpinus.*

Walked along the rocks towards the foot of Glen Dole, gathering:—

Epilobium alpinum
Saussurea alpina
Veronica alpina
Veronica saxatilis
Salix reticulata

Returned to the inn about 6.30 p.m., and were engaged putting up plants in paper.

Monday, 8th August 1853.

This morning, after our usual bathe in the Esk and after breakfasting, proceeded about 8 a.m. up the glen to Glen Dole, and then up Jock's Road to the summit of the hill.

Near the White Waterfall found abundance of *Polypodium alpestre* in fine fructification. In all parts of the mountain here this fern is remarkably luxuriant. At Don's original station for *Sonchus* it is very large, along with *Athyrium Filix-fœmina*; the two are usually associated together, and it does not seem to be the rule (as Backhouse states) that where the one begins the other ends. Along with these ferns *Lastrea Oreopteris* and *L. dilatata* are common.

At the top of Jock's Road also there is abundance of *Rubus Chamæmorus* and *Cornus suecica*—some of them were still in flower, others in fruit. *Saussurea alpina* also was seen on the rocks near the falls.

Proceeding along the White Water we looked in vain for *Juncus castaneus*, but we picked :—

Sibbaldia procumbens
Epilobium alsinifolium
„ alpinum
Gnaphalium supinum
Veronica alpina

and many other alpine plants.

Crossing the hills towards Little Gilrannoch we gathered :—

Rubus Chamæmorus (in fine flower)
Epilobium alpinum
Trientalis europæa (in flower)
Carex vaginata (in abundance)
Alopecurus alpinus
Phleum alpinum

On the felspar rocks of Little Gilrannoch *Lychnis alpina* was found to be tolerably abundant. Only a small quantity was gathered. The party divided at this point after lunch, some returning to the inn, whilst Gilchrist, Soubki, Mostapha, Wood, A. and C. Cowan, Ross, and Balfour walked to Canlochan, descended into the glen and gathered :—

Thlaspi alpestre
Saussurea alpina
Gentiana nivalis
Veronica humifusa
„ alpina
Veronica saxatilis
Luzula spicata
Poa alpina
„ Balfourii

Returned to the inn at Clova about 9 p.m. after a long day's work. Near Braedownie a green flowered var. of *Galium verum* was picked, and near Acharn *Hieracium denticulatum* and *Hieracium prenanthoides.*

Tuesday, 9th August 1853.

After bathing and breakfast, left the inn about 8.30 a.m. and walked to the lower part of Glen Dole. Ascended the rocks of Craig Rennet, gathering :—

Linnæa borealis (in fine flower)	Arctostaphylos Uva-ursi
	Lycopodium annotinum

Walked along the rocks towards the *Astragalus* cliff. Gathered the usual alpine plants, also :—

Hieracium alpinum	Salix arenaria
,, nigrescens	,, reticulata
Mulgedium alpinum (not in flower)	

Ascended to the summit by a deep ravine, where the *Mulgedium* grew. Examined the station of the *Astragalus* cliff, but did not see any specimens. On the summit gathered *Carex rariflora* in abundance. Walked towards the ravine which descends into Glen Fee and examined the rocks along the northern side, saw *Epilobium angustifolium*, and many alpine plants. No *Woodsia.* Returned to the inn about 7.30 p.m. Cunningham and Ogilvie left this morning.

Wednesday, 10th August 1853.

This day examined the rocks round Loch Brandy and the loch itself. The plants gathered were :—

Subularia aquatica	Sparganium natans
Callitriche autumnalis (in a pool close to loch)	Isoëtes lacustris

On the rocks *Potentilla alpestris*, and all the ordinary alpine species. Looked in vain for *Potentilla tridentata.*

Returned to the inn between 5 and 6 p.m. Gathered :—

Lamium maculatum

Carex aquatilis, var., on the banks of the Esk

Bayley left for Perth, Stirling and Dollar; Jenner and Wood for Braemar.

Thursday, 11*th August* 1853.

The party, now reduced to 12, after sending their baggage by cart to Glammis, and breakfasting, left the inn about 10 a.m. and walked to Dykehead, Kirriemuir and Glammis.

On the way gathered :—

Rosa villosa
Meum athamanticum
Lysimachia vulgaris

Ligustrum vulgare (near Cortachy)
Mentha viridis (?) (about one mile from Clova Inn)

Reached Glammis Station about 4 p.m. and joined train at 4.50, arriving in Edinburgh about 9.30 p.m.

EXCURSIONS IN 1854.

Canal, Slateford, Colinton, Dreghorn, Pentlands.

Saturday, 13*th May* 1854.

Party of about 80 or 90 met, 10 a.m., at the Canal Basin, Port Hopetoun, and walked along the banks of the Canal to Slateford, and thence to Colinton, Dreghorn and the Pentlands, returning by Morningside about 5 p.m.

Usual plants gathered. Among others :—

Anemone nemorosa
Corydalis lutea (Colinton grounds)
Cardamine amara
Lychnis diurna
Geranium phæum
Potentilla Fragariastrum
Antennaria dioica (Pentlands)

Tussilago Farfara
Petasites vulgaris
Doronicum Pardalianches
Vinca major (Colinton)
,, minor
Lilium Martagon
Arum maculatum (near Dreghorn gate)

Burntisland, Pettycur, Kinghorn.

Saturday, 20th May 1854. *Queen's Birthday.*

Party of 120 met at the Dundee and Perth Railway Station and at Scotland Street Station at 9.45 a.m., and proceeded to Burntisland. Return tickets, 9d.

Visited the Island, gathering :—

Salvia Verbenaca	Sclerochloa maritima
Parietaria officinalis	,, loliacea

Thence walked to hills to the east of Burntisland, where we got *Botrychium Lunaria.* Mr. David Philip Martyn picked *Orobanche rubra.* Mr. Lowe gathered *Alyssum calycinum* (on the bank near the roadside) and *Reseda lutea* was also found. Some shale plants, as *Lepidodendron*, and some coaly matter, in the trap tuff.

Walked by the shore to Pettycur and then by Kinghorn and Kinghorn Loch to Burntisland.

Picked on the way *Fumaria micrantha, Thlaspi arvense, Littorella lacustris, Potamogeton lucens, Nostoc* on stones in running water, and a peculiar kind of lichen on stones at Kinghorn Loch.

Tynehead Borthwick Castle, Crichton Castle, Fushie Bridge, Gorebridge.

Saturday, 27th May 1854.

Party of 130 met at the North British Railway Station at 11 a.m. and proceeded to Tynehead, thence they walked to Crichton Castle, Borthwick Castle, Fushie Bridge, and Gorebridge, returning by the train which passes Gorebridge at 7.27 p.m. Return tickets, 1s. 2d.

Near Tynehead *Genista anglica* was gathered in profusion, and also :—

Hippophaë rhamnoides	Botrychium Lunaria
Gymnadenia albida (by Mr. Fairbairn)	Lycopodium Selago
	,, clavatum

In woods on the bank of the stream :—

Cardamine amara (near Crichton Castle)
Alyssum calycinum
Viola palustris
„ sylvatica
Cerastium arvense
Vicia Orobus
Anthemis arvensis
Pyrola media
Listera cordata
Carex paniculata
„ paludosa
Polypodium Dryopteris
„ Phegopteris
Equisetum arvense
„ sylvaticum
„ palustre

Near Borthwick Castle :—

Cardamine amara
Myrrhis odorata
Anchusa sempervirens
Humulus Lupulus
Arum maculatum
Potamogeton oblongus

Valeriana dioica was also gathered, but very sparingly, the chief station being destroyed by the draining of the marsh. It was also gathered by the side of a hedge to the west of Fushie Bridge. The station for *Trollius europæus* has been destroyed by cultivation.

Burntisland, Starly Burn, Aberdour, Donibristle.

Saturday, 3rd June 1854.

Party of about 100 met at the Dundee and Perth Railway Station and at Scotland Street Station, and proceeded to Burntisland. Return tickets, 9d.

Walked to Starly Burn, Aberdour, and Donibristle, and returned by the boat at 5.10 p.m.

The following plants were gathered :—

Thalictrum majus (Aberdour)
Lepidium campestre (near Aberdour)
Thlaspi arvense
Sagina subulata
Euonymus europæus
Medicago maculata (Donibristle)
Dipsacus sylvestris (near Donibristle)

Primula elatior
Anchusa sempervirens (Aberdour Castle)
Solanum Dulcamara
Atropa Belladonna
Hyoscyamus niger (near Donibristle)
Allium Scorodoprasum
Ornithogalum umbellatum
Blysmus rufus
Carex distans
,, extensa
Ophioglossum vulgatum (Aberdour)
Botrychium Lunaria (Aberdour)

Bathgate, Boghead, Torbane Hill, Kirkton, Woodcockdale, Linlithgow.

Saturday, 10*th June* 1854.

Party of about 80 met at the Edinburgh and Glasgow Railway Station at 8.15 a.m. and proceeded to Bathgate, thence walked to Boghead and Torbane Hill, Kirkton, Knock Hill, Woodcockdale, Lithgow Bridge, and Linlithgow. Return tickets, 1s. 6d. each. Visited Torbane Hill coal-pit; about 40 of the party descended under the guidance of Mr. M'Kinlay. Numerous fossils seen—*Stigmaria*, *Sigillaria*, *Calamites*. Many species of *Carex* picked in the boggy ground near, also *Vaccinium Oxycoccus* and *Leontodon palustris*, and near Kirkton *Senecio saracenicus*, *Chara flexilis*. Near Bathgate *Geranium lucidum*. Near Bellside *Sedum Telephium* and *Pyrethrum Parthenium*.

At and near Knock Hill:—

Hesperis matronalis
Viola lutea
Cerastium tetrandrum
Sedum villosum
Symphytum tuberosum
Botrychium Lunaria

At Kipps:—

Sisymbrium Thalianum
Sagina subulata

In Woodcockdale:—

Trollius europæus
Geranium sylvaticum
Doronicum Pardalianches

Near Linlithgow :—

Fumaria micrantha
Nasturtium palustre (the Loch)
Rumex obtusifolius (with very large leaves like R. alpinus)
Lilium Martagon

Returned by train passing Linlithgow at 6.39 p.m.

Cockburnspath, Dunglass Dene, Pease Dene.

Saturday, 17th June 1854.

The morning was very unpromising, but 55 met at the North British Railway Station at 7.45 a.m. and proceeded to Cockburnspath. Return tickets, 2s.

The day turned out very wet, and the east wind was very cold. The ardour of a great number of the party was damped on reaching Cockburnspath, and they remained at the Inn all day or returned to Edinburgh. Nevertheless 15 or 20 ventured up Dunglass Dene; on coming to the bottom of the glen, on returning, several of the party left for the purpose of walking to Dunbar and Linton. About 12 still remained who proceeded along the coast, but by the time the party reached Pease Dene only nine remained, who continued to the last, and got back to Cockburnspath at 3 p.m., when they got their habiliments dried at Mrs. Wetherall's kitchen fire; the drying scene was not a little ludicrous.

A number of good plants were gathered :—

In Dunglass Dene, besides some good specimens of ferns, there were :—

Eranthis hyemalis
Cardamine amara
Hypericum calycinum
Acer campestre
Ribes alpinum
Campanula latifolia
Pyrola minor
Lysimachia Nummularia
Vinca major
„ minor
Anchusa sempervirens
Veronica montana
Lamium Galeobdolon
Neottia Nidus-avis
Carex pendula
„ lævigata
Scolopendrium vulgare
Polystichum aculeatum
Equisetum Telmateia

On the shore :—

Glaucium luteum
Astragalus hypoglottis
Œnanthe crocata

In Pease Dene, *Vicia sativa*, var. *angustifolia* and *Polystichum angulare.*

The party returned by train passing Cockburnspath at 6 p.m.

In Dunglass Dene a plant (not in flower), which appears to be *Solidago altissima*, was gathered.

East Linton, Prestonkirk, Tynningham, Belhaven Sands, Dunbar.

Saturday, 24th June 1854.

Party of 50 met at the North British Railway Station at 8 a.m. and proceeded to East Linton; thence they walked to Prestonkirk, Tynningham, where they were met by Mr. Lees; and then proceeded by the sands to Belhaven and Dunbar, returning by the train passing Dunbar at 625 p.m. Return tickets, 2s. Amongst the 140 species of plants gathered were :—

Near Prestonkirk :—

Fumaria capreolata
„ micrantha
„ officinalis
Malva sylvestris
„ rotundifolia
Ballota fœtida

Near Tynningham and at the mouth of the Tyne :—

Lepigonum marinum
Antennaria maritima, var. gallica
Hieracium aurantiacum
Salicornia herbacea
Suæda maritima

On Belhaven sands :—

Reseda lutea
Onobrychis sativa
Poterium Sanguisorba
Plantago major (in a viviparous state)

Kincardine, Tulliallan.

Saturday 1*st July* 1854.

Party of 66 went by train to Granton at 6.30 a.m. Return tickets, rail, 3d. each. Then by Stirling boat to Kincardine, paying 2d. at pier at Granton (2d. also returning). Return tickets by steamboat, 1s.

On reaching Kincardine, breakfasted at Dewar's Unicorn Inn for 1s. 3d. each. Then under the direction of a guide kindly supplied by Mr. Menzies, Count Flahault's factor, we walked through Tulliallan woods and garden, and gained the shore near sands, returning by the embankment to Kincardine, and going on board the steamboat at 6.45 p.m.

Among the best plants gathered were :—

Corydalis claviculata
Fumaria capreolata
„ micrantha
„ officinalis
Sagina maritima
Lepigonum rubrum
„ marinum
Geranium lucidum (old castle)
Genista anglica
Rubus cæsius?
Rosa arvensis?
Œnanthe crocata
Viburnum Opulus
Vaccinium Vitis-Idæa
Trientalis europæa (abundant in Tulliallan woods)
Ligustrum vulgare
Anchusa sempervirens
Solanum Dulcamara

Parietaria officinalis
Empetrum nigrum
Habenaria viridis
„ bifolia
„ chlorantha
Carex pulicaris
„ fulva
„ riparia
Milium effusum
Molinia cærulea
Glyceria aquatica
Sclerochloa distans
Festuca arundinacea
Hordeum pratense (on embankment)
Hordeum maritimum
Juniperus communis
Lastrea Oreopteris
Osmunda regalis (on sands)

An abundance of *Ranunculus hirsutus* near Kincardine, eighteen inches high, and of the var. *parvulus* on the shore.

Inchkeith, Inchcolm.

Saturday, 8th July 1854.

Party of upwards of 200 went to Inchkeith and Inchcolm. Tickets, including railway to Leith and steamboat, 2s. 6d. The party met at the railway station at 7.45 a.m., and proceeded to Leith. The Stirling steamboat "Prince of Wales" had been hired and was waiting at the West Pier. Professor Edward Forbes and many of his pupils joined the trip.

The party first went to Inchkeith, where they arrived about 9.30 a.m., and after spending three or four hours on the island they proceeded to Inchcolm, on which they remained for a couple of hours. The day was favourable, and lunch was supplied partly on deck. Among the interesting plants collected on Inchkeith were the following :—

Sinapis nigra
Conium maculatum (abundant)
Haloscias scoticum
Hyoscyamus niger (very abundant)
Marrubium vulgare

On Inchcolm *Dipsacus sylvestris* and *Hyoscyamus niger* were seen, and peculiar fasciated stems and heads of *Carduus.*

Longniddry, Gosford, Aberlady, Luffness, Gullan, Dirleton.

Saturday, 15*th July* 1854.

Party of about 50 met at the North British Railway Station at 8 a.m. and proceeded to Longniddry. Thence walked to Gosford, Aberlady, Luffness, Gullan, and Dirleton, and returned by train at 6.55 p.m. from Drem. Return tickets, 1s.

Amongst plants gathered were :—

Silene anglica (near Luffness)
Silene noctiflora (Luffness, abundant)
Trifolium fragiferum
Sedum album
,, reflexum
Hippuris vulgaris

Smyrnium Olusatrum
Helosciadium repens
Sium angustifolium
Centranthus ruber
Carduus nutans
Centaurea Scabiosa
Thrincia hirta
Campanula hybrida
Anagallis arvensis
„ tenella
Asperugo procumbens
Scrophularia vernalis
Limosella aquatica (Gullan and at Drem)
Utricularia vulgaris
Hippophaë rhamnoides
Habenaria viridis
Scirpus Tabernæmontani
„ maritimus
Carex vulpina
Lepturus filformis
Triticum repens
„ laxum (near Luffness)
Chara hispida
„ vulgaris

St. Andrews, Guard Bridge, Leuchars.

Saturday, 22nd July 1854.

Party of 86 met at the Edinburgh, Perth, and Dundee Railway Station at 6.30 a.m. and proceeded to St. Andrews. Return tickets, 3s. 8d. Professor Edward Forbes and Dr. Greville were in the party.

Reached St. Andrews about 10 a.m., and breakfasted in the Town Hall (76 sat down to breakfast). Mr. Thomson of the Star Hotel provided breakfast at 1s. 6d. each.

After breakfast, walked by Links to Guard Bridge and thence to Tents Muir, reaching Leuchars about 6 p.m. in time for the train.

Among the plants gathered were the following :—

Fumaria micrantha
Lychnis Githago
Œnanthe crocata
Anthemis Cotula
„ arvensis
Anagallis tenella
Rhinanthus major
Littorella lacustris
Euphorbia Esula
Juncus balticus
Carex incurva
Lycopodium Selago
„ inundatum
„ clavatum
„ selaginoides
Didymodon inclinatum
Trichostomum rubellum
Gymnostomum fasciculare
Bryum trichodes

Loch Lomond.

Wednesday, 26th July 1854.

Party consisting of J. H. Balfour, Edward Forbes, Thomas Barclay, George Coates Bell, H. M. Birdwood, Thomas M. Cage, M. Cowan, Henry Davidson, Robert Dean, Robert Farquharson, Patrick Graham, Thomas Hardie, John Hay, James Hector, Wm. R. Hill, Robert D. Horne, William F. Humphrey, William Johnston, Mohamid Ali Katib, James Landall, Henry Leach, James H. Lock, Stevenson Macadam, David P. Maclagan, Robert Maclagan, John Matthews, James Miller, R. Mutrikima, William Nichol, Alexander Nicolson, John Grant Nicolson, Alexander Peddie, James Peddie, junr., F. H. Richardson, William O. Roberts, Alexander R. Simpson, David Simpson, M. A. Soubki, P. Appleby Stephenson, Wm. R. Todd, J. B. Tuke, Thomas J. Walker, James Wardrop, John K. Wilson, left Edinburgh at 5 p.m. on Wednesday, 26th July, and proceeded to Glasgow. Were accommodated at the Queen's Hotel. Return tickets to Inverarnan and back to Edinburgh, 7s. 6d.

Thursday, 27th July 1854.

Left by the steamboat at 7 a.m. for Bowling and Loch Lomond; reached Inverarnan about 11.30 a.m. Were all comfortably accommodated by M'Lellan, the innkeeper. Proceeded up Glen Falloch, picking *Quercus pedunculata* and *Quercus sessiliflora*, and ascended some of the lower hills about a mile and a half from Inverarnan.

Gathered :—

Saxifraga stellaris
„ aizoides
Sedum Rhodiola
Oxyria reniformis
Hymenophyllum Wilsoni

Returned by Glen Caorrunn, gathering a number of subalpine ferns.

Friday, 28th July 1854.

Started about 7.15 a.m. to visit Ben Laoigh, Ben Oss, and

other hills in the neighbourhood. On Ben Dubh Chraige picked the following plants :—

Thalictrum alpinum
Arabis petræa
Cochlearia grœnlandica
Silene acaulis
Sagina subulata
Rubus Chamæmorus
Sibbaldia procumbens
Saxifraga oppositifolia
„ stellaris
„ aizoides
„ hypnoides
Epilobium alpinum
Antennaria dioica (var. of Don)
Gnaphalium supinum
Saussurea alpina
Vaccinium uliginosum
Armeria maritima
Euphrasia officinalis
Rhinanthus Crista-galli
Plantago maritima
Polygonum viviparum
Oxyria reniformis
Salix arenaria
„ herbacea
Malaxis paludosa
Habenaria chlorantha
Juncus trifidus
„ triglumis
Luzula spicata
Rhynchospora alba
Carex pauciflora
„ rigida
„ capillaris
„ saxatilis
Aira cæspitosa vivipara
Poa alpina
„ Balfourii
Asplenium viride
Cystopteris fragilis
„ dentata
Polystichum Lonchitis
Polypodium Dryopteris
„ Phegopteris
Botrychium Lunaria
Lycopodium Selago
„ alpinum
„ selaginoides
Andreæa
Hookeria

Professor Forbes visited Ben Oss and gathered similar alpine species, and in addition *Allosorus crispus.*

Saturday, 29th July 1854.

Party, diminished by departure of some members, started about 8 a.m. and proceeded along banks of Falloch towards Ben Voirlich. Geological party under Professor Forbes proceeded by shore of lake. Botanical party ascended Ben Voirlich and descended to Loch Sloy, reaching Tarbet about 3 p.m.

Among the plants gathered were the following :—

Thalictrum alpinum
Ranunculus acris (alpine form)
Corydalis claviculata
Cardamine pratensis
Cochlearia vars.
Cerastium alpinum
Hypericum Androsæmum
„ humifusum
Rubus nitidus
Sibbaldia procumbens
Alchemilla alpina
Saxifraga oppositifolia
„ stellaris
„ aizoides
„ hypnoides
Sedum Rhodiola
„ anglicum (near Tarbet)
Lythrum Salicaria
Epilobium alpinum
Carum verticillatum (near Tarbet)
Gnaphalium supinum
Lysimachia vulgaris
Scutellaria galericulata (Loch Lomond)
Salix herbacea
Listera cordata
Juncus trifidus
„ triglumis
Luzula spicata
Carex pauciflora
„ rigida
„ saxatilis
Poa Balfourii
Osmunda regalis
Lycopodium annotinum
Isoëtes lacustris

Joined the steamboat at 4 p.m. and reached Glasgow at 8 p.m. Returned by train which left Glasgow at 9, and reached Edinburgh about 11 p.m.

Braemar.

Tuesday, 8th August 1854.

Party composed of J. H. Balfour, M. A. Badre, Thomas Barclay, George Coates Bell, Herbert M. Birdwood, Edward W. Cropper, J. Earle, James Gilchrist, M. A. Katib, G. Lawson, G. S. Lawson, James Miller, David Ross, M. A. Soubki, J. G. Whitehead, left Edinburgh by the Edinburgh, Perth and Dundee Railway at 9.45 a.m. on Tuesday, 8th August 1854. Return tickets, available for 14 days, had been granted for 12s. 6d. Train reached Aberdeen much behind its time; in place of 4.23, being 5.30. Dined at Douglas Hotel close to the

station, and at 7 p.m. proceeded by train to Banchory. On our arrival there found all the inns occupied. The party had to hunt for beds in the village.

Wednesday, 9th August 1854.

Party breakfasted at the Burnett Arms, and after sending baggage by a cart to Aboyne and Ballater, started on their walk. Examined woods on the banks of the Dee. Gathered :—

Rubus cordifolius
Pyrola (several species)
Trientalis europæa
Plantago maritima
Goodyera repens (abundant in woods at Aboyne)

Lunched at Aboyne, a very comfortable hotel. Visited Suspension Bridge, walked by south side of Dee to Ballater. Visited Pannanich Wells, near them there is abundance of *Mimulus luteus*. Near Ballater there is abundance of *Melampyrum sylvaticum*. Were comfortably accommodated at the inn at Ballater.

Thursday, 10*th August* 1854.

Left Ballater at 8 a.m. after sending the baggage by cart to Castleton of Braemar. Walked along the banks of the Dee as far as the Balmoral Suspension Bridge, crossed the bridge to Balmoral, and were allowed by Dr. Robertson to see all parts of the grounds. Visited the old and new buildings under the guidance of Mr. Paterson, the gardener. The old building appears to be most in keeping with the situation. The new Palace is built of beautiful white granite from Glen Gelder ; the building is very chaste and elegant so far as it has been completed ; much remains to be done. It is proposed to have a square tower connected with it, 100 feet high. The flower-garden is well kept. Went by the private walks to the summit of a hill overlooking Balmoral, and had a fine view. Picked :—

Vaccinium Vitis-Idæa
Pyrola secunda
Melampyrum sylvaticum
Neottia Nidus-avis

The gardener informed us that the Queen occasionally used *Lycopodium clavatum* as a wreath for her head.

Proceeded to Lochnagar, botanised in the corrie, gathered abundance of *Polypodium alpestre*, which commenced a few hundred feet below the little tarn and extended up to the high cliffs. No *Asplenium Filix-fœmina* was seen.

Among the plants gathered were :—

Cerastium alpinum
Rubus Chamæmorus
Sibbaldia procumbens
Saxifraga oppositifolia
„ stellaris
„ aizoides
„ rivularis
„ hypnoides
Epilobium alpinum
Cornus suecica
Antennaria dioica, var.
Gnaphalium sylvaticum, var.
Gnaphalium supinum
Hieracium alpinum (very hairy)
Juncus trifidus
„ triglumis
Luzula spicata
Phleum alpinum
Poa alpina vivipara
„ laxa
Allosorus crispus
Lastrea dilatata (in various forms)
Lycopodium annotinum

After reaching the top, descended by Ballochbuie, gathering on the way *Splachnum mnioides* growing on the jaw-bone of a dead sheep, and *Betula nana.*

Reached Invercauld Arms, Braemar, about 9.30 p.m., after a long and fatiguing walk. Found all prepared for us by Mr. G. Clark.

Friday, 11*th August* 1854.

All were so tired with yesterday's journey that we did not breakfast till about 9 a.m. At 10 started for Little Craigendal, going by the second valley on the right hand after crossing the Ben na Bourd burn by a wooden bridge. It is perhaps better to take the third valley on the right, and thus to come on the south-west corner of Little Craigendal, where *Astragalus alpinus* grows.

Among the plants gathered, besides the *Astragalus*, on Little Craigendal were the following :—

Silene acaulis
Potentilla alpestris
Sibbaldia procumbens
Gnaphalium supinum
Pyrola secunda
Carex capillaris
Bartramia fontana (male and female)

The *Astragalus* had flowered early, and only a few specimens were procured in blossom.

Returned to the inn about 6.30 p.m.

Saturday, 12th August 1854.

Left the inn this morning at 8 o'clock in two carriages, and proceeded to the foot of Loch Callater, thence walked to rocks in Glen Callater and Glen Candlich (Cean-mohr?). The day became very wet and misty, and after spending three or four hours on the rocks, and being thoroughly wet, we returned to the inn about 4.30 p.m.

The plants gathered were (besides lower cryptogams):—

Thalictrum alpinum
Subularia aquatica
Saussurea alpina
Hieracium (many forms)
Lobelia Dortmanna
Salix venulosa
Salix Lapponum
„ arbutifolia
„ reticulata
Carex rupestris
„ atrata
„ stictocarpa

Monday, 14th August 1854.

The morning being misty we postponed our trip to Ben na Mac Dhu. The whole party (with the exception of Mr. Bell, who went fishing) proceeded in a large car, accompanied by Mr. Esson, the accountant, to visit Canlochan. The car took the party a little beyond a bridge about eight miles from Castleton, on the Spital of Glenshee road. The party ascended the hill and visited the Canlochan rocks.

In the Glen we picked the following plants:—

Draba incana
Cochlearia forms
Cerastium alpinum
Dryas octopetala
Saxifraga nivalis
„ stellaris
„ aizoides
„ hypnoides (with large flower)
Erigeron alpinus
Hieracium forms
Sonchus alpinus (about 6 or 8 specimens in flower)
Pyrola rotundifolia
„ minor
Gentiana nivalis (sparingly)
Veronica humifusa
„ alpina
„ saxatilis (sparingly in flower)

Carex vitilis
„ atrata
„ rigida
„ aquatilis
„ stictocarpa
„ capillaris
„ binervis
Poa alpina
Poa Balfourii
„ nemoralis
Asplenium viride
Polystichum Lonchitis
Polypodium alpestre (in large quantity, and towards the east side of Canlochan very large)

The rocks in the Glen are of a basalt or hypersthene nature.

Visited Glas Maol and had a splendid view of all around as the day cleared up. Saw the Lomonds in Fife, Pentlands, and Edinburgh? Ochils, Ben Lawers, Ben Nevis, all the Braemar hills. Descended from Glas Maol, joined the road about three miles from the Spital of Glenshee, and joined the car at the bridge about 6 p.m. and returned to Castleton.

Tuesday, 15*th August* 1854.

The morning being fine we breakfasted at 6 a.m. and started at 7 by conveyance to the Linn of Dee, accompanied by Mr. Rathay and Mr. Esson (in all 15). Mr. Barclay had a horse and guide to meet him at the Linn of Dee and take him to Loch Etchachan. We walked by Glen Lui after seeing the Linn of Dee and the Mar Forest. We gathered *Arabis petræa* in stony places in the bed of the Linn.

Remarked particularly in all the old firs deprived of their bark the spiral arrangement of the wood. The trees were dead. Got a curious knot from one of the trees for the Museum. Walked up Glen Derry to Loch Etchachan and then to the top of Ben na Mac Dhu, which we reached between 1 and 2. On the way gathered *Luzula arcuata* and some other rare plants.

On or about the summit among the plants seen were:—

Silene acaulis
Gnaphalium supinum
Salix herbacea
Luzula arcuata
„ spicata
Carex rigida
Festuca ovina vivipara
Lycopodium Selago
Andreæa rupestris
Polytrichum alpinum
Dicranum nigro-viride
Trichostomum lanuginosum
Cetraria islandica
„ nivalis
Lecidea geographica

Lunched at the summit and had a fine view, descended towards the shelter and Loch Avon amidst a pretty severe shower.

Gathered *Carex leporina* on the sides of a stream going to the corrie of the Avon, not far from patches of snow, also *Stellaria cerastoides* and many alpine plants. *Polypodium alpestre* abounds on the ascent to Loch Etchachan and on the descent to Loch Avon, also on the ascent to Cairngorm from Loch Avon. It is a very abundant fern. Reached the Shelter Stone by a steep and rugged descent about 4 p.m. Our men had brought up plaids and provisions. They returned with the horses. Proceeded to make a fire of juniper. Kettle boiled and tea prepared. Mr. Rathay, alarmed at the dampness of the cave, left us at 7 p.m., and walked to Castleton, which he reached at 2 in the morning.

We had a restless night in the cave. Some sat up all night and kept themselves warm by the fire outside. The stone is 40 feet long, on an average, 20 feet broad, and about 16 or 18 feet high.

Wednesday, 16*th August* 1854.

Mr. Esson returned this morning to Castleton; the rest of the party after breakfast ascended to Cairngorm, gathering abundance of *Polypodium alpestre*, *Luzula arcuata*, and other alpine plants. Mist came on after the party reached the summit; the fine view was only seen for a few minutes. Descended from summit and visited cliffs looking to the Spey side. These cliffs seem worthy of examination. It is probable that the best way of examining all the hill in this quarter is from the Spey side. Important to find accommodation on that side. Walked by back of Ben na Mac Dhu, picking numerous confervoid plants. Descended into the valley of the Dee; had beautiful view of the pass to Rothiemurchus. After reaching Glen Dee visited the Wells of Dee; near this there is abundance of *Polypodium alpestre* all the way, continuing till opposite Cairn Toul. On the descent from Ben na Mac Dhu, *Asplenium Filix-fœmina* picked by Mr. G. Lawson, high up, above *Polypodium alpestre*.

Among other plants were gathered :—

Stellaria cerastoides	Veronica alpina
Hieracium alpinum	Phleum alpinum

Lunched at Wells of Dee. Rain came on and continued till about five. Met our conveyance near the Linn of Dee and returned about 7 p.m.

Thursday, 17*th August* 1854.

After paying bill and arranging for transmission of baggage to Dunkeld by a cart, the party left in a conveyance for the head of Glen Tilt (Mr. G. S. Lawson returned to Aberdeen) about 11 a.m. Walked through the Glen, picking alpine saxifrages and :—

Rubus saxatilis	Asplenium viride
Epilobium angustifolium	Polystichum Lonchitis

Near the Glen, in the woods :—

Campanula latifolia	Melampyrum sylvaticum

Dr. Gilchrist visited the Marble Quarry near the bridge about four or five miles from Blair. A bridge near the upper part of the Glen is broken down, so that it is almost impossible for an ordinary traveller to proceed without wading up to the knees ; in a flood it must be quite impassable. Surely the Right of Way Society should see that the road is passable for travellers. Our party were not interrupted, although we went by the same route as my party in 1847 did. The gate at which we were stopped was at once opened to them by an old woman. Most of the party kept on the left side of the river after passing the lowest bridge and descended by what was the old road, keeping clear of the woods entirely. Reached the Bridge of Tilt Inn about 8 p.m. and were comfortably accommodated.

Friday, 18*th August* 1854.

This morning party breakfasted at 6 a.m. and at 7 commenced their walk. Mr. Barclay went by the mail to Dunkeld. Walk-

ing party 11 in number proceeded by Killiecrankie, gathering *Lathyrus niger* in the woods nearly opposite Mrs. Hay's cottage. Attempt is now made to shut up the old Killiecrankie road and to allow visitors to enter by a small gate which is kept locked and only opened when parties request permission to go through. Our party were escorted by a Highlander. Spent about an hour in the wood. Reached Dunkeld about 1.30 p.m., when Mr. Barclay met the party. After lunch at Fisher's Inn, proceeded by coach to Dunkeld Road Station, and joined the railway, reaching Edinburgh about 9 p.m.

EXCURSIONS IN 1855.

Granton, Caroline Park, Cramond Woods, Barnton. Craigcrook, Craigleith.

Saturday, 12th May 1855.

About 100 met at Granton Pier at 10 a.m. Walked by shore to Caroline Park, Granton Woods, Cramond Woods, and returned by Barnton, Craigcrook, and Craigleith. Visited Granton Quarry and got a specimen of the fossil tree.

Among the plants gathered were:—

Anemone nemorosa
Ranunculus Ficaria
Caltha palustris
Eranthis hyemalis (at Caroline Park)
Aconitum Napellus (at Caroline Park)
Fumaria capreolata
Cochlearia officinalis
Capsella Bursa-pastoris
Viola odorata
" hirta
" sylvatica
Geranium molle
" lucidum
Oxalis Acetosella
Prunus domestica
Geum rivale
Potentilla Fragariastrum
" verna
Saxifraga granulata
Chrysospleniuin oppositifolium
Ribes Grossularia
" alpinum
" rubrum
" nigrum
Bunium flexuosum
Valerianella olitoria
Tussilago Farfara

Petasites vulgaris
Doronicum Pardalianches
Vinca minor
Myosotis arvensis
Veronica hederæfolia
Mentha viridis
Lamium purpureum
„ incisum
„ maculatum
„ album
Polygonum Bistorta
Daphne Laureola
Mercurialis perennis
Ulmus montana
Salix triandra
„ alba
„ Caprea
„ viminalis
Salix Smithiana
„ Helix
Stratiotes aloides
Polygonatum multiflorum
Luzula sylvatica
Lemna trisulca
„ minor
Asplenium Trichomanes
Equisetum arvense
„ limosum
Polytrichum piliferum
Dicranum scoparium
Trichostomum lanuginosum
Bryum punctatum
Didymodon purpureum
Hypnum splendens
Ramalina scopulorum
Cetraria islandica

Tynehead, Borthwick, Fushie Bridge, Gorebridge.

Saturday, 19*th May* 1855.

Party of 100 met at the North British Railway Station at 10.45 a.m. and proceeded to Tynehead, thence walked to Borthwick and Fushie Bridge, and returned by train passing Gorebridge at 4.57 p.m. Return third-class tickets, 1s. 2d.

Vegetation very far back, three weeks or a month behind. Observed colours in vegetation as they affected the eye, found that the yellow dandelion and green grass were very marked features. M'Cosh talks of the red stalk of the dandelion, but in most cases they were green, and even when a reddish or brownish tinge was present it did not appear to the eye. The marked effect was produced by yellow and green, and these, although not complementary colours, were pleasing. So also in many places nothing seen but the yellow primroses and the green sward—without any other colour, no white nor red. Some of the party visited Arniston also.

Some of the plants gathered were:—

Ranunculus aquatilis
„ Ficaria
Caltha palustris
Viola palustris (not in flower)
„ tricolor
„ arvensis
Oxalis Acetosella (with pink flower, nearly all the plants had flowers of this colour and were very beautiful)
Genista anglica
Lathyrus macrorrhizus
Fragaria vesca
Potentilla Fragariastrum
Chrysosplenium oppositifolium
„ alternifolium
Adoxa Moschatellina
Doronicum plantagineum (scarcely in flower)
Pyrola media (not in flower)
Primula vulgaris
„ veris
Fraxinus excelsior
Anchusa sempervirens
Myosotis sylvatica
„ arvensis
Lathræa Squamaria
Lamium amplexicaule
Salix Caprea
Empetrum nigrum
Luzula pilosa
Arum maculatum (not expanded)
Phalaris arundinacea
Melica nutans
Juniperus communis
Equisetum arvense
„ sylvaticum
„ limosum
Chara vulgaris
„ flexilis
Polytrichum commune
Dicranum heteromallum
Didymodon purpureum
Bryum hornum
Hypnum cuspidatum
Stereocaulon paschale
Evernia prunastri

Mid-Calder, Meadowbank, Dalmahoy Hills, Ravelrig, Balerno, Currie, Woodhall.

Saturday, 26th May 1855.

Party of 75 met at the Caledonian Railway Station, Lothian Road, at 8.30 a.m., and proceeded to Mid-Calder, thence walked to Meadowbank, Dalmahoy Hills, Ravelrig, Water of Leith, Balerno, Currie, and Woodhall. Returned from Currie by the train passing that place at 5.26 p.m. Return tickets, 8d. Vegetation was found to be far behind.

Among the plants gathered were :—

Anemone nemorosa
Ranunculus acris
„ repens
„ Ficaria
Caltha palustris
Meconopsis cambrica (in bud)
Cardamine sylvatica
Sisymbrium Thalianum
Alliaria officinalis
Viola palustris
„ sylvatica
„ canina
„ tricolor
„ lutea
Arenaria serpyllifolia
Montia fontana
Oxalis Acetosella
Acer platanoides
Vicia sepium
Lathyrus macrorrhizus
Prunus insititia
„ communis
Potentilla Fragariastrum
Saxifraga granulata
„ hypnoides (in bud)
Ribes Grossularia
„ rubrum
Myrrhis odorata
Anthriscus sylvestris
Adoxa Moschatellina
Antennaria dioica
Vaccinium Myrtillus
Primula vulgaris
„ veris
Fraxinus excelsior
Vinca minor, var. alba
Menyanthes trifoliata
Anchusa sempervirens
Scrophularia vernalis
Veronica serpyllifolia
Pedicularis sylvatica
Mentha viridis (not in flower)
Nepeta Glechoma
Lamium incisum
Mercurialis perennis
Ulmus montana
Fagus sylvatica
Salix fragilis
„ Caprea
„ viminalis
„ Smithiana
„ Helix
Empetrum nigrum
Orchis mascula
Allium ursinum (not out)
Tulipa sylvestris
Paris quadrifolia (not in flower)
Luzula pilosa
„ sylvatica
„ campestris
Arum maculatum (nearly out)
Carex vulgaris
„ glauca
„ pallescens
Equisetum arvense
„ palustre
Polytrichum commune
Didymodon purpureum
Bartramia pomiformis
Bryum punctatum
„ pyriforme
Funaria hygrometrica
Lecanora tartarea
Cladonia rangiferina
Alectoria jubata
Cetraria glauca
Calicium chrysocephalum
Bæomyces rufus
Scyphophorus pyxidatus
„ bellidiflorus
phærophoron coralloides

Burntisland, Aberdour, Donibristle, Humbie Woods, Pettycur, Kirkcaldy, Wemyss.

Saturday, 2nd June 1855.

Party of 60–70 proceeded at 9.45 a.m. by train to Burntisland, and returned by the train at 5 p.m. Return tickets, 9d. Walked from Burntisland to the Island, then by the shore all the way to Aberdour, thence to Humbie Woods, Grange Quarry, and Burntisland. Some of the party went to Donibristle, others to Wemyss, Dysart, and Kirkcaldy.

Among the plants gathered were the following :—

Ranunculus acris
" repens
" bulbosus
" Ficaria
Berberis vulgaris (near Aberdour)
Arabis hirsuta
Cardamine hirsuta
Alyssum calycinum (near Pettycur)
Cochlearia officinalis
" danica
Brassica Napus
" Rapa
Lepidium campestre
" Smithii
Thlaspi arvense
Helianthemum vulgare
Viola hirta
Cerastium tetrandrum
Geranium sanguineum
" molle
Ilex Aquifolium
Medicago maculata
Vicia lathyroides
Prunus insititia
" domestica
Saxifraga granulata
Smyrnium Olusatrum (near Kirkcaldy)
Hedera Helix (in fruit)
Dipsacus sylvestris (not in flower)
Matricaria Parthenium (old Castle, Aberdour, not in flower)
Silybum Marianum (not in flower)
Hieracium murorum
" vulgatum
Leontodon lævigatus
Vaccinium Myrtillus
Armeria maritima
Glaux maritima
Fraxinus excelsior
Anchusa sempervirens
Solanum Dulcamara (not in flower)
Linaria Cymbalaria
Antirrhinum majus (old Castle, Aberdour, not in flower)
Veronica Chamædrys
" Beccabunga
Lamium amplexicaule
" purpureum
" incisum

Lamium album
Plantago Coronopus
Rumex scutatus (Aberdour Castle)
Ulmus montana
Parietaria erecta
Quercus Robur
Orchis mascula
„ „ var. alba
Allium Scorodoprasum (not in flower)
Tulipa sylvestris (Doni-bristle)
Triglochin maritimum
Blysmus rufus
Carex præcox
„ distans
Avena pubescens
Sclerochloa loliacea (Burnt-island Pier)
Pinus sylvestris
Asplenium marinum (Wemyss)
Ophioglossum vulgatum
Botrychium Lunaria
Equisetum arvense
„ sylvaticum

Many sea-weeds.

Linlithgow, Carriden, Blackness, Hopetoun.

Saturday, 9th June 1855.

Party of 74 met at the Edinburgh and Glasgow Railway Station, and proceeded to Linlithgow. Visited the Palace, walked to Carriden, Blackness, and Hopetoun, and returned from Winchburgh at 4.5 p.m. Return tickets, 1s. 6d.

Among the plants collected were the following :—

Ranunculus aquatilis
„ sceleratus
Berberis vulgaris
Nasturtium palustre
Arabis hirsuta
Cardamine sylvatica
Draba verna
Lepidium campestre
Sinapis arvensis
„ alba
Viola sylvatica
„ tricolor
„ arvensis
„ lutea
Lychnis diurna
Moehringia trinervia
Ilex Aquifolium
Prunus Padus
Cratægus Oxyacantha
Saxifraga granulata
Petroselinum sativum (not in flower)
Myrrhis odorata
Lonicera Caprifolium (not in flower)
Valeriana pyrenaica (Hopetoun)
Valerianella olitoria

Primula veris
Ligustrum vulgare (not in flower)
Vinca minor
Symphytum officinale
Plantago maritima
„ Coronopus
Chenopodium Bonus-Henricus
Quercus Robur
Salix fragilis, var. Russeliana
„ alba
„ viminalis
„ Smithiana
Listera ovata (not in flower)
Orchis mascula
Triglochin palustre
Eleocharis palustris
„ uniglumis
„ multicaulis
Blysmus rufus
Alopecurus geniculatus
Asplenium Ruta-muraria
„ Filix-fœmina
Polystichum aculeatum
Lastrea Filix-mas
„ dilatata
Botrychium Lunaria
Jungermannia bidentata
Agaricus campestris

Cleghorn, Lanark, Cora Linn, Bonnington Falls.

Saturday, 16*th June* 1855.

Party of nearly 100 met at the Caledonian Railway Station at 7 a.m., and proceeded to Cleghorn Station. Return tickets, 2s. 6d. Walked by the road to Lanark, thence proceeded to Cora Linn and Bonnington Falls, and returned by the banks of the Mouse to Cleghorn, joining the train at 4.8 p.m. Mr. M'Kinley, the gardener at Bonnington, had made arrangements as to the guides. There were four guides, to whom we paid in all 6s. 8d., and to the woman at the gate 2s.

Among the plants collected were the following :—

Ranunculus auricomus
Trollius europæus
Aquilegia vulgaris
Aconitum Napellus (not in flower)
Cardamine amara
Sisymbrium Thalianum
Viola palustris
Cerastium glomeratum
Montia fontana
Geranium sylvaticum
„ lucidum
Anthyllis Vulneraria
Vicia Orobus
„ sylvatica (not in flower)
Rubus saxatilis
Pyrus Aucuparia

Saxifraga oppositifolia
Galium boreale
Carduus heterophyllus (not in flower)
Hieracium murorum
Vaccinium Vitis-Idæa (not in flower)
Pyrola media? (not in flower)
Origanum vulgare (not in flower)
Salix viminalis
Neottia Nidus-avis
Orchis latifolia
Convallaria majalis
Eriophorum latifolium
Carex disticha
" paniculata
" aquatilis
" vulgaris
" glauca
" præcox
" panicea
" fulva
" flava
Carex ampullacea
Melica uniflora
Briza media
Asplenium Adiantum-nigrum
" viride
" Trichomanes
" Filix-fœmina
Cystopteris fragilis
Polystichum aculeatum
Lastrea Filix-mas
" dilatata
Polypodium Dryopteris
" Phegopteris
Equisetum arvense
" umbrosum
" sylvaticum
" palustre
" limosum
" hyemale
Bartramia fontana
Ramalina fraxinea
Peltidea canina

Newton, Dryburgh, Gladswood, Eildon Hills, Melrose, Hassendean, Minto Crags.

Saturday, 23rd June 1855.

Party of about 100, including Mr. Christie of the School of Design and 15 of his pupils, met at the North British Railway Station at 7.30 a.m., and proceeded to Newton Station, thence walked to Dryburgh Abbey and along the banks of the Tweed by Gladswood to the Eildon Hills and Melrose. Visited the East and Middle Eildon Hills, ascending to the top of each. Return tickets 2s. 6d., besides 3d. at Dryburgh, 1d. at Ferry, and a few pence at Melrose. Messrs. Nichol and Sadler went to Hassendean and visited Minto Crags, where they got *Asplenium germanicum* (one specimen).

They also gathered :—

Trollius europæus
Berberis vulgaris
Viola canina
Lychnis Viscaria
Sanguisorba officinalis (not in flower)
Valeriana dioica
Typha latifolia
Carex paludosa
Asplenium septentrionale
Lycopodium Selago
Sticta scrobiculata

The chief plants gathered by the rest of the party were :—

Berberis vulgaris
Nasturtium palustre?
Arabis hirsuta
Cochlearia officinalis (walls of Melrose Abbey)
Hesperis matronalis (Gladswood)
Sisymbrium Thalianum
Erysimum cheiranthoides (shore of Tweed near Dryburgh)
Lepidium Smithii
Stellaria nemorum
Moehringia trinervia
Malva moschata (not in flower)
Tilia grandifolia
Geranium sanguineum
" sylvaticum
" molle
" lucidum
Euonymus europæus
Staphylea pinnata
Anthyllis Vulneraria
Vicia sylvatica (not in flower)
Lathyrus pratensis
Prunus Avium
" Padus
Rubus saxatilis
Geum intermedium
Fragaria elatior
Potentilla reptans (not in flower)
Rosa spinosissima
" tomentosa
Pyrus Aria
Saxifraga umbrosa
Sanicula europæa
Galium boreale
Valeriana dioica (at foot of Middle Eildon Hill)
Antennaria dioica
Anthemis arvensis
Matricaria Parthenium
Doronicum Pardalianches
Hieracium Pilosella
" vulgatum
Apargia hispida
Vaccinium Vitis-Idæa
" Myrtillus
Erica cinerea
Lysimachia nemorum
Symphytum officinale
Echium vulgare
Verbascum Thapsus (not in flower)
Digitalis purpurea
Lathræa Squamaria
Mentha viridis
Origanum vulgare
Plantago media
Rumex sanguineus
" viridis
Buxus sempervirens (in fruit)
Alnus glutinosa

Salix fragilis, var. Russeliana
„ cinerea
„ aquatica
„ Caprea
Populus alba
Neottia Nidus-avis
Scirpus sylvaticus
Carex disticha
„ glauca
„ pilulifera
„ panicea
„ binervis
„ fulva
„ flava
Melica nutans
„ uniflora
Briza media
Poa nemoralis
Nardus stricta
Taxus baccata (drooping, at Dryburgh)
Allosorus crispus
Asplenium Adiantum-nigrum
„ Trichomanes
Polystichum aculeatum
Lastrea Oreopteris
Equisetum palustre
Lycopodium alpinum
Andreæa rupestris
Trichostomum lanuginosum
Grimmia ovata

Falkland, Bishop Hill, West Lomond Hill, Glenvale, East Lomond Hill.

Saturday, 30*th June* 1855.

Party of upwards of 100, including Mr. Christie and about 12 pupils of the School of Design, started by the train from North Bridge Station and Scotland Street Station at 6.30 a.m., and proceeded to Falkland Road Station. Return tickets, 2s.

Walked from Falkland Road Station to Falkland, where, through the kind attention of Mr. Barclay, breakfast was prepared. Mr. Howden, factor for Mr. Bruce, had arranged to allow the breakfast-table to be placed on the lawn in front of the old Palace. The party amounted to 114, including all our party and Mr. Christie's, also Mr. Barclay, the Sheriff-Clerk of Cupar, Mr. Howden, the Rev. Mr. M'Duff, minister of Falkland, Mr. Gulland, Mr. Cruikshank, the schoolmaster, and Mr. Laing, from Cupar. Dr. Balfour was chairman, and Mr. Barclay croupier. In front of the chairman was placed the huge tin kettle which had been used by the botanical party (of which Mr. Barclay was one) who visited Ben na Mac Dhu last year, and who slept for a night under the shelter-stone. The kettle

had an inscription on it to the following effect:—"Professor Balfour's Botanical Party to Ben na Muich Dhui, August 1854."

After partaking of a very substantial breakfast, the party, under the guidance of Mr. Howden, visited the old Palace with its large Hall, John Knox's pulpit. They then proceeded to the roof of the building, where they had an excellent view of the surrounding country. Visited the new church built by the late Mr. Tindal Bruce. Then walked to Falkland House, some visited the interior of the mansion. Thence proceeded towards the West Lomond Hill, at the foot of which lunch was provided by Mr. Barclay. After lunch the party went to the top of the hill, which is 1712 feet above the level of the sea. Had a fine view of Kinross-shire and Loch Leven. Descended into Glenvale, and walked along the side of the stream. Proceeded to Balo and by the south side of the East Lomond to the Falkland Road Station, where the party arrived about 6.30 p.m., thoroughly wet by a heavy thunderstorm which commenced between 3 and 4 p.m. and lasted all evening. Some visited the Bishop Hill. Returned to Edinburgh by the train passing Falkland Road at 7.12 and reaching Edinburgh about 9 p.m.

Among the plants gathered were the following:—

Papaver Argemone
Fumaria micrantha
Cardamine amara
Viola lutea
Sagina subulata
Geranium pusillum
Oxytropis Halleri (on Bishop Hill)
Saxifraga umbrosa
" hypnoides
Chrysosplenium alternifolium
Sedum villosum
Hippuris vulgaris
Epilobium angustifolium
" alsinifolium
(latter abundant on West Lomond Hill)
Conium maculatum
Galium pusillum (in Glenvale)
Solidago Virgaurea
Antennaria dioica
Centaurea Cyanus
Hieracium atratum
Leontodon Taraxacum
" palustris
Vaccinium Vitis-Idæa
Trientalis europæa (in great profusion in the woods and on the hill)
Myosotis repens
Solanum Dulcamara
Veronica scutellata
Littorella lacustris

Chenopodium Bonus-Henricus
Polygonum viviparum (abundant)
Salix cinerea
„ aquatica
„ repens
„ fusca
Empetrum nigrum
Listera cordata (in great profusion)
Orchis mascula
„ latifolia
„ maculata
Gymnadenia conopsea
Habenaria bifolia
Juncus supinus
Luzula multiflora
„ congesta
Potamogeton oblongus
„ heterophyllus
Eleocharis palustris
Scirpus pauciflorus
Carex dioica
„ pulicaris
„ stellulata
„ curta
„ ovalis
„ vulgaris
„ glauca
„ pilulifera
„ præcox
„ panicea
„ binervis
„ fulva
„ flava
„ ampullacea
„ vesicaria (in tarn on the hill)
Aira flexuosa
Briza media
Poa nemoralis
„ montana
Nardus stricta
Pteris aquilina
Allosorus crispus
Blechnum boreale
Asplenium Adiantum-nigrum
„ Ruta-muraria (old Palace)
„ Filix-fœmina
Cystopteris fragilis
Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Botrychium Lunaria
Equisetum arvense
„ umbrosum
„ sylvaticum
„ palustre
„ limosum
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides
Pilularia globulifera
Andreæa Rothii
„ rupestris
Bartramia fontana
„ pomiformis
Bryum punctatum
Hypnum stramineum
Polytrichum commune
„ alpinum
Sphagnum acutifolium
„ cymbifolium
„ compactum
Splachnum sphæricum
Trichostomum canescens
„ lanuginosum
Cetraria glauca
Cladonia rangiferina
Peltidea canina
Scyphophorus pyxidatus
Sphærophoron coralloides

North Berwick, Dirleton, Gullan, Luffness, Aberlady, Gosford, Longniddry.

Saturday, 7th July 1855.

A party of about 60 or 70 met at the North British Railway Station and proceeded to North Berwick, thence walked by the Links to Dirleton and its Castle, then to Gullan and Gullan Links, Luffness, Aberlady, Gosford, and Longniddry, returning by the train reaching Edinburgh at 7.50 p.m. Return tickets, 1s. 6d. Day remarkably fine, and many good plants procured.

Among others, the following :—

Papaver Argemone
Alyssum calycinum (Dirleton)
Reseda lutea
Viola canina (Dirleton)
Silene noctiflora
Geranium pusillum
Trifolium fragiferum
Hippuris vulgaris
Conium maculatum
Smyrnium Olusatrum
Galium Mollugo
Centranthus ruber
Pulicaria dysenterica
Crepis biennis (Luffness)
Thrincia hirta
Campanula glomerata
„ Trachelium (Luffness)
Anagallis arvensis
„ tenella
Erythræa pulchella
Polemonium cæruleum (Luffness)
Cynoglossum officinale
Asperugo procumbens (Luffness)
Solanum Dulcamara
Hyoscyamus niger (abundant near Luffness)
Scrophularia vernalis (Gosford)
Veronica Anagallis
Utricularia vulgaris
Calamintha Acinos
Stachys ambigua
Lamium intermedium (Luffness)
Littorella lacustris (Gullan)
Beta maritima
Salicornia herbacea
Hippophaë rhamnoides
Listera ovata
Epipactis latifolia
Habenaria viridis
Sparganium ramosum
Potamogeton oblongus
„ rufescens
Ruppia maritima (Luffness)
Scirpus pauciflorus
Carex incurva (near Longniddry)
Carex disticha
„ teretiuscula
„ paniculata
„ vulpina
„ distans
„ extensa

Carex Œderi (abundant in Gullan Links between the marshy ground and the sand hills)
Carex hirta
Phleum arenarium
Trisetum flavescens
Triodia decumbens
Sclerochloa maritima
Lepturus filiformis
Botrychium Lunaria
Equisetum variegatum
Lycopodium selaginoides
Chara hispida
„ vulgaris

Dunfermline, Knock Hill, Black Devon, Saline, Rumbling Bridge, Loch Leven, Benarty, Bishop Hill.

Saturday, 14th July 1855.

Party of 60-70 met at the Edinburgh, Perth, and Dundee Railway Station at 6.30 a.m. and proceeded to Dunfermline. Return tickets, 2s. Breakfasted at Melvie's New Inn, Dunfermline, about 9 a.m. for 1s. 3d. each. Visited the Abbey—where two artists who accompanied the party remained to take measurements. Walked towards Cleghorn and Knock Hill, crossed over the western side of the hill and visited the banks of the Black Devon, and returned by the pass between the two Saline Hills to Dunfermline, which was reached about 6 p.m. Returned by train at 6.40 p.m., reaching Edinburgh about 9 p.m. Some of the party went the day previously to Loch Leven, Benarty, and met us, others went to Rumbling Bridge and joined us in the evening.

Among the plants gathered by the various parties were the following :—

Ranunculus hederaceus
„ Flammula
„ reptans (Loch Fittie and Loch Leven)
Trollius europæus
Nuphar luteum
Nymphæa alba
Nasturtium palustre
Viola lutea
Radiola Millegrana (near Loch Leven)
Linum usitatissimum
Trifolium medium
„ striatum
Oxytropis Halleri (Bishop Hill)
Vicia sylvatica
Rubus saxatilis
Saxifraga hypnoides
Sedum villosum
Sempervivum tectorum

Myriophyllum spicatum
„ alterniflorum
Callitriche platycarpa
Helosciadium repens
Cicuta virosa
Carum Carui
Meum athamanticum
Viburnum Opulus
Galium boreale (Bishop Hill)
„ Witheringii
„ uliginosum
Centranthus ruber
Chrysanthemum segetum
Carduus setosus
Vaccinium Oxycoccus
Erica Tetralix
„ cinerea
Pyrola rotundifolia (Black Devon)
„ media
„ minor
Veronica scutellata
Calamintha Clinopodium
Galeopsis versicolor
Littorella lacustris
Polygonum viviparum
Rumex alpinus (near Rumbling Bridge)
Euphorbia Cyparissias (near Rumbling Bridge)
Myrica Gale
Populus tremula
Listera cordata
„ ovata
Gymnadenia conopsea
„ albida
Habenaria bifolia
„ chlorantha
Narthecium ossifragum
Paris quadrifolia (near Rumbling Bridge)
Sparganium ramosum
Alisma ranunculoides (Loch Leven)
Potamogeton natans
„ oblongus
„ perfoliatus(Loch Leven)
„ acutifolius
„ pusillus
„ pectinatus
Scirpus setaceus
„ lacustris
„ sylvaticus
Eriophorum angustifolium
Carex paniculata
„ sylvatica
„ Œderi
„ filiformis
Molinia cærulea
Poa nemoralis
„ montana
Festuca bromoides
Allosorus crispus (Saline Hills)
Polypodium Dryopteris
„ Phegopteris
Equisetum umbrosum
Lycopodium Selago
„ clavatum
„ selaginoides

Ayton, Eyemouth, St. Abb's Head.

Friday, 20*th July* 1855.

Party consisting of Dr. Balfour, Zerub Baillie, George Blackie, Joseph Bell, M. Cockram, W. H. Dewar, Alex. Dickson, George

Dods, Wm. Drysdale, E. W. Dubuc, J. A. Forbes, William Forbes, Adolphus Graham, William Grey, James Hay, J. Hector, A. B. Nieser, Joseph Perry, Wm. D. Singer, Francis Skae, V. E. Walker, M. Whitfield, M. Yellowlees, John A. Yule, met at the North British Railway Station at 4 p.m., and proceeded to Ayton. Mr. Hector had preceded us for the purpose of examining geologically Siccars Point and other rocks near the sea. He met the party near Eyemouth. Return tickets, 2s. 6d.

On reaching Ayton the party were met by the gardener to Mr. Mitchell Innes and conducted to Ayton Castle, where strawberries and cream were provided on the grass. After partaking of them the party visited the Castle under the direction of Mr. Mitchell Innes. The party then walked through the grounds of Ayton Castle and Netherbyres under the guidance of the gardener, and reached Eyemouth between 8 and 9 p.m. They were accommodated at Mr. William Paterson's Ship Inn; some had beds in other places.

Saturday, 21st July 1855.

Breakfasted at 7 a.m. and then walked by the coast to St. Abb's Head, and reached the shore near Fast Castle about 3 in the afternoon. Observed the remarkable construction of the lower Silurian rocks—the old sandstone cliffs with the trap. Day was delightful, although oppressively hot.

Among the plants gathered during the trip were the following:—

Thalictrum minus
" flexuosum (Netherbyres)
Ranunculus aquatilis
" hirsutus (near Dunlow Farm)
Glaucium luteum
Fumaria capreolata
Sinapis alba
Cakile maritima
Dianthus deltoides
Silene maritima
Lychnis Githago
Cerastium tetrandrum
Alsine verna (St. Abb's Head)
Geranium pratense
Acer campestre (Netherbyres)
Astragalus hypoglottis
Vicia sylvatica
Agrimonia Eupatoria
Sedum Rhodiola
Epilobium angustifolium
Conium maculatum

Æthusa Cynapium
Haloscias scoticum
Viburnum Opulus (Netherbyres)
Matricaria Parthenium
Carlina vulgaris
Hieracium prenanthoides
Tragopogon minor
Anagallis arvensis
Mertensia maritima
Solanum Dulcamara
Linaria vulgaris
Atriplex Babingtonii
Neottia Nidus-avis (Netherbyres)
Listera ovata (Netherbyres)
Gymnadenia conopsea
Blysmus rufus
Carex disticha
" arenaria
" vulpina
" ovalis
Triticum repens
" laxum
" junceum
Asplenium Adiantum-nigrum
" Trichomanes
Botrychium Lunaria
Ramalina scopulorum

The total expenses at Eyemouth, including tea, beds, breakfast, and sandwiches, were 5s., which added to the railway fare makes the expense of the trip 7s. 6d.

Ben Lawers.

Friday, 3rd August 1855.

A party consisting of J. H. Balfour, R. K. Greville, Thomas Barclay, Joseph Bell, James S. Candlish, P. Neill Fraser, James Gilchrist, James Hector, Charles W. Hope, J. Augustus Metcalfe, James Miller, William Nichol, William Ogle, Andrew Pow, James C. Rattray, William D. Singer, Mohamed Ali Soubki, Hugh G. Stewart, C. J. J. Terrot, V. E. D. Walker, left Edinburgh on Friday, 3rd August, at 6.30 a.m., and reached Stirling at 8.20. Met Dr. Gilchrist and Mr. Bell there. Nineteen breakfasted in Campbell's Royal Hotel. Some of the party gathered *Lactuca virosa* and *Linaria repens* at Stirling Castle. After breakfast, left in a coach, hired for the purpose, whieh held six inside and thirteen out.

On reaching Callander visited Bracklinn Bridge, where we found :—

Vicia sylvatica
Hieracium denticulatum
" prenanthoides
Hieracium strictum
Polypodium Dryopteris
Equisetum umbrosum

Dr. Greville gathered *Diatomella Balfouriana* and other Diatomaceæ.

Changed horses at Callander at Menzies' Inn—Menzies had been a keeper at Braemar when Greville, Brand, and I visited that part of the country in 1847. Met Mr. Hill and his son at Callander. Proceeded by the Pass of Leny to Loch Lubnaig. Gathered :—

Nuphar luteum	Nymphæa alba
,, pumilum	Lysimachia vulgaris

Again changed horses at King's House, near Lochearnhead. Walked from Lochearnhead to the summit of the Pass. On the way gathered many good mosses and diatoms :—

Bryum elongatum	Orthotrichum rupestre
Didymodon capillaceum	Blindia acuta
Neckera crispa	Hypnum myosuroides
Bryum alpinum	Sticta fuliginosa (Bracklinn Bridge)
,, nutans	
,, julaceum (in abundant fructification)	

Reached Mrs. M'Tavish's Inn at Killin at 7 p.m., and were all comfortably accommodated. Met Mr. Rattray, who joined the party. Met also a Mr. Young, who was making a collection of ferns ; he was particularly interested in the ferns of Wales, and was engaged in publishing a work on the subject, illustrated by specimens.

Saturday, 4th August 1855

Party numbering 21, including Mr. Young from Wales, proceeded at 8 a.m. to Craig Chailliach.

In Finlarig woods gathered *Linnæa borealis* and *Habenaria chlorantha.* Noticed particularly Watson's regions in ascending, characterised by *Rubus Chamæmorus, Calluna vulgaris, Erica Tetralix, Pteris aquilina.*

On reaching the foot of the cleft on Craig Chailliach, gathered *Polystichum Lonchitis, Polystichum lobatum* and varieties.

Ascended the hills and went along the foot of the high cliffs till we reached a deep ravine by which we ascended to the

summit. Had a fine view although the day was rather misty now and then, though beautiful glimpses were seen of the surrounding scenery. On the Ben Chailliach cliffs were gathered all the ordinary alpine plants. Some of the rarer species seen were :—

Draba incana
„ verna, var. inflata
Cochlearia officinalis
„ alpina
Cerastium alpinum
Sagina apetala
„ subulata
Potentilla alpestris
Saxifraga nivalis
Epilobium alpinum
Vaccinium uliginosum
Armeria maritima
Euphrasia officinalis, var. gracilis
Oxyria reniformis
Salix nigricans, var. rupestris
Carex atrata
„ stictocarpa
„ capillaris
Sesleria cærulea
Poa alpina vivipara
„ Balfourii and vars.
Botrychium Lunaria

The ravine at the end of the cliffs was very productive of alpine plants :—

Alsine rubella
Dryas octopetala
Potentilla alpestris
Veronica saxatilis
Juncus biglumis
Luzula spicata

Rain came on and lasted for about an hour. Walked along the cliffs towards Ben-y-Cruiach Ben, and ascended the hill—reached the summit about 3 p.m. Gathered :—

Sibbaldia procumbens
Saussurea alpina
Carex atrata
„ pulla

Dr. Greville saw a golden eagle to-day, and Messrs. Metcalfe and Walker saw two eagles with white tail feathers.

Reached the inn about 6 p.m.

Craig Chailliach 2570 feet, Ben-y-Cruiach Ben 3070 feet above Killin.

Monday, 6th August 1855.

Twenty started this morning at 7.30 a.m. for Ben Lawers. Morning tolerable, but the hills misty. In the course of the day

the mist became very thick and rain fell in quantity. Walked to the 4¾ mile-stone from Killin, and then began to ascend the hill. Proceeded first in the direction of Loch-na-gat, gathering on the way :—

Rubus Chamæmorus
Cornus suecica
Eriophorum latifolium
Splachnum sphæricum

Visited the rocks above Loch-na-gat, and then walked round the corrie in the midst of mist—the effects of the late storms seen in the debris on the hills—appearance of the effects of water-spouts. Gathered :—

Erigeron alpinus
Myosotis suaveolens
Juncus castaneus
„ biglumis
Poa Balfourii
Woodsia hyperborea
Polypodium alpestre

and all the ordinary alpine plants. Abundance of *Cystopteris montana* on rocks to the west of Loch-na-gat.

Ascended to the top of Ben Lawers, which was reached about 3 p.m. Near the summit got *Draba rupestris*, *Cetraria islandica.* The wind on the summit was very strong, accompanied with mist and rain. Descended from the summit by the aid of the compass, taking a S.W. direction. Reached the glen leading to Glen Lyon, and thence proceeded across the flanks of Cat-yaheaman to Loch Tay. Reached the inn about 6.30 p.m. thoroughly drenched. On our return home at night found Mr. Hugh Macmillan, who had arrived from Aberfeldy in the morning with the view of ascending Ben Lawers.

Peltidea venosa is abundant on walls near Killin.

Tuesday, 7th August 1855.

This morning was wet, misty, and unpromising, and the party found it impossible to ascend any of the hills. Dr. Greville, on account of the weather, left for Edinburgh at 1 o'clock by the coach passing through Stirling. He took with him my packet of dried plants, including *Cystopteris montana*, also some roots of it as well as of *Polypodium alpestre*, *Woodsia hyperborea* and *Draba rupestris.*

About 10 a.m. some of the party visited the Macnab Burying Ground and saw the peculiar fir in which a branch from another tree has fallen into a cleft and become grafted; the branch now hangs down from the plant to which it is attached.

Some of the party then walked along the south side of Loch Tay and gathered numerous ferns in a fine state:—

Asplenium viride
,, Trichomanes (very large)
Polypodium Dryopteris
,, Phegopteris

Proceeded about six miles along the shore to a ferry, there crossed the loch, landing between one and two miles west of Lawers Inn. Returned by the road to Killin, visiting the upper part of Loch Tay and gathering :—

Arctium majus
Calamintha Clinopodium
Salix phylicifolia
Carex vesicaria
Parmelia caperata

Mr. Nichol attempted the ascent of Meal Ghaordie, but failed on account of the mist. Mr. Macmillan left for Aberfeldy by coach.

Wednesday, 8th August 1855.

The morning was doubtful, mist hung over the hills, and there was a calm in the air. The wind, however, ultimately assumed a north-westerly direction, and part of the mist was cleared away, but the higher summits were covered all day. Captain Terrot, Mr. Rattray, and Mr. Singer left for the South. There remained, therefore, 16 of our party, of whom 13 went to Meal Ghaordie, while three remained fishing in the Dochart, and caught two dozen trout. The botanical party started about 7.30 a.m. and walked along the banks of the Lochay. At Lochay Inn met Mr. George Mann, who had been successful in getting *Cystopteris montana* on Chorrach Uachdar. Walked about three miles up the Lochay to a farm, near which was seen some common metamorphic limestone with mica slate alternating with it. At the lower part of the hill picked :—

Corydalis claviculata
Drosera anglica
Meum athamanticum
Malaxis paludosa
Gymnadenia albida

Ascended by the south-eastern side of the hill, gathering :—

Rubus Chamæmorus
Cornus suecica
Vaccinium uliginosum
Tofieldia palustris

Then ascended to the summit amidst thick mist, gathering a number of alpine plants, especially mosses and lichens. Descended to the northern side of the hill, and afterwards examined the rocks on the southern side.

Among the plants gathered were (on the northern side by Mr. Nichol) :—

Salix Lapponum
„ Myrsinites
Salix arbutifolia
Rhynchospora alba

Also gathered :—

Silene acaulis
Cherleria sedoides
Sibbaldia procumbens
Epilobium alpinum
Gnaphalium supinum
Salix venulosa
„ herbacea
„ reticulata
Juncus trifidus
„ biglumis
„ triglumis
Carex pulla (some specimens very large on northern side by Mr. Nichol)
Poa Balfourii
Allosorus crispus
Polypodium alpestre (in fruit on southern rocks)
Cystopteris dentata
Polystichum Lonchitis
Lastrea dilatata
„ „ var. collina
Splachnum mnioides
Sphærophoron coralloides
Stereocaulon paschale

Mr. Hector, by the aneroid, made height of hill 3124 feet, and height of *Pteris* about 1200 or 1300 feet above Killin.

Party returned to the inn about 6.30 p.m.

Thursday, 9th August 1855.

The morning was promising although there was still mist on the hills. A party of ten started for Ben Lawers about 7.30 a.m. The remainder went fishing and geologising. Mr. Hector examined the limestone quarry up the Lochay. The party to Ben Lawers walked by the road for about three miles, and then

turned up the hill. Ascended the back of the hill called Ben y Lassigh. By the time the party reached the summit there was still thick mist. Visited the cliffs on the west side of Ben Lawers and found abundance of :—

Draba rupestris (which was also found lower down)
Alsine rubella
Sedum villosum (which extended to near the summit)
Erigeron alpinus
Gentiana nivalis

Ascended the south side of Ben Lawers and saw abundance of *Saxifraga cernua*, some in flower, some in fruit, some barren. Then reached the summit of the hill, which was gained about 2 p.m., where we had a splendid view of the country around. The view was very extensive—Ben Lomond, Ben More, Ben na Mac Dhu, Ben Nevis, Ben Cruachan, and Schiehallion were seen.

Descended from the summit in the direction of Loch-na-gat. Gathered :—

Cerastium alpinum and many alpine plants
Alsine rubella
Juncus castaneus
Phleum commutatum
Cystopteris montana

The sides of the hills were furrowed with the effects of the rain of the 3rd August, apparently as if waterspouts had burst on the hills. Vast masses of debris were carried down to the valleys below, and deep furrows were made in the hill.

Returned to the inn about 7 p.m.

Friday, 10*th August* 1855.

Many of the party were disposed to go directly to Inverarnan to-day, and accordingly Mr. Barclay, Dr. Ogle, Messrs. Fraser, Candlish, Stewart, Walker, and Dr. Soubki went by coach to Inverarnan, carrying the baggage of the party. They left Killin about 8 a.m. The remainder, viz. Dr. Balfour, Messrs. Hope, Nichol, Pow, Bell, Miller, Hector, Metcalfe, and Dr. Gilchrist, after settling the bill at Killin, proceeded on foot up Glen Lochay as far as the slated farm-house, where they were hospitably entertained with milk and cakes. The morning was

dull, and there was some drizzling rain on the high grounds, while the tops of the hills were covered with heavy and thick mist. On leaving the farm-house the party walked directly up the hill opposite the house, and finally reached the mountain called Chorrach Uachdar. The cliffs of this hill were carefully examined, and many alpine plants were seen, such as :—

Sibbaldia procumbens	Oxyria reniformis
Saxifraga oppositifolia	Salix herbacea
,, stellaris	,, reticulata
Epilobium alsinifolium	Juncus biglumis
,, alpinum	,, triglumis
Gnaphalium supinum	

In a ravine on the hill there was abundance of *Cystopteris montana*; the spot had been apparently recently visited. Probably this was the spot where the plant was gathered by Mr. George Mann. In a spot of difficult access, Mr. Nichol gathered a specimen with a stalk 7 inches long and blade $3\frac{1}{2}$ inches, making a total for the frond of $10\frac{1}{2}$ inches. On Chorrach Uachdar there is a large quantity of the *Cystopteris* in different spots, some of them not likely to be reached except by good alpine climbers. Near the summit of this high hill there was abundance of *Tussilago Farfara* as well as *Bellis perennis*.

On leaving the cliffs, which are about 2400 feet above the level of the sea, the party ascended to the top of the hill (probably 1000 feet more) amidst thick mist; they required to guide themselves in their descent by the compass, directing their course S.W. On their way down *Arctostaphylos Uva-ursi* was gathered, also *Hieracium boreale*.

The party reached the Dochart, across which they waded. In Loch Dochart *Lobelia Dortmanna* was picked.

They then proceeded to Crianlarich, where they had refreshments, and then walked amidst drizzling rain and mist to Inverarnan, which was reached (M'Lellan's Inn) about 8.30 p.m., after walking for twelve hours, and covering 32 or 34 miles, many of them over lofty hills. Two of the party (Fraser and Candlish), who had gone by coach in the morning to Inverarnan, and thence to Tarbet by steamer, and walked back, gathered on the way *Osmunda regalis* and *Lythrum Salicaria*.

The party at Inverarnan to the number of 14 were most comfortably accommodated at this inn.

The Lochay Inn (John Cameron's), close to the bridge over the Lochay, and about half a mile from Killin, is infinitely superior to M'Tavish's at Killin, and ought to be encouraged.

Saturday, 11*th August* 1855.

The morning was misty and drizzly as on former days. The mist reached to the very bottom of the mountains and completely obscured the view of the beautiful scenery on Loch Lomond. After breakfast we left by the boat at 7.45 a.m. and reached Balloch, whence we proceeded by train to Bowling, and then to Glasgow, reached about 12.45, and Edinburgh reached at 2.45 p.m., thus ending the highland excursion for the season.

EXCURSIONS IN 1856.

Corstorphine, Almond Bridge, Cramond, Granton.

Saturday, 10*th May* 1856.

About 120 pupils met at the Edinburgh and Glasgow Railway Station at 12 noon and proceeded by train at 12.15 to Corstorphine Station (tickets 3d. each), thence walked over the hill to the Almond Bridge, and by the banks of the river to Cramond and along the shore to Granton.

Among the plants gathered were:—

Anemone nemorosa
Ranunculus Ficaria
Caltha palustris
Cochlearia officinalis
Capsella Bursa-pastoris
Viola hirta
„ sylvatica
Lychnis diurna
Stellaria media
„ Holostea
Geranium lucidum
„ molle
Prunus communis
„ Avium
Fragaria vesca
Potentilla Fragariastrum
Saxifraga granulata
Ribes Grossularia
„ alpinum
„ rubrum

Galium Cruciata
Tussilago Farfara
Petasites vulgaris
Myosotis arvensis
Linaria Cymbalaria
Nepeta Glechoma
Lamium purpureum
„ album
Mercurialis perennis
Ulmus montana (in fruit)
Betula alba
Salix (various)
Orchis mascula
Endymion nutans
Luzula sylvatica
Carex vulgaris
Taxus baccata
Pinus sylvestris
Asplenium Trichomanes
„ Ruta-muraria
Cystopteris fragilis
Lastrea Filix-mas
Equisetum arvense

Some of the party visited Colinton and gathered :—

Helleborus fœtidus
Berberis vulgaris
Doronicum Paradalianches
Arum maculatum

Gorebridge, Arniston, Dalhousie, Dalkeith.

Saturday, 17*th May* 1856.

Party of 110 met at the North British Railway Station at 11.20 and proceeded to Gorebridge, thence walked to Arniston, Dalhousie, and Dalkeith Station, returning about 8 p.m. Return tickets, 1s. The day was very showery.

Among the plants gathered were the following :—

Anemone nemorosa
Ranunculus auricomus
„ Ficaria
Aconitum Napellus (in leaf)
Barbarea vulgaris
Viola sylvatica
Stellaria nemorosa
Moehringia trinervia
Oxalis Acetosella
Sarothamnus scoparius
Lathyrus macrorrhizus
Prunus communis
„ domestica
Prunus Avium
„ Padus
Geum urbanum
„ rivale
Chrysosplenium oppositifolium
„ alternifolium
Ribes Grossularia
„ alpinum
Myrrhis odorata
Adoxa Moschatellina
Galium Cruciata

Asperula odorata
Valeriana pyrenaica (not in flower)
Petasites vulgaris
Doronicum plantagineum (not in flower)
Primula vulgaris
„ veris
Fraxinus excelsior
Vinca minor
Pulmonaria officinalis
Myosotis sylvatica
Lathræa Squamaria (abundant)
Lamium purpureum
„ album
Buxus sempervirens
Ulmus montana
Fagus sylvatica
Salix Russeliana
„ Caprea
Neottia Nidus-avis
Orchis mascula
Galanthus nivalis (in fruit)
Allium ursinum
Arum maculatum
Carex vulgaris
Alopecurus pratensis
Pinus sylvestris
Equisetum Telmateia
„ arvense
„ limosum
Polypodium vulgare
„ Phegopteris
Xyloma acerinum
Polyporus betulinus?

Burntisland, Starly Burn, Aberdour.

Saturday, 24*th May* 1856.

Party of about 90 proceeded by train at 9.45 a.m. to Granton, thence to Burntisland. Return tickets, 9d. From Burntisland the party walked by the shore to Starly Burn and Aberdour, and returned by the boat leaving Burntisland at 5 p.m.

Among the interesting plants gathered were the following:—

Ranunculus auricomus
Cheiranthus Cheiri
Arabis hirsuta
Cochlearia danica (Island)
Sisymbrium Thalianum
Lepidium Smithii
Thlaspi arvense
Helianthemum vulgare
Viola sylvatica
„ tricolor, var. arvensis
„ lutea
Acer Pseudo-platanus
Geranium sanguineum
„ phæum
Medicago maculata
Anthyllis Vulneraria
Vicia hirsuta
„ lathyroides
Spiræa Filipendula
Pyrus Malus
Saxifraga granulata
Myrrhis odorata

Æthusa Cynapium
Asperula taurina (near Burntisland)
Valerianella olitoria
Leontodon lævigatus
Primula caulescens
„ elatior
Anchusa sempervirens
Myosotis collina
Solanum Dulcamara
Salvia Verbenaca
Lamium incisum
Asarum europæum
Ruscus aculeatus
Scolopendrium vulgare
Botrychium Lunaria
Hypnum commutatum (encrusted with carbonate of lime)
Fucus ceranoides (an allowed form of Fucus vesiculosus, fresh-water shore at Aberdour where it joins the sea at Starly Burn)
Exidia Auricula-Judæ (on an elder near Aberdour Castle, Mr. Park, in large quantity)

Penicuik, Auchendinny, Roslin.

Saturday, 31*st May* 1856.

Party of about 80 met at the North British Railway Station at 8.40 a.m. and proceeded to Penicuik, then walked to Auchendinny and Roslin by banks of the Esk. Tickets to Penicuik and return from Roslin, 1s. 3d. each.

Among the plants collected were the following:—

Anemone nemorosa
Ranunculus auricomus
Trollius europæus
Aquilegia vulgaris (Auchendinny)
Aconitum Napellus (Auchendinny, not in flower)
Cardamine amara
„ hirsuta
„ sylvatica
Viola palustris
Cerastium glomeratum
Stellaria nemorum
„ uliginosa
Moehringia trinervia
Montia fontana
Geranium sylvaticum
„ molle
Oxalis Acetosella (pink)
Prunus Padus
Pyrus Aucuparia
„ Malus
Saxifraga granulata
Chrysosplenium alternifolium
Ribes Grossularia
„ rubrum
„ nigrum
Sanicula europæa
Myrrhis odorata

Adoxa Moschatellina
Myosotis versicolor
Veronica agrestis
„ arvensis
„ montana
Betula glutinosa
Salix fragilis
„ cinerea
„ Caprea
Neottia Nidus-avis
Orchis mascula
Luzula pilosa
Carex præcox
Melica uniflora
Polystichum aculeatum
Polypodium Dryopteris
„ Phegopteris
Equisetum maximum
„ arvense
„ umbrosum (Auchendinny and Penicuik)
„ sylvaticum
„ palustre
„ limosum
„ hyemale
Bartramia fontana
Agaricus fascicularis
Morchella esculenta

Mid-Calder, Meadowbank, Dalmahoy Hills, Ravelrig, Currie.

Saturday, 7th June 1856.

Party of 80 met at the Caledonian Railway Station at 9.35 a.m. and proceeded to Mid-Calder, then walked to Meadowbank, Dalmahoy Hills, Ravelrig, Water of Leith, and Currie, returning from the latter place at 5.36 p.m. Return third-class tickets, 8d. Morning good, but afternoon very wet.

Among the plants collected were the following :—

Trollius europæus
Meconopsis cambrica
Corydalis claviculata
Draba verna
Sisymbrium Thalianum
Viola palustris
„ sylvatica
„ canina
„ tricolor
„ lutea
Geranium sylvaticum
„ columbinum
Prunus insititia
„ domestica
Geum intermedium
Saxifraga hypnoides
Myrrhis odorata
Linnæa borealis
Leontodon palustris
Vaccinium Myrtillus
Pyrola minor
Trientalis europæa
Anchusa sempervirens
Myosotis versicolor

Scrophularia vernalis (Meadowbank)
Salix cinerea
„ aquatica
„ Caprea
Corallorrhiza innata
Listera ovata
Orchis mascula
„ latifolia
Narcissus poeticus
Allium ursinum
Tulipa sylvestris
Arum maculatum
Scirpus cæspitosus
Carex vulgaris
„ glauca
„ binervis
Pinus sylvestris
Polypodium Phegopteris
Botrychium Lunaria
Equisetum arvense
„ sylvaticum
„ palustre
„ limosum
Weissia verticillata (at Currie)
Tortula papillosa (at Balerno)
Sticta crocata (and other lichens, Dalmahoy)
Sticta scrobiculata
Lecanora tartarea
Usnea barbata
Parmelia pulverulenta
„ pallescens

Cockburnspath, Dunglass Dene, Pease Dene.

Saturday, 21*st June* 1856.

Party of between 80 and 90 met at the North British Railway Station at 8 a.m. and proceeded to Cockburnspath, visited Dunglass Dene, stones in the neighbourhood, and Pease Dene, returning by train passing Cockburnspath at 6.3, and reaching Edinburgh about 8 p.m. Return tickets, 2s.

Among the plants gathered were the following :—

Ranunculus hederaceus
Silene maritima
Stellaria uliginosa
Geranium phæum
„ sylvaticum
Trifolium arvense
„ striatum
Anthyllis Vulneraria
Astragalus hypoglottis
Vicia sepium
„ sativa
„ lathyroides
Chærophyllum temulum
Œnanthe crocata
Valerianella olitoria
Carduus acanthoides
Pyrola minor
Vinca major

Vinca minor
Anchusa sempervirens
Hyoscyamus niger
Veronica montana
Lamium Galeobdolon
Chenopodium Bonus-Henricus
Neottia Nidus-avis
Carex pendula
Briza media
Polystichum aculeatum
„ angulare
Equisetum Telmateia
„ arvense
„ palustre
„ limosum
Weissia verticillata
Plocamium coccineum
Delesseria sanguinea
„ limosa
„ alata
Odonthalia dentata
Alaria esculenta
Ptilota plumosa
Halidrys siliquosa
Desmarestia aculeata
Laminaria saccharina
„ digitata
Polysiphonia fastigiata
Chylocladia articulata
Corallina officinalis
Rhodymenia palmata
Hypnea purpurascens
Enteromorpha intestinalis
Polyporus versicolor

North Queensferry, Inverkeithing, St. Davids.

Saturday, 28th June 1856.

Party of 50-60 met at Granton Pier at 6 a.m. and proceeded by steamboat to North Queensferry, thence walked to Inverkeithing and St. Davids, and returned to Queensferry by boat between 3 and 4 p.m. Return tickets—Queensferry, 9d.; Granton Pier, 2d.; Ferry Pier, 6d.

Among the plants gathered were the following:—

Thalictrum flexuosum
„ majus
Ranunculus hederaceus
Papaver Rhœas
„ dubium
„ Argemone
Fumaria micrantha
Draba verna
Brassica oleracea
Diplotaxis tenuifolia
Thlaspi arvense
Reseda lutea
Viola hirta
„ canina
Saponaria officinalis
Lychnis vespertina
Cerastium tetrandrum
„ semidecandrum
Sagina maritima
„ subulata

Lepigonum marinum
Linum usitatissimum
Geranium sanguineum
„ sylvaticum
„ pyrenaicum
Melilotus officinalis
Trifolium arvense
„ striatum
„ filiforme
Astragalus Glyciphyllos
Oxytropis Halleri
Vicia lutea
„ sativa
Spiræa Filipendula
Rubus corylifolius
Potentilla verna
Comarum palustre
Rosa spinosissima
Sedum Telephium (not in flower)
Sedum villosum
Sempervivum tectorum (not in flower)
Callitriche platycarpa
Carum Carui
Anthriscus vulgaris
Œnanthe crocata
Haloscias scoticum
Pastinaca sativa (St. Davids)
Daucus Carota
Sambucus Ebulus (not in flower)
Filago germanica
Antennaria dioica
Anthemis Cotula
Carduus tenuiflorus
„ crispus
Campanula rotundifolia
Erica cinerea
Armeria maritima
Anagallis arvensis
Lithospermum arvense
Echium vulgare
Veronica agrestis
Lamium intermedium
„ maculatum
Scleranthus annuus
Suæda maritima
Orchis mascula
„ maculata
Scirpus pauciflorus
Carex (numerous species)
Arundo epigejos (St. Davids)
Trisetum flavescens
Koeleria cristata
Sclerochloa maritima
„ distans
Festuca arundinacea
Nardus stricta

Arran.

Wednesday, 2nd July 1856.

Party consisting of J. H. Balfour, George J. Allman, Alex. Abercrombie, Arthur Amys, J. W. Anderson, Roderick Hope Bain, John B. Balfour, Thomas Barclay, John M. Bell, Joseph Bell, M. Montgomerie Bell, William M. Black, James M. Brodie, E. B. Broxter, James Burn, George Calvert, James S. Candlish

T. S. Christie, R. H. Clay, John de la Condamine, Robert C. Cowan, Ric. John Will. Dixon, James Dodd, George Dods, T. T. Douglass, Andrew Duncan, John Duncan, San Effendi, F. W. A. Fabeck, William Forbes, Thomas Fuller, Archibald W. Hamilton, Robert B. Hay, James Hector, George Hill, M. Horn, C. R. Howden, W. Jernanor, Henry Leach, W. Ward Lendam, William Lorimer, Alexander J. Macfarlan, William M'Neillie, Robert Maxwell, F. A. Morton, John R. Murray, William Nichol, Arthur Pearse, Andrew Pow, John Sandison, John Small, William D. Singer, Alex. D. Soutter, Wm. Hy. Stephenson, William Turnbull, Thomas James Walker, and George Williamson, met at the Edinburgh and Glasgow Railway Station at 8.20 p.m., and proceeded by the 8.30 train to Glasgow. Return tickets, available till 5th, 3s. 6d.

Reached Glasgow at 10.30 p.m., and proceeded to the Queen's Hotel, George Square (Mr. Macgregor), where accommodation was ready for us all.

Thursday, 3rd July 1856.

Party was roused at 6 a.m., and, after settling the bill, proceeded at 7 a.m. to the Broomielaw to the Arran steamboat "Jupiter." Baggage was conveyed in a cart for a charge of 3s. Breakfasted on board the "Jupiter." Reached Springbank about 1 p.m. Here the botanical party landed with all the baggage, while Professor Allman with a party of about 12 proceeded by the steamboat to Holy Island. There Dr. Greville and Dr. Miles had boats ready for the party (dredging), who were very successful.

The botanical party, after making arrangements at the inn for beds and tea-dinner, walked by the shore to Corriegills and Clachland Point. Crossing the trap without going round the point, they walked by the shore to Lamlash, meeting Dr. Greville, and afterwards went by the road to Springbank.

The chief plants gathered were :—

Hypericum Androsæmum
Saxifraga Geum (wood near Springbank)
Cotyledon Umbilicus
Anagallis tenella
Samolus Valerandi
Pinguicula lusitanica
Juncus maritimus (not in flower)
Blysmus rufus

Schœnus nigricans
Carex lævigata
,, fulva
Triticum laxum (near Lamlash)
Hymenophyllum Wilsoni
Asplenium marinum
Lastrea Oreopteris

Also on shore between Springbank and Brodick :—

Brassica monensis
Eryngium maritimum
Mertensia maritima
Fucus vesiculosus, vars.

Returned for tea-dinner about 7 p.m. After putting plants in paper retired to rest, some to beds, others to mattresses on the floor of the court house, others to a bed of straw. One of the party slept in a sycomore-tree for three hours, and another lay on the grass plot.

Friday, 4th July 1856.

All were roused at 6 a.m., and, after breakfasting in the open air, started about 7.30 for their destinations. About 12 went to dredge with Professor Allman, the rest went to Goatfell. The day was good at first and promised well, but ere we reached the summit of the mountain (which is 2875 feet high) mist and rain came on. We found it impossible to go along the ridge to Glen Sannox, and we therefore descended to the shore at Brodick, and walked towards Corrie.

The plants gathered were :—

Sedum anglicum
Œnanthe Lachenalii (not in flower)
Jasione montana
Anagallis tenella
Erythræa littoralis (not in flower)
Linaria Cymbalaria
Pinguicula lusitanica
Lycopus europæus (not in flower)
Scutellaria galericulata
Gymnadenia conopsea
Habenaria chlorantha
Juncus maritimus (not in flower)
Potamogeton plantagineus
Schœnus nigricans

In woods on the Red Sandstone Cliffs :—

Lythrum Salicaria (not in flower)
Hymenophyllum tunbridgense
Lastrea dilatata
,, Foenisecii
Osmunda regalis

On Goatfell :—

Alchemilla alpina
Saxifraga stellaris
Peplis Portula
Vaccinium Vitis-Idæa
Salix herbacea
Carex pauciflora
Carex pilulifera
,, pallescens
Juniperus nana
Lycopodium Selago
Batrachospermum vagum

Returned to Springbank about 3.30 p.m. Dredging party did not return till 7.30 p.m.

Mr. Nichol walked by Corrie to Loch Ranza, and did not return to Springbank till next day, when he brought back with him *Pyrus fennica, Drosera anglica, Lobelia Dortmanna.*

Saturday, 5th July 1856.

The morning was beautiful, and all breakfasted about 7 a.m. in the open air at Springbank. After breakfast the party divided into different sections, some going to dredge in Lamlash Bay, others boating and fishing, others going to Holy Island. The party for Holy Island proceeded to Lamlash and got a large boat to take them across and wait for them. They inspected Dr. Miles' Vivarium which is admirably kept, and contains many beautiful specimens of marine animals. Dr. Miles and Dr. Greville left in the morning for Glasgow.

The party next examined the vegetation of the island and gathered :—

Sedum anglicum
Arctostaphylos Uva-ursi
Lycopus europæus
Scutellaria galericulata
Zostera marina
Asplenium marinum
Osmunda regalis

Visited also St. Molio's Cave ; some ascended to the top of the island. The day became overcast and some rain descended. It was not, however, till late in the afternoon that the mist, rain, and wind became great.

On returning to Lamlash gathered fine specimens of *Hypericum Androsæmum* and *Cotyledon Umbilicus.* Joined the boat at 1.45 p.m., our baggage having been put on board at Springbank.

Dined on board the boat. Took up some of the party at Corrie in passing. The captain of the "Jupiter" made great efforts to take the party back to Glasgow in time for the 8 o'clock train to Edinburgh. He was much hindered by the parties coming on board at all the ports, owing to the day being set apart for Greenock Fair. In spite of this, we reached the Broomielaw at 7.45 p.m., and were in time for the train, reaching Edinburgh at 10 p.m.

Dysart, Wemyss, MacDuff's Castle, Leven Bridge, Thornton.

Saturday, 12th July 1856.

Party of 70-80 met at the Edinburgh, Perth, and Dundee Railway Station at 9.45 a.m. and proceeded to Dysart, thence walked to Wemyss, MacDuff's Castle, and Thornton Junction, where they joined the train at 8.10 p.m., and returned to Edinburgh about 10. Return tickets, 2s.

Professor Allman with a geological party accompanied the botanists. At Dysart Station Mr. Barclay, Mr. Kerr, mining engineer, and the Messrs. Knight, sons of the Free Church minister of East Wemyss, met the party. Mr. Bywater also met them at his College, and exhibited his coal fossils and some diamonds. At Dysart the geological and botanical parties separated, the geological party guided by Mr. Kerr, the botanical by Messrs. Knight. The botanists walked near the shore to Wemyss, saw fossils on shore in shale.

Visited Chapel Gardens under guidance of Mr. Bywater, the gardener. Went to Wemyss Castle—examined cliffs and garden, went by shore to East Wemyss, called at Mr. Knight's and saw a beautiful collection of seaweeds and zoophytes, then walked to caves and gathered *Asplenium marinum.*

Visited the cave below MacDuff's Castle, and lunched at the Castle about 3.30 or 4 p.m. Violent thunderstorm passed towards south-east, we only got a few drops of rain. Mr. Barclay kindly provided lunch for the whole party. Walked towards Leven Bridge, and then by banks of Leven and Ore to Thornton Junction.

Among the plants collected were the following :—

Thalictrum minus
Ranunculus aquatilis
Brassica oleracea (Wemyss Castle rocks)
Lepidium latifolium (Wemyss Castle rocks)
Cerastium glomeratum
Hypericum humifusum (Leven Railway banks)
Linum usitatissimum
Geranium sylvaticum
„ pratense
Acer campestre (hedges, MacDuff's Castle)
Pyrus Aria
Circæa lutetiana (Chapel woods)
Conium maculatum
Smyrnium Olusatrum (Wemyss Castle)
Sambucus nigra, var. laciniata (near Chapel)
Valeriana pyrenaica (woods at Wemyss Castle)
Dipsacus sylvestris (near Wemyss)
Knautia arvensis
Matricaria Parthenium
Senecio viscosus
Cynoglossum officinale
Anchusa sempervirens
Hyoscyamus niger (Wemyss Castle)
Verbascum Thapsus (MacDuff's Castle)
Galeopsis versicolor
Atriplex Babingtonii
Polygonum Raii (near West Wemyss)
Rumex viridis
Euphorbia exigua
Listera ovata
Lilium Martagon (from garden)
Scirpus setaceus (near Thornton)
„ sylvaticus (near Thornton)
Carex lævigata (near Thornton)
Festuca arundinacea
Triticum junceum
Asplenium marinum (caves at Wemyss)
Polyporus

Moffat.

Friday, 18*th July* 1856.

Party consisting of J. H. Balfour, A. Amys, J. Ballantyne, John Montgomerie Bell, Joseph Bell, M. Montgomerie Bell, James B. Carruthers, William Carruthers, John de la Condamine, Alexander Dickson, A. B. Duffin, Allan Duke, P. Neill Fraser, H. R. Handyside, Charles Wm. Hope, John A. Hudleston,

J. St. Johnston, William Johnston, Henry Leach, Alexander J. Macfarlan, David Philip Maclagan, Robert Craig Maclagan, W. M'Neillie, Alex. C. Maingay, A. Murray, Robert Nicholson, John Orphoot, Ric. John Wil. Orton, James Sadler, John Sadler, William R. Sanders, Thomas James Walker, George Williamson, met at the Caledonian Railway Station at 5 p.m., and proceeded to Beattock, which was reached about 8.30 p.m. Return ticket, 4s. Three of the party, Messrs. Leach, Walker, and Orton, missed the train, and came by one at 8.15 p.m.

At Beattock met the Rev. Mr. Little, who had kindly made preparation for our accommodation at Moffat. Walked to Moffat and took up our quarters at the Annandale Arms Inn, Mrs. Cranstoun's, where all were comfortably accommodated. Beds were provided for the most of the party in the town. Mr. Hope, Mr. Fraser, and Mr. Maingay had been in the district two days before us and brought a number of good plants, among others *Vicia Orobus* and *Allosorus crispus.*

Saturday, 19*th July* 1856.

Breakfasted about 6.30 a.m. After settling bill proceeded by one omnibus with four horses and two carriages with two horses each to the Grey Mare's Tail. There we dismissed our conveyances, and walked the rest of the day.

Visited the waterfall and the rocks near it, gathering :—

Thalictrum minus	Festuca ovina vivipara
Epilobium alpinum	Hymenophyllum Wilsoni
Oxyria reniformis	Allosorus crispus

Thence, under the guidance of a shepherd provided by Mr. Little from Mr. Robert Johnstone, of Polmoodie, walked to Dobb's Linn, picking *Saxifraga stellaris* and *Sedum villosum* on the way. On the rocks near the Linn *Saxifraga hypnoides* and *Botrychium Lunaria.* Thence walked to Loch Skene, gathering on the way *Rubus Chamæmorus* and *Melampyrum montanum*, and in the Loch *Littorella lacustris.* Saw no *Isoëtes.* Some of the party visited the rocks round Loch Skene searching for *Woodsia ilvensis*, but did not find it. Mr. Sadler and his brother had started at about 3 a.m. with the view of getting this

fern, and Messrs. Hope, Maingay, and Fraser examined the Loch Skene rocks very carefully. They had previously searched for the fern unsuccessfully in the Beef Tub. Most of the party examined the rocks on White Coombe, which is said to be the highest hill in the south of Scotland.

On the rocks were found :—

Thalictrum alpinum
Saxifraga stellaris
Sedum Rhodiola
Epilobium angustifolium
„ alpinum
Saussurea alpina
Oxyria reniformis
Salix Lapponum
„ Myrsinites
„ herbacea
Carex rigida
„ pilulifera
Allosorus crispus

Ascended to the summit of the hill and had a splendid view all round, particularly in the direction of the Cumberland hills and the Solway.

After this our guide left us, and we proceeded under the direction of Messrs. Carruthers (natives of Moffat) along the top of the hill towards Hartfell, lunching on the side of a stream between White Coombe and Hartfell. The road was very fatiguing. Reached summit of Hartfell, and had again a splendid view. From this we descended by the Well Burn to the Mineral Well, and thence to Moffat, which was reached about 5 p.m. Some descended by a glen to the road, and Mr. Macfarlan got *Woodsia ilvensis*. After a cold collation we proceeded to Beattock and met the express train at 6.43, by which we returned to Edinburgh about 8.30 p.m.

The following are some of the more interesting plants gathered by the party :—

Ranunculus acris
Trollius europæus
Cardamine pratensis
Cochlearia officinalis
Geranium sylvaticum
Vicia sylvatica (Grey Mare's Tail)
Rubus saxatilis
„ Chamæmorus
Saxifraga oppositifolia (Dobb's Linn)
„ stellaris (Dobb's Linn)
„ hypnoides (Dobb's Linn)
Sedum Rhodiola
„ villosum (Dobb's Linn)

Callitriche platycarpa
„ pedunculata
Epilobium angustifolium
„ alpinum
Circæa alpina
Viburnum Opulus
Galium pusillum (Grey Mare's Tail)
Valeriana officinalis
Solidago Virgaurea
Antennaria dioica
Saussurea alpina
Vaccinium Vitis-Idæa
Pyrola minor
„ secunda
Melampyrum montanum
Oxyria reniformis
Rumex aquaticus
Salix Lapponum
„ Myrsinites
„ herbacea
Empetrum nigrum
Narthecium ossifragum
Carex remota
„ rigida
„ pilulifera
„ binervis
„ flava
Festuca ovina vivipara
Hymenophyllum Wilsoni
Allosorus crispus
Athyrium Filix-fœmina
Woodsia ilvensis
Cystopteris fragilis
Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
Marchantia androgyna
Neckera crispa
Cladonia rangiferina
Sticta sylvatica
„ scrobiculata
„ pulmonaria

Haddington, Lennoxlove, Coalston, Eaglescarnie, Danskine Loch, Yester.

Saturday, 26th July 1856.

Party of 35 met at the North British Railway Station and proceeded to Haddington. Return tickets, 1s. 6d. each. At the Haddington Station met Mr. Shearer, who kindly accompanied us through the woods of Lennoxlove (where we visited the Tower by permission of Mr. Stuart), Coalston, and Eaglescarnie woods, visited Gothic Hall and cave, and walked to Yester, thence we walked to Danskine Loch and returned to Yester House about 3, where lunch was prepared for us by the Marquis of Tweeddale. Lord Arthur Hay and Lord Frederick Hay also joined the party. After luncheon walked by Gifford to Haddington, where the party joined the train at 6.50 p.m., and reached Edinburgh about 8 p.m.

Among the plants collected may be noted the following:—

Ranunculus sceleratus
Stellaria nemorum
Hypericum quadrangulum
„ hirsutum
Tilia grandifolia
„ parvifolia (Lennoxlove)
„ europæa
Geranium sylvaticum
„ pratense
Ononis arvensis
Trifolium medium
Rubus corylifolius
Comarum palustre
Agrimonia Eupatoria
Rosa rubiginosa
Saxifraga umbrosa (Lennoxlove)
Ribes Grossularia
„ alpinum
„ rubrum
Sempervivum tectorum
Epilobium angustifolium
„ hirsutum
„ parviflorum
„ palustre
Circæa alpina
Viburnum Opulus
Doronicum Pardalianches (Lennoxlove)
Arctium minus
Hieracium vulgatum
Tragopogon minor
Campanula latifolia
Calluna vulgaris
Erica Tetralix
„ cinerea
Pyrola minor
Lysimachia nemorum
Anagallis arvensis
Ligustrum vulgare
Erythræa Centaurium
Myosotis sylvatica (Yester)
Lithospermum arvense
Veronica polita
„ scutellata (Danskine)
Atriplex hastata
Polygonum Convolvulus
„ aviculare
„ Persicaria
Rumex sanguineus
„ viridis
Daphne Laureola (Lennoxlove)
Euphorbia exigua
Quercus Robur
„ sessiliflora (Lennoxlove)
Listera ovata
Juncus glaucus
„ supinus (Danskine)
Potamogeton natans (Danskine)
„ compressus
Scirpus setaceus
Carex muricata (Lennoxlove)
„ ovalis
„ sylvatica (Yester)
„ hirta
„ riparia (Danskine)
„ ampullacea
Phalaris arundinacea
Festuca arundinacea
Brachypodium sylvaticum
Triticum caninum
Cystopteris fragilis (Yester)

EXCURSIONS IN 1857.

Craigleith, Corstorphine, Barnton, Banks of the Almond, Cramond, Granton.

Saturday, 23rd May 1857.

Party of upwards of 100 met at Dean Bridge at 10 a.m. and walked by Craigleith Quarry to Corstorphine Hill, crossed over the hill to the Queensferry road, and then proceeded by Barnton to the banks of the Almond and Cramond. Returned by shore of Firth of Forth to Granton, and reached Edinburgh about 5.30 p.m. Rain in the afternoon.

Usual spring plants gathered :—

Anemone nemorosa
Ranunculus Ficaria
Epimedium alpinum
Draba verna
Viola lutea
Geranium lucidum (Caroline Park)
Acer platanoides (near Almond)
Prunus Avium
„ Cerasus
„ Padus
Saxifraga granulata
Ribes Grossularia
„ alpinum
„ nigrum
Valeriana pyrenaica
Doronicum Pardalianches (Corstorphine)
Vinca minor
Lamium maculatum
Ruscus aculeatus
Allium ursinum

Penicuik, Valleyfield, Auchendinny, Roslin.

Saturday, 30th May 1857.

Party of 74 met at the North British Railway Station at 9 a.m. and proceeded to Penicuik. Return tickets, 1s. 3d. Walked to Valleyfield, saw the Paper Works, then walked by the banks of the North Esk to Auchendinny and Roslin. Visited Roslin Chapel. Returned by train passing Roslin Station at 5.29 p.m.

Among the plants gathered were the following :—

Ranunculus auricomus
Trollius europæus (scarcely in flower)
Cheiranthus Cheiri
Arabis hirsuta
Cardamine amara
Viola palustris
Stellaria nemorum
„ uliginosa
Oxalis Acetosella (pink)
Prunus Avium
„ Padus
Rubus saxatilis
Chrysosplenium alternifolium
Adoxa Moschatellina
Valeriana pyrenaica
Vaccinium Myrtillus
Vinca minor
Veronica montana
Lamium incisum
Salix alba
„ cinerea
„ Caprea
Carex vulgaris
„ glauca
„ præcox
Melica uniflora
Asplenium Ruta-muraria (Roslin)
Scolopendrium vulgare (Roslin)
Polypodium Dryopteris
„ Phegopteris
Equisetum Telmateia
„ arvense
„ umbrosum
„ sylvaticum
„ palustre
„ limosum
„ hyemale
Polytrichum commune
Bryum hornum
Hypnum undulatum
Bartramia fontana
Jungermannia albida
„ bidentata
„ epiphylla

Burntisland, Pettycur, Kinghorn.

Saturday, 6th June 1857.

Party of about 100 met at Edinburgh, Perth, and Dundee Railway Station at 10 a.m. and proceeded to Burntisland. Return tickets, 9d.

Walked by shore and rocks near it to Pettycur and Kinghorn, and returned by Kinghorn Loch to Burntisland in time for boat at 5.10 p.m.

Among the chief plants gathered were the following :—

Ranunculus aquatilis
Trollius europæus (Glasmount woods)
Cheiranthus Cheiri
Arabis hirsuta

Alyssum calycinum (railway banks)
Cochlearia officinalis
Thlaspi arvense
Reseda lutea
Viola sylvatica
„ canina
Silene inflata
„ maritima
Lychnis vespertina
Cerastium tetrandrum
„ arvense (Links near Pettycur and railway banks)
Linum catharticum
Geranium sanguineum
Erodium cicutarium
Trifolium repens
„ procumbens
„ minus
„ filiforme
Anthyllis Vulneraria
Astragalus hypoglottis
„ Glyciphyllos (railway banks)
Vicia hirsuta
Fragaria elatior
Saxifraga umbrosa
Carum Carui (near Kinghorn)
Myrrhis odorata
Scandix Pecten-Veneris
Valerianella olitoria
Anthemis arvensis
Senecio viscosus
Centaurea Cyanus
Hieracium vulgatum
Leontodon palustris
Tragopogon minor
Primula veris
Cynoglossum officinale
Linaria Cymbalaria (Pettycur)
Thymus Serpyllum
Salvia Verbenaca
Lamium amplexicaule
„ incisum
Plantago maritima
Parietaria erecta
Orchis mascula
Ruscus aculeatus
Carex arenaria
„ glauca
„ ampullacea
Phleum arenarium
Aira præcox
Avena pratensis
Koeleria cristata
Sclerochloa maritima
„ loliacea
Ophioglossum vulgatum (near Burntisland)
Botrychium Lunaria
Algæ (many)

Lanark, Cora Linn, Bonnington, Stonebyres, Cartland Crags.

Saturday, 13th June 1857.

Party of 100 met at Caledonian Railway Station at 6.45 a.m., and proceeded to Cleghorn Junction. Return tickets, 2s. 6d.

Walked from the station to Lanark, thence to the Falls of Clyde, Cora Linn, and Bonnington, thence to Stonebyres, Cartland Crags, and back to Cleghorn. Returned by train leaving Cleghorn at 4.37 p.m.

Among the plants gathered were the following :—

Trollius europæus
Aquilegia vulgaris
Arabis hirsuta
Draba muralis (rocks at Cora Linn)
Stellaria uliginosa
Geranium sylvaticum
" lucidum
Anthyllis Vulneraria
Vicia Orobus
Rubus saxatilis
Carum Carui
Galium boreale
Solidago Virgaurea
Antennaria dioica
Doronicum Pardalianches
Hieracium murorum
Apargia hispida
Pyrola minor
Polemonium cæruleum
Melampyrum pratense
Polygonum Bistorta
Neottia Nidus-avis
Orchis latifolia
Eriophorum latifolium
Carex disticha
" paniculata
" aquatilis
" vulgaris
" glauca
" panicea
" sylvatica
" binervis
" fulva
" flava
" paludosa
" ampullacea
Milium effusum
Melica nutans
" uniflora
Briza media
Asplenium viride
Cystopteris fragilis
Polystichum lobatum
" aculeatum
Polypodium Dryopteris
" Phegopteris
Equisetum umbrosum
Lycopodium selaginoides

Newton, Dryburgh Abbey, Eildon Hills, Melrose, Minto Crags, Hassendean, Galt.

Saturday, 20th June 1857.

Party of 75 met at the North British Railway Station and proceeded to Newton, then walked to Dryburgh Abbey, banks of Tweed to Eildon Hills and Melrose. Return tickets, 2s. 6d.

Some of the party went to Minto Crags by Hassendean, and gathered :—

Lychnis Viscaria
Asplenium germanicum
Asplenium septentrionale

and some good lichens, as :—

Nephroma resupinata
Parmelia glomulifera
„ aquila
Calicium chrysocephalum
Sticta fuliginosa
„ limbata
„ scrobiculata

Mr. Arnot examined Galtmede Moss and Cauldfield Loch, and got :—

Sedum villosum
Valeriana dioica
Euphorbia Esula
Carex limosa

Among the plants gathered by the party may be noticed :—

Thalictrum flexuosum (Tweedbank)
Eranthis hyemalis (in fruit, Dryburgh)
Aquilegia vulgaris (Dryburgh)
Aconitum Napellus (Dryburgh)
Sisymbrium Thalianum
Sinapis alba
Viola odorata (Dryburgh)
„ lutea (Eildon)
Tilia europæa
Geranium sanguineum
„ sylvaticum
„ pratense
„ lucidum
Euonymus europæus (Tweedbank)
Prunus Avium
„ Cerasus
„ Padus
Rubus saxatilis
Geum intermedium
Saxifraga Geum (Dryburgh)
Lonicera Caprifolium (Dryburgh)
Galium boreale
„ pusillum
Valeriana dioica
Solidago Virgaurea
Antennaria dioica
Anthemis arvensis
Matricaria Parthenium
Doronicum Pardalianches
Fraxinus excelsior
Menyanthes trifoliata
Digitalis purpurea, var. alba
Lathræa Squamaria (Tweedbank)
Origanum vulgare
Lamium album
Plantago media
Polygonum Bistorta
Rumex sanguineus
„ viridis
Salix cinerea
„ aquatica
„ Caprea

Neottia Nidus-avis
Listera cordata
Orchis latifolia
„ maculata
Polygonatum multiflorum
Convallaria majalis
Carex disticha
„ hirta
Nardus stricta
Polystichum aculeatum
Lycopodium clavatum

Mr. Gorrie states that he found *Poterium Sanguisorba* in the low part of the Eildon, in the spot where the great fair is usually held.

East Linton, Binny Wood, Tynningham, Belhaven, Dunbar.

Saturday, 27th June 1857.

Party of 35 met at North British Railway Station at 8 a.m. and proceeded to East Linton, thence walked to Binny Wood, Tynningham, Belhaven, and Dunbar, returning from Dunbar at 6.26 p.m. Return tickets, 2s.

Among the plants collected were the following :—

Thalictrum minus
Papaver Rhœas
„ dubium
„ Argemone
Cochlearia danica
Cakile maritima
Lepigonum marinum
Malva sylvestris
„ rotundifolia
Rhamnus Frangula
Agrimonia Eupatoria
Poterium Sanguisorba (near Belhaven)
Conium maculatum
Scandix Pecten-Veneris
„ Anthriscus
Knautia arvensis
Aster Tripolium
Artemisia maritima, var. gallica
Pyrola minor
Cynoglossum officinale
Solanum Dulcamara
Hyoscyamus niger (Dunbar Castle)
Salicornia herbacea
Suæda maritima
Salsola Kali
Rumex viridis
Hippophaë rhamnoides
Parietaria erecta
Juncus Gerardi
Triglochin palustre
„ maritimum
Carex arenaria
„ distans
„ extensa
Phalaris arundinacea
Phleum arenarium
Sclerochloa maritima
„ loliacea (Dunbar Castle)
Triticum junceum
Lastrea Oreopteris
Verrucaria maura (rocks near Dunbar)

Forteviot, Invermay Woods, Pitkeathly, Moncrieff Hill, Kinnoul Hill, Perth.

Saturday, 4th July 1857.

Party of about 40 met at the Scottish Central Railway Station at 6.30 a.m. and proceeded to Forteviot, and returned from Perth at 6.27 p.m., reaching Edinburgh at 9 p.m. Return tickets, 3s. 11d. They were met by Dr. Lauder Lindsay, Dr. Stirling, Dr. Lyell. They first visited Invermay Woods, and then went to Pitkeathly, visited Moncrieff Hill, crossed the water to Kinnoul Hill, and returned to Perth.

Among the more important plants gathered were the following:—

Thalictrum minus
Nasturtium sylvestre
Hesperis matronalis
Lepidium campestre
,, Smithii
Malva moschata
Genista anglica
Ornithopus perpusillus
Rubus nitidus
Potentilla argentea
Sedum Telephium
Œnanthe crocata
Dipsacus sylvestris
Solidago Virgaurea
Doronicum Pardalianches
Cnicus heterophyllus
Centaurea Scabiosa
Lactuca virosa (Kinnoul)
Vinca minor
Cynoglossum sylvaticum
Echium vulgare
Solanum Dulcamara
Scrophularia vernalis (sparingly)
Betonica officinalis (abundant)
Listera Nidus-avis
,, ovata
Epipactis latifolia (sparingly)
Habenaria viridis
,, chlorantha
Paris quadrifolia (sparingly)
Carex hirta
Aira cæspitosa
,, ,, vivipara
Bartramia pomiformis
Cladonia rangiferina

Perth, Methven.

Saturday, 11th July 1857.

No excursion to-day owing to illness, but Mr. Sadler with others went to Perth, visited Muirward Wood, in Highfield

Farm, near New Scone, and gathered *Moneses grandiflora* and *Trientalis europæa*, then proceeded 6 or 7 miles further to Methven Woods and Marsh. In the Almond Bank Marsh, at fourth milestone from Perth on way to Crieff, gathered :—

Cicuta virosa
Vaccinium Oxycoccus
Utricularia minor
Scheuchzeria palustris
Lastrea spinulosa

Kelso, Cornhill, Coldstream, Tweedmill, Twisel Castle, Norham, Berwick.

Friday, 17*th July* 1857.

The following party met at the North British Railway Station at 4.35 p.m. and proceeded to Kelso :—J. H. Balfour, Thomas Ainslie, J. Andrew, Robert Brown, Robert C. Cowan, Alex. Graham, Alex. Hutchison, Andrew Inglis, John Inglis, John C. Jones, John Linton, Alex. J. Macfarlan, John Menzies, William Mitchell, William Russell, Thomas G. Scott, P. A. Simpson, William D. Thomson, William Traill, George Williamson. Return tickets to Kelso on Friday and from Berwick on Saturday, 3s. 6d.

On reaching Kelso the party proceeded by train to Cornhill (paying 1s. each), and thence walked to Coldstream, where they met the Rev. Mr. Goldie. The party were accommodated partly at the Manse, partly in three different inns, Hardie's, Horne's, and the Black Bull.

Saturday, 18*th July* 1857.

After breakfasting at 6 a.m. proceeded along banks of Tweed to Tweedmill, then crossed to the Till, ascended that river to Twisel Castle and the old bridge over which the Earl of Surrey crossed with the English army to Flodden. Proceeded on English side of Tweed to point opposite Milnegraden, and then to Norham, which was reached between 1 and 2 p.m. Had lunch partly at the inn and partly at Mr. Ainslie's. Visited the old Castle of Norham, and then went by train to Berwick, reaching it about 3.20 p.m. Fares, 1s. 2d. each. Among the

plants gathered were the following :—

Cheiranthus Cheiri (Twisel)
Nasturtium sylvestre (Tweed bank)
Sisymbrium Irio (Pier gate, Berwick)
Diplotaxis tenuifolia (Berwick wall, North-east point near Pier)
Lepidium latifolium (near Norham)
Viola odorata (Norham)
Saponaria officinalis (Twisel)
Lychnis Githago
Sagina maritima (Berwick walls)
Hypericum perforatum
,, hirsutum
Malva moschata (Tweed, Coldstream)
Geranium pratense
Melilotus officinalis
Trifolium arvense
Prunus Avium
Rubus nemorosus ?
Potentilla reptans
Agrimonia Eupatoria
Myriophyllum spicatum
Lythrum Salicaria
Epilobium angustifolium
,, hirsutum
,, montanum
,, palustre
Conium maculatum
Œnanthe crocata
Æthusa Cynapium
Torilis Anthriscus
Sambucus Ebulus (Twisel)
Dipsacus sylvestris (Coldstream)
Scabiosa Columbaria
Matricaria Parthenium
Tanacetum vulgare
Carduus acanthoides
,, lanceolatus
,, palustris
,, arvensis
Hieracium vulgatum
Lactuca virosa (8-10 feet high)
Lysimachia Nummularia (near Norham)
Anagallis arvensis
Ligustrum vulgare
Anchusa sempervirens
Lithospermum arvense
Echium vulgare
Convolvulus arvensis
Hyoscyamus niger (near Railway Station, Berwick)
Verbascum Thapsus
Linaria vulgaris
Origanum vulgare
Lamium purpureum
,, album
Ballota fœtida
Polygonum amphibium
Humulus Lupulus
Parietaria diffusa
Salix aquatica
,, Helix
Anacharis Alsinastrum (Whiteadder)
Sparganium ramosum
Potamogeton natans
,, heterophyllus
,, lucens
,, perfoliatus
,, pectinatus
Carex vulpina (near Coldstream, far from sea)
Holcus mollis
Asplenium marinum (rocks near Milnegraden, 8 or 9 miles from sea)

Stirling, Inverarnan, Loch Lomond, Ben Voirlich, Tarbet.

Thursday, 23rd July 1857.

Party of 18, composed of J. H. Balfour, M'Taggart Cowan, Robert C. Cowan, F. Deas, P. Neill Fraser, Alex. Graham, Edwin Grogan, John Inglis, John C. Jones, John Linton, Alex. J. Macfarlan, William Mitchell, David Robertson, William Russell, Thomas G. Scott, Offley B. Shore, P. A. Simpson, William D. Thomson, met at the Scottish Central Railway Station at 8 a.m. and proceeded to Stirling. After waiting about an hour and a half there, visiting the Castle, and gathering :—

Sedum album	Verbascum Lychnitis
Lactuca virosa	Linaria repens

and other plants, the party proceeded by train to Balloch, and then by steamboat to Inverarnan, which was reached about 3.15 p.m. Return tickets to Stirling, available to 25th, 3s. Do., from Stirling to head of Loch Lomond, 5s. Total 8s.

Rain came on after leaving Stirling, and the sail up the loch was very wet. Mr. Shore left the party at Tarbet and went to Lord Benholme's. On reaching Inverarnan the party proceeded to M'Lellan's Inn, where beds had been provided.

In spite of the rain the party took short walks in the vicinity, and gathered :—*Malaxis paludosa*, *Lycopodium inundatum*, and other plants more common. After a tea-dinner the plants were examined and put into paper.

Friday, 24th July 1857.

Party breakfasted at 6.30 a.m. The day was wet and misty. Notwithstanding, the greater part walked to Ben Voirlich and examined the flora of the hill. Sleet and rain continued more or less until about 5 in the evening, when the sun broke out, and an exquisite view of the surrounding country was displayed.

Among the plants gathered were :—

Thalictrum alpinum
Cochlearia, varieties
Silene acaulis
Rubus saxatilis
Sibbaldia procumbens
Alchemilla alpina
Saxifraga oppositifolia
„ stellaris
„ aizoides
„ hypnoides
Sedum Rhodiola
Epilobium alpinum
Galium boreale
Antennaria dioica
Gnaphalium supinum
Saussurea alpina
Armeria maritima
Plantago maritima
Polygonum viviparum
Salix herbacea
Juncus trifidus
„ triglumis
Luzula spicata
Carex rigida
„ pulla
Aira cæspitosa vivipara
Poa Balfourii
Juniperus nana
Hymenophyllum Wilsoni
Cystopteris fragilis
„ dentata
Polystichum Lonchitis
Lycopodium Selago
„ annotinum
„ clavatum
„ alpinum
Isoëtes lacustris

On the lower grounds :—

Corydalis claviculata
Hypericum humifusum
Drosera rotundifolia
Lythrum Salicaria
Lysimachia vulgaris
Stachys ambigua
Quercus Robur
„ sessiliflora
Narthecium ossifragum
Carex vesicaria

Saturday, 25th July 1857.

Breakfasted at 6.30 a.m., and then the majority of the party walked by shores of Loch Lomond to Tarbet and Loch Long, meeting the boat at Tarbet about 4.10 and reaching Edinburgh about 9 p.m. This day we gathered :—

Hypericum Androsæmum
Drosera anglica
Circæa alpina
Hieracium prenanthoides
„ denticulatum
Lobelia Dortmanna
Littorella lacustris
Scutellaria galericulata
Polypodium Phegopteris
Osmunda regalis

Day very windy and showery.

Arran.

Monday, 17*th August* 1857.

On Monday, 17th August, the following botanical party met at Lamlash:—J. H. Balfour, Mr. M'Taggart Cowan, Mr. Robert Cowan, Mr. Deas, Mr. Linton, Mr. Macfarlan.

Tuesday, 18*th August* 1857.

The party proceeded this morning by the steamboat at 5.45 to Corrie, and after breakfasting at Mrs. Jamieson's Inn proceeded to Sannox, where they had a bathe before going up Glen Sannox. On the way saw a large adder, walked up on the northern side of the glen, and at the upper part near Caisteal Abhail gathered *Alchemilla conjuncta*. It seems to be a new variety of *A. alpina*, for plants were found in which the leaflets were seemingly adherent. Gathered also a number of common plants as well as *Saxifraga stellaris* and *Oxyria reniformis*. The Glen is very poor as regards species, and the heather and slippery rocks render a walk through it very toilsome. Ascended a difficult gully by south side of Caisteal Abhail and had some difficulty in reaching the top. The day was very fine, and the party had an excellent view from the summit of Goatfell. Some clouds rested now and then on the different summits, which marred the effect. Ben Lomond clearly seen, Jura, Ireland, Mull of Cantyre, Mull of Galloway. Many lichens were collected on the summit, also *Salix herbacea* and *Carex rigida*. Descended by the steep side from the summit to Brodick. On the shore collected *Sinapis monensis*, *Mertensia maritima*, *Fucus vesiculosus*, varieties.

After refreshments at Springbank, reached Lamlash about 8 p.m.

Wednesday, 19*th August* 1857.

This day the party was joined by Mr. Stevenson, and proceeded about 9 a.m. along the Lamlash shore to Whiting Bay. Visited the Nameless Rill of Mr. Waller Paton.

Gathered :—

Anagallis tenella
Atriplex arenaria
„ Babingtonii
Salicornia herbacea
Salsola Kali
Scirpus Savii
„ maritimus
Hymenophyllum tunbridgense
Lastrea Foenisecii
Polypodium Phegopteris

On the roadside to Whiting Bay there is abundance of *Hypericum dubium.* Near Whiting Bay Mr. Robert Cowan picked *Cichorium Intybus.*

After bathing at Whiting Bay, party joined the "Isle of Arran" steamer and proceeded round the island to Loch Ranza, where they landed about 5 p.m. On landing at Loch Ranza five took up their quarters at the inn, while the Messrs. Cowan went to Dr. Hannie's house.

The party went up the glen from Loch Ranza by the waterfall and gathered specimens of *Pyrus fennica.*

Thursday, 20th August 1857.

After breakfast, started about 8 a.m. from Loch Ranza and walked along the shore by Catacol Bay to Dugary, Imachar (where we rested), King's Caves, Drumadoon, and Blackwaterfoot, which was reached about 6.30 p.m. The day was very warm and oppressive, and the party bathed three times on the way.

Among the plants gathered were the following :—

Crambe maritima (shore Imachar)
Convolvulus Soldanella (shore at Blackwaterfoot)
Stachys arvensis
Polygonum Raii (shore at Blackwaterfoot)
Asplenium marinum (rocks at King's Hill)
Cystopteris fragilis (Loch Ranza)
Osmunda regalis (Loch Ranza)

After resting at Blackwaterfoot and taking tea, the party started at 7.30 p.m. across the hill, and had some difficulty in reaching the Lag road, along which they proceeded to Lamlash, which was reached about 11 p.m.

The distance accomplished this day was 40 miles, and all were very much knocked up.

Friday, 21st August 1857.

This day was spent chiefly in dredging off Holy Island in company with Dr. Carpenter. Many good animals were got as well as some sea-weeds. On the island abundance of *Arctostaphylos Uva-ursi*. In the evening occupied in fishing.

Saturday, 22nd August 1857.

The party broke up this day; most returned to Ayrshire or Glasgow, while Mr. M'Taggart Cowan remained at Invercloy. Some plants were picked along the shore. I visited Dr. Carpenter at the island and examined the flora partially.

Tuesday, 25th August 1857.

Mr. Hugh Cowan, from Thornton, and Mr. M'Taggart Cowan met me at Springbank, and, after picking some sand plants at Brodick, walked up Glen Cloy, where we gathered :—

Sedum Rhodiola
Galium boreale
Hymenophyllum Wilsoni (in great abundance)
Asplenium viride
Cystopteris fragilis
Polystichum aculeatum
Lastrea Foenisecii

and several other less rare plants.

Returned about 6 p.m. Mr. Robert Cowan gathered on Ben Gornic the following plants :—

Viola palustris
Alchemilla alpina
,, conjuncta
Saxifraga stellaris
Sedum Rhodiola
Galium saxatile
Vaccinium Vitis-Idæa
Veronica officinalis
Salix herbacea
Juniperus nana

Thursday, 17th September 1857.

Party consisting of Archibald and John Stevenson, William Carpenter, and J. H. Balfour left Lamlash at 3 p.m. and walked by Whiting Bay and Dippin to Kildonan and thence to Lag. Called on Mr. Macrae at East Kilmorie, near Pladda, at

whose manse we saw beautiful specimens of *Lavatera arborea*, a plant commonly cultivated in Arran, perhaps originally from Ailsa Craig, also *Fuchsia*, which forms hedges in many places. *Hydrangea* very vigorous.

The following were some of the plants seen :—

Montia fontana
Hypericum Androsæmum
Geranium pratense
Agrimonia Eupatoria
Cotyledon Umbilicus
Sedum anglicum
Anthemis nobilis (near cottage door, Kildonan)
Solanum Dulcamara
Verbascum Thapsus
Scutellaria galericulata
Atriplex arenaria
Suæda maritima
Carex vulpina
Asplenium marinum
Ramalina scopulorum (abundant on trap rocks at Dippin)

Numerous mushrooms gathered. Remarkable red *Salicornia herbacea* near Whiting Bay.

In the evening took up our quarters in Lag Inn, where we were well and cheaply accommodated. Reached Lag at 8.30 p.m. Met Mr. Spittal, who had been geologising in the district and who accompanied us during the rest of our trip.

Friday, 18*th September* 1857.

Breakfasted at Lag. Left Lag Inn about 8 a.m., and walked by the shore to Blackwaterfoot. On the way gathered a large quantity of :—

Ranunculus hederaceus
Cakile maritima
Silene maritima
Geranium pratense
Rosa spinosissima
Eryngium maritimum
Apium graveolens
Haloscias scoticum
Matricaria maritima
Anagallis arvensis
Anagallis tenella
Mertensia maritima
Convolvulus Soldanella
Salsola Kali
Polygonum Hydropiper
,, Persicaria
,, lapathifolium
Scirpus maritimus
Triticum laxum
Agaricus campestris

Numerous *Rubi* varying in the quality of fruit ; *Rubus discolor* later in fruit than others, fruit highly-flavoured.

At Blackwaterfoot went to the fine basaltic column at Drumadoon and thence to King's Caves.

Gathered :—

Asplenium Adiantum-nigrum
,, marinum
,, Trichomanes
Scolopendrium vulgare
Osmunda regalis
Ramalina scopulorum (covering the basaltic rocks at Drumadoon)

Returned to Blackwaterfoot. Most of the party returned by cars to Lamlash, while Dr. B., Mr. J. Stevenson, and Mr. Spittal walked to Shedog and Shisken Church, and then by the Clachan Glen to Glen Benlister, and thence to Lamlash, which was reached about 8 p.m. after three hours' walking from Blackwaterfoot.

Tuesday, 22nd September 1857.

Walked by coast to Whiting Bay, Dippin, Kilmorie, Lag, getting the usual plants, *Hypericum dubium* being the rarest. From Lag walked in the evening by the shore back to Kilmorie, gathering on the way numerous specimens of *Agaricus campestris*.

On the rocks near Bennan Head :—

Silene maritima
Vicia sylvatica (still in flower, as well as specimens in fruit, especially on shingle of the shore)
Pulicaria dysenterica
Armeria maritima
Plantago maritima

Reached Mr. Macrae's house at Kilmorie Manse, where I remained for the night.

Wednesday, 23rd September 1857:

After breakfast visited Stracy rocks with Mr. Macrae and his son Donald. Gathered :—

Geranium sanguineum
Cotyledon Umbilicus
Carlina vulgaris
Atriplex arenaria
,, Babingtonii
Phragmites communis
Asplenium marinum (on trap rocks at Stracy)
Equisetum Telmateia (some specimens between 6 and 7 feet high). This plant very abundant in the district

Peculiar red matter on rocks at Bennan.

Visited the island of Pladda in a boat, gathered *Agaricus campestris* and *Anthemis nobilis*, no other plants of interest. Visited the lighthouse. Joined the party for the steamer "Isle of Arran," and returned to Lamlash about 4 p.m. Sea rather rough and weather stormy.

Friday, 26th September 1857.

Visited the hill near Lamlash on the south of the road to Lag. Ascended by a mountain stream, reached the summit, whence a fine view was obtained, Goatfell and hills near it well seen, islands on Clyde, Ayrshire, Blackwaterfoot, Argyllshire. Descended by a deep ravine which joins the glen to south of Lag Road. This ravine very deep, steep sides, and yielded some good plants, as :—

Cardamine hirsuta (6 stamens and long style)
Saxifraga hypnoides (in profusion)
Festuca ovina vivipara
Hymenophyllum Wilsoni
Blechnum boreale
Asplenium Trichomanes (in great profusion)
Athyrium Filix-fœmina
Cystopteris fragilis
Lastrea Oreopteris
,, Filix-mas
,, dilatata
Polypodium vulgare
,, Dryopteris
,, Phegopteris

Numerous lichens and mosses. On the hill was seen a peculiar form of *Lastrea Filix-mas*. Numerous diatoms in slimy matter on the rocks. *Nostoc* also seen.

EXCURSIONS IN 1858.

Canal, Slateford, Colinton, Swanston.

Saturday, 15*th May* 1858.

Party of about 80-100 met at the Canal Basin at 10 a.m., and proceeded by the banks of the Canal to Slateford, Colinton, and Swanston, returning between 4 and 5 p.m.

Among the plants gathered were the following :—

Anemone nemorosa
Ranunculus auricomus
„ Ficaria
Caltha palustris
Corydalis lutea
Sisymbrium Thalianum
Viola sylvatica
Geranium phæum
Staphylea pinnata
Prunus communis
„ Avium
Pyrus Aria
„ Aucuparia
„ Malus
Ribes Grossularia
„ rubrum
Myrrhis odorata
Adoxa Moschatellina
Tussilago Farfara
Petasites vulgaris
Doronicum plantagineum
Vinca minor
Lamium purpureum
„ album
Daphne Laureola
Carpinus Betulus
Salix alba
„ cinerea
„ Helix
Orchis mascula
Allium ursinum
Endymion nutans
Lilium Martagon (not in flower)
Arum maculatum
Potamogeton crispus
Carex vulgaris
„ glauca
Polystichum aculeatum
Equisetum arvense
Grimmia pulvinata
Lepraria flava
Scyphophorus pyxidatus
Polyporus versicolor

Penicuik, Esk Mill, Auchindinny, Roslin.

Saturday, 22nd May 1858.

Party of about 90 met at the North British Railway Station at 9 a.m. and proceeded to Penicuik, thence to Valleyfield and visited Mr. Cowan's paper works, thence went by banks of Esk to Esk Mill, Auchindinny, and Roslin, returning by train leaving Roslin at 5.29 p.m., and reaching Edinburgh at 6.15 p.m. Return third-class tickets, 1s. 3d.

Among the plants collected were the following :—

Ranunculus auricomus
Trollius europæus
Cardamine amara
Viola tricolor
Oxalis Acetosella (pink)
Staphylea pinnata (Roslin)
Prunus Avium
„ Cerasus (between Powder Mill and Roslin on western bank of river)
Rubus saxatilis (Auchindinny)

Pyrus Aucuparia
„ Malus
Saxifraga granulata
Chrysosplenium alternifolium
Myrrhis odorata
Sanicula europæa
Adoxa Moschatellina
Doronicum Pardalianches (Roslin)
Vaccinium Myrtillus
Primula veris
Veronica montana
Lamium amplexicaule
Salix Helix
„ cinerea
„ aquatica
„ alba
„ Caprea
Neottia Nidus-avis
Carex paniculata
„ præcox
„ sylvatica
„ pendula
„ paludosa
Melica uniflora
Polypodium Dryopteris
„ Phegopteris
Equisetum umbrosum
„ arvense
„ sylvaticum
„ palustre
Bryumn puctatum
Polytrichum commune
Dicranum scoparium
Jungermannia asplenioides
Evernia prunastri
Calicium chrysocephalum
Polyporus versicolor

Burntisland, Aberdour, Donibristle, Kinghorn.

Saturday, 29*th May* 1858.

Party of about 60 met at 10 a.m. at station of Edinburgh, Perth and Dundee Railway, and proceeded to Burntisland. Walked by shore to Aberdour, and returned by road to Burntisland for boat at 5 p.m., railway to Edinburgh at 6. Return ticket, 9d. Some went to Donibristle, others to Kinghorn.

Among the plants gathered were :—

Berberis vulgaris
Lepidium campestre
Cerastium trigynum
Sagina maritima
Geranium phæum (Burntisland)
„ sanguineum
Astragalus hypoglottis
Smyrnium Olusatrum (Kinghorn)
Centranthus ruber
Valerianella olitoria
Armeria maritima
Primula veris
Vinca major
Solanum Dulcamara (scarcely in flower)
Linaria Cymbalaria
Antirrhinum majus (Aberdour Castle, scarcely in flower)
Veronica agrestis
„ arvensis
„ serpyllifolia
„ Chamædrys

Veronica Beccabunga
Salvia Verbenaca
Plantago Coronopus
Hippophaë rhamnoides
Parietaria erecta
Populus alba (leaf)
Ornithogalum umbellatum
Tulipa sylvestris
Carex arenaria
„ vulgaris
Carex gluca
„ præcox
„ distans
„ extensa
Aira præcox
Sclerochloa loliacea
Asplenium Adiantum-nigrum
„ Ruta-muraria
Botrychium Lunaria
Exidia Auricula-Judæ

Mid-Calder, Meadowbank, Kames Hill, Dalmahoy Hill, Ravelrig, Currie.

Saturday, 5th June 1858.

Party of 90 met at the Caledonian Railway Station at 10.30 a.m. and proceeded to Mid-Calder, thence walked to Meadowbank woods, Kames Hill, Dalmahoy Hill, Ravelrig, Water of Leith, and Currie, returning from Currie by train at 6.9 p.m. Return tickets, 10d.

The day was remarkably fine, and there was a splendid view from the top of Kames Hill.

Among the plants gathered were the following :—

Ranunculus aquatilis
„ trichophyllus
Trollius europæus
Draba verna
Sisymbrium Thalianum
Viola palustris
„ sylvatica
„ canina
„ tricolor
„ arvensis
Cerastium semidecandrum
Stellaria uliginosa
Moehringia trinervia
Sagina subulata
Geranium sylvaticum and var. (paler flower)
Geranium columbinum
Vicia sativa, var. Bobartii
Prunus Padus
Geum intermedium
Fragaria elatior
Pyrus Aucuparia
Ribes nigrum
Adoxa Moschatellina
Linnæa borealis
Antennaria dioica
Pyrola minor
Menyanthes trifoliata
Anchusa sempervirens
Myosotis palustris
Pinguicula vulgaris
Mentha viridis
Lamium amplexicaule
„ intermedium
Carpinus Betulus

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

OCTOBER 1902.

CONTENTS.

Page.

History of the Royal Botanic Garden, Edinburgh. Botanical Excursions made by Professor John Hutton Balfour in the Years from 1846 to 1878 inclusively, - - - 253

GLASGOW

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from

OLIVER & BOYD, Edinburgh.

[PRICE NINEPENCE.]

[*All rights reserved.*]

Orchis latifolia
Ornithogalum umbellatum
Arum maculatum
Potamogeton oblongus
" crispus
Carex curta
Carex riparia
Trisetum flavescens
Briza media
Botrychium Lunaria
Equisetum hyemale

Many lichens collected by Mr. Sadler on Dalmahoy Hills.

North Queensferry, Inverkeithing, St. Davids, Ferry Hill.

Saturday, 12*th June* 1858.

Party of between 60 and 70 met at Granton at 10 a.m. and proceeded by steamboat to North Queensferry, thence walked to Inverkeithing, St. Davids, and returned by road to Ferry Hill about 6.30 p.m., meeting boat to Granton. Return ticket by boat, 1s.; Granton Pier, 2d.; Ferry Pier, 6d.; total, 1s. 8d.

Among the plants gathered were the following :—

Ranunculus hederaceus
" sceleratus
Fumaria micrantha
Brassica oleracea
" campestris
Diplotaxis tenuifolia
Thlaspi arvense
Reseda lutea
Cerastium semidecandrum
Sagina maritima
" subulata
Malva sylvestris
" rotundifolia
Geranium pyrenaicum
" columbinum (near Inverkeithing)
Melilotus officinalis
Astragalus Glyciphyllos
Spiræa Filipendula
Potentilla verna
Potentilla reptans
Sedum Telephium
" villosum
Sambucus Ebulus
Echium vulgare
Convolvulus arvensis
Stachys arvensis
Leonurus Cardiaca
Lamium incisum
Salicornia herbacea
Polygonum Bistorta
Allium Scorodoprasum
" vineale
Scirpus pauciflorus
Carex vulpina
" ovalis
" fulva
Triticum junceum
Nardus stricta

Tynehead, Crichton Castle, Borthwick Castle, Fushie Bridge, Arniston, Dalhousie.

Saturday, 19*th June* 1858.

Party of 60 met at the North British Railway Station and proceeded to Tynehead, walked to Crichton Castle by the glen, thence to Borthwick Castle, Fushie Bridge, Arniston, and Dalhousie, reaching Dalhousie Station about 5 p.m. Returned by train at 5.12 p.m. Return tickets, 1s. 2d.

Among the plants gathered were the following :—

Thlaspi arvense
Geranium sylvaticum
Genista anglica
Saxifraga Geum? (Arniston)
„ umbrosa
(Tynehead; also in woods at Arniston)
Sedum reflexum
(near Tynehead)
Antennaria dioica
(Tynehead)
Doronicum Pardalianches
(Arniston)
Pyrola media (glen near Crichton Castle)
Ligustrum vulgare
(near Fushie Bridge)
Myosotis sylvatica
(Arniston)
Mimulus luteus (Arniston)
Lathræa Squamaria
Mentha sylvestris
(at Tynehead)
„ viridis
Rumex sanguineus, var. viridis
Salix pentandra
Neottia Nidus-avis
(woods near Tynehead)
Orchis incarnata
„ latifolia
Gymnadenia conopsea
Sparganium ramosum
(near Fushie Bridge)
Arum maculatum
(Borthwick Castle)
Potamogeton pusillus
(near Fushie Bridge)
Eriophorum latifolium
(near Crichton)
Carex remota
„ pendula (Arniston)
„ sylvatica
(between Crichton and Borthwick)
„ lævigata
„ fulva
„ paludosa
Phalaris arundinacea, var. variegata
(near Tynehead)
Lastrea Oreopteris
(near Tynehead)
Equisetum Telmateia
(Arniston)
Lycopodium clavatum
(near Tynehead)

Cockburnspath, Dunglass Dene, Pease Dene.

Saturday, 26th June 1858.

Party of about 60 or 70 met at the North British Railway Station at 8 a.m. and proceeded to Cockburnspath, thence walked through Dunglass Dene. Visited pond near the house, proceeded by the shore to Pease Dene, and then to Cockburnspath Town Dene, and returned by train at 6.3 p.m. Return tickets, 2s. Mr. Hardie of Penmanshiel accompanied the party. Mr. Smith, factor for Sir John Hall, sent a man to guide us.

Among the plants gathered were the following :—

Aquilegia vulgaris (Dunglass)
Nuphar luteum (Dunglass)
Papaver Argemone
Cakile maritima
Dianthus deltoides
Sagina maritima
Hypericum calycinum
Malva rotundifolia
Geranium pratense
Acer campestre
Rubus cæsius (foot of Pease Dene)
Potentilla reptans
Epilobium angustifolium
Conium maculatum
Œnanthe crocata
Senecio saracenicus (woods at Dunglass)
Silybum Marianum (near Cockburnspath Station, cultivated)
Centaurea Cyanus
Tragopogon minor
Campanula latifolia
Pyrola minor
Vinca major
„ minor
Anchusa sempervirens
Hyoscyamus niger
Mimulus luteus (cultivated)
Veronica montana
Mentha viridis (Pease Dene)
„ piperita
Rumex viridis
Anacharis Alsinastrum (Dunglass Pond)
Neottia Nidus-avis
Typha angustifolia
Sparganium ramosum
Carex arenaria
„ vulpina
„ pendula
Melica uniflora
Scolopendrium vulgare
Polystichum angulare

Bridge of Allan, Keir, Kippenross, Wharrie Glen, Stirling.

Saturday, 3rd July 1858.

Party of between 60 and 70 met at the Scottish Central Railway Station at 6.20 a.m., and proceeded to Bridge of Allan. Breakfasted there, visited the Well, Dr. Paterson's tree-fern, then proceeded to Keir and Kippenross, saw large sycamore here, then to Wharrie Glen and Stirling, examined Castle rocks and visited the Castle, and returned by train at 5.38 p.m. Return tickets, 3s. 3d. Breakfast, 1s. 6d.

At breakfast in Philp's Inn there were present Rev. Dr. Roger, Dr. Paterson, Dr. W. A. F. Brown, Mr. Girdwood, a Polish captain, and others from Bridge of Allan; Mr. Buchan and Mr. Moir joined us.

Among the plants gathered were the following:—

Aquilegia vulgaris
(roadside near Wharrie Glen)
Brassica campestris
(Stirling Castle)
Hypericum perforatum
" quadrangulum
" humifusum
" pulchrum
" hirsutum
Geranium sylvaticum
" lucidum
Trifolium striatum
Lotus major
Agrimonia Eupatoria
Rosa tomentosa
" rubiginosa
" canina
Sedum Telephium
" anglicum
" acre
Circæa lutetiana
Conium maculatum
Smyrnium Olusatrum
(Stirling Castle)
Lactuca virosa
(Stirling Castle)
Anchusa sempervirens
Echium vulgare
(Stirling Castle)
Atropa Belladonna
(Stirling Castle)
Linaria repens
(Stirling Castle)
Pinguicula vulgaris
Neottia Nidus-avis
Listera ovata
Paris quadrifolia
Carex sylvatica
" hirta
Melica uniflora
Triticum caninum
Cystopteris fragilis
Polystichum aculeatum
Polypodium Dryopteris
Equisetum arvense
" umbrosum
" sylvaticum
" palustre

North Berwick, Canty Bay, Bass Rock, Tantallon Castle, Dirleton.

Saturday, 10*th July* 1858.

Party of about 60 met at the North British Railway Station at 8 a.m. and proceeded to North Berwick. Walked to Canty Bay, visited the Bass Rock, Tantallon Castle, North Berwick Links, Dirleton Common and Castle, and returned by train at 6.22 p.m. Return tickets, 2s.; boat to Bass, 1s.

Among the plants gathered were the following:—

Clematis Vitalba
(Dirleton Castle)
Thalictrum minus
Lepidium latifolium
(Tantallon Castle)
Reseda lutea
Lavatera arborea (Bass)
Geranium pusillum
Agrimonia Eupatoria
Sedum album
(Dirleton Castle)
Smyrnium Olusatrum
Lonicera Xylosteum
(Tantallon)
Centranthus ruber
Scabiosa Columbaria
Filago germanica
„ minima
Silybum Marianum
Apargia hispida
Anagallis tenella
(North Berwick)
Ligustrum vulgare
Hyoscyamus niger
(Dirleton)
Calamintha Acinos
(Dirleton)
Ballota fœtida (Dirleton)
Beta maritima (Bass)
Salsola Kali
Narcissus biflorus
(Bass; not in flower)
Potamogeton densus
Phleum arenarium
Triodia decumbens
Parmelia parietina (Bass)
Ramalina scopulorum (Bass)

Perth, Birnam, Stenton Crag, Dunkeld.

Saturday, 17*th July* 1858.

Party of between 40 and 50 met at the Edinburgh and Glasgow Railway Station at 6.20 a.m. and proceeded by Scottish Central to Perth, which was reached at 10. There breakfast was provided in the rooms at the station at 1s. 9d.

each. At 11.15 a.m. the party proceeded to Birnam Station, visited Birnam Hill, height 1500 feet, under the guidance of Dr. Lauder Lindsay, also visited slate quarries. Some of the party went to Stenton Crag, others to Dunkeld.

Sergeant John Sim met the party at Perth, and gave them many rare plants mentioned in the following list. Dr. Stirling also accompanied the party. Returned from Dunkeld at 5.15 p.m. Return tickets, 5s. 2d.

Among the plants gathered were the following :—

Thalictrum minus
Ranunculus aquatilis
Aquilegia vulgaris
Corydalis claviculata
Arabis hirsuta
Lepidium Smithii
Lepigonum rubrum
Malva moschata (Stenton)
Geranium sanguineum
" phæum
Erodium cicutarium
Genista anglica
Prunus communis
Agrimonia Eupatoria
Saxifraga aizoides
Circæa alpina
Carum Carui
Lonicera Periclymenum
Solidago Virgaurea
Antennaria dioica
Gnaphalium uliginosum
" sylvaticum
Chrysanthemum segetum
Vaccinium Vitis-Idæa
" Myrtillus
Erica Tetralix
" cinerea
Trientalis europæa
Erythræa Centaurium
Gentiana campestris
Verbascum Thapsus
(Stenton)
Origanum vulgare
Calamintha Clinopodium
Polygonum aviculare
" Hydropiper
" Persicaria
" lapathifolium
Rumex aquaticus
Salix repens
" fusca
Empetrum nigrum
Neottia Nidus-avis
(Murthly)
Listera cordata
Gymnadenia conopsea
" albida
Allium oleraceum
Narthecium ossifragum
Sparganium ramosum
Carex irrigua
" limosa
" binervis
Melica nutans
Serrafalcus commutatus
Nardus stricta
Allosorus crispus
Asplenium germanicum
(Stenton Crag)
Lastrea Oreopteris
Polypodium Dryopteris
" Phegopteris
Lycopodium Selago
" clavatum

Lycopodium alpinum
" selaginoides
Cladonia rangiferina
" pyxidata
" gracilis
" bellidiflora
" digitata
" anomæa
Cetraria glauca
Peltidea canina
" horizontalis
Stereocaulon paschale
Cornicularia aculeata
Gyrophora pellita
Gyrophora polyphylla
Lecanora ventosa
" Parella
" tartarea
Parmelia saxatilis
" omphalodes
" conspersa
" olivacea
" frigida
Lecidea rivulosa
" geographica
" icmadophila
Evernia prunastri
Sphærophoron coralloides

Mr. Sim's list :—

Hesperis matronalis (Kinnoul Hill)
Hypericum humifusum (Blairgowrie)
Geranium pyrenaicum (roadside near Barnhill)
Potentilla hirta ? (rocks near Kinnoul Church)
" argentea(rocks near Kinnoul Church)
Aremonia agrimonioides (wood of Scone)
Sedum album (rocks near Barnhill)
Sedum dasyphyllum (Craigie, near Perth)
Moneses grandiflora (wood of Scone)
Lysimachia Nummularia (banks of Tay)
Cynoglossum sylvaticum (Kinfauns Toll-bar)
Linaria repens (limestone wall, left bank of Tay, opposite Perth)
Mimulus luteus (banks of Tay)
Allium oleraceum (banks of Tay)
Scheuchzeria palustris (Methven Bog)

St. Andrews.

Saturday, 24th July 1858.

Party of about 40 met at the Edinburgh, Perth, and Dundee Railway Station at 6.30 a.m. and proceeded to St. Andrews.

Breakfasted in the Town Hall. Breakfast provided by Mr. Thomson of Star Hotel for 1s. 6d. Met Mr. Barclay of Cupar, Dr. Day, Mr. Howie, Rev. Mr. Dickson of Cameron, and Mr. Laing.

After breakfast saw the old buildings at St. Andrews, visited the harbour, and then went by banks of Eden to Tentsmuir. Reached Leuchars about 6 p.m., and returned to Edinburgh about 9 p.m. Return tickets, 3s. 8d.

Among the plants gathered were the following :—

Aconitum Napellus
Radiola Millegrana
Rubus suberectus
Haloscias scoticum
Senecio sylvaticus
Anagallis tenella
Borago officinalis
Solanum Dulcamara
Linaria vulgaris
Scrophularia aquatica
Lycopus europæus
Marrubium vulgare
Atriplex erecta
„ angustifolia
Polygonum lapathifolium
Euphorbia Esula
Salix repens
Juncus Gerardi
Scirpus maritimus
Blysmus rufus
Carex arenaria
„ vulpina
„ distans
Sclerochloa maritima
„ loliacea
Triticum laxum
Elymus arenarius
Lycopodium inundatum
„ selaginoides

Switzerland.

Saturday, 7th August 1858.

Party consisting of J. H. Balfour, Thomas Barclay, Sheriff-Clerk, Cupar; J. M. Bell, Alexander Buchan, Dunblane; E. Dubuc, M.D.; J. Fayrer, Lucknow; P. Neill Fraser, Alexander Graham, Patrick Graham, surgeon; James Hill, W. Johnston, John C. Jones, Texas, U.S.A.; F. Lockwood Logan, David Philip Maclagan, Robert C. Maclagan, S. J. Meintjes, Sam Maverick, Texas, U.S.A.; Henry B. Radford, S. H. Ramsbotham, George Rodger, Gideon Colquhoun Sconce, William Soper, W. Turnbull, and G. Williamson met at the Docks at Leith at 11.30 this

morning. The day was remarkably fine, and all were in high spirits. Even those who dreaded a sea voyage in ordinary circumstances felt less anxiety than usual, seeing that the barometer was very high and the sea as smooth as possible. The steamer which was to convey us to Rotterdam was the "Ivanhoe," commanded by Mr. John Cairns, a very civil and obliging captain, although with a rough exterior.

Monday, 9th August 1858.

We reached the bar on the Dutch coast between 12 and 1 and Rotterdam about 4 p.m. The sail up the Meuse brought under our notice the novel Dutch scenery, the flat surface, marshy ground, willows, canals, windmills, &c. On landing at the quay some time was spent in getting the luggage examined. We started in a third-class carriage by the train at 6.40 p.m. and passed through the characteristic scenery of Holland, with "its ubiquitous canals, bowling-green flatness and swampy meadows." We reached the University town of Utrecht about 9 p.m. and took up our quarters at the Hôtel des Pays Bas, where we were all accommodated.

Tuesday, 10th August 1858.

Rose at 6 a.m. and went with a commissionaire to the Botanic Garden where we met Professor Bergsma, who is lecturer on Botany and has charge of the garden. He was most attentive and kind, and gave us a full description of the plants cultivated. The garden is small but contains some interesting plants, particularly those sent from the Dutch possessions in Java. The houses are not extensive. There did not seem to be a good arrangement of the plants for study. The number of pupils attending the lectures is about 40. The Professor's house is connected with the garden.

Among the plants which we noticed were the following :—

Amherstia nobilis
Angiopteris angustata
Antiaris toxicaria
Araucaria Cunninghamii
" excelsa
Caladium pinnatifidum
Casuarina sumatrana
Cephalotus follicularis
Chamærops conduplicatus
" humilis

Cinchona Condaminea
„ pubescens
Dracæna elegans
Dracontium pertusum
Garcinia Mangostana
Hura crepitans
Isonandra Gutta
Laurus Sassafras
Livistona chinensis
Magnolia (in fruit)
Marsilia ægyptiaca
Nepenthes ampullacea
Olea europæa
(several varieties)
Oreodaphne
Pandanus furcatus
Paulownia imperialis
(in fruit)
Philodendron bipinnatifidum
Polygonum perfoliatum
Punica Granatum
Salisburia adiantifolia
(fine standard)
Ulmus americana
(fine specimen)

It was too early in the day to visit any of the other Professors. Donders, the famous physiologist, was absent; we had the pleasure of meeting him afterwards in Paris.

After breakfasting at the inn we started by rail for Cologne—leaving Utrecht at 8.50 and reaching Cologne about 5 p.m. On the way we noted buckwheat abundantly cultivated, also lettuce. Heather was seen in some spots and on higher ground Scots pine. At Cologne we took up our quarters at the Hôtel Belle Vue. Met here the Rev. Dr. McCosh, who had reached Cologne on his return from a three and a half months' tour. He had seen a great deal of the Continent and expected to accomplish a four months' excursion for £70.

Wednesday, 11*th August* 1858.

Went on board the boat at 6 a.m. to sail up the Rhine. We reached Cassel about 8 p.m. Finally the party reached Frankfort by fourth-class carriage about 10 p.m. and were distributed in two hotels—the Hôtel de Russie and the Hôtel de l'Empereur Romain.

Thursday, 12*th August* 1858.

Started by train at 12.25 for Heidelberg, which was reached about 4 p.m., and took up our quarters at the Hôtel du Prince Charles.

Friday, 13*th August* 1858.

Some of us rose early and visited the magnificent Castle before

breakfast and gathered a number of interesting plants. Amongst them :—

Diplotaxis tenuifolia
Iberis amara
Dianthus Carthusianorum
Geranium pratense
Circæa lutetiana
Gnaphalium arenarium
Centaurea Jacea
Campanula Trachelium
" rotundifolia
Linaria Cymbalaria
Lamium maculatum

After breakfast proceeded by the railway to Basle, which was reached at 2.30 p.m. As our object was to get to the Swiss mountains as soon as possible we only remained in Basle for a short time, and joined the train for Berne at 4.55. We met here Mr. R. Anderson, architect, from Edinburgh, on his way to Berne. Reached Berne about 9.30 p.m. Party divided; the greater part were accommodated at the Hôtel des Gentils-hommes, while some had to go to the Hôtel du Môre.

Saturday, 14*th August* 1858.

Astir early this morning; visited the platform 108 feet above the Aar, and had a splendid view of the Bernese Alps. Called on Shuttleworth but found that he was in Britain. Saw M. Guthnick, the pharmacien, who gave us important hints as to our route. Met Professor Meissner, who accompanied us to the Botanic Garden—small; some good alpine plants. Promised to send plants and Botanical Society's Transactions to Guthnick and Meissner. Paper and pasteboard purchased, maps, Koch's abbreviated Synopsis, &c. Sent heavy baggage by post to Geneva and got it booked. Started at 5.15 by diligence and carriages of various sorts for Thun. Reached Thun about 8 p.m., took up our quarters at the Hôtel du Freienhof (M. Stähli, a friend of Guthnick's).

Monday, 16*th August* 1858.

We left Thun at 8.30 a.m. and sailed up the beautiful lake to Neuhaus. From Neuhaus the whole party walked, carrying their knapsacks and bundles of paper by relays, to Interlaken, through a beautiful valley shaded by walnut trees. At Inter-laken the greater number of the party purchased their alpen-

stocks, some plain, others with horn, false or real chamois. Passing through the English village of Interlaken and Unterseen we reached the Lake of Brienz, where we joined the steamer. Landed below the Giessbach waterfall. In the wooded banks and rocks in this vicinity there are numerous excellent lowland plants.

At the Giessbach and near Thun the following plants were observed by different members of the party :—

Aconitum Lycoctonum
" pyrenæum
Hepatica triloba
Dentaria pentaphyllos
Moehringia muscosa
Tamarix gallica
Hypericum montanum
Althæa officinalis
Geranium pyrenaicum
" columbinum
" Robertianum
Impatiens Noli-me-tangere
Melilotus leucantha
Onobrychis sativa
Spiræa Aruncus
Rubus cæsius
Potentilla reptans
Alchemilla vulgaris
" alpina
Saxifraga aizoides
Ribes petræum
Sedum album
Lythrum Salicaria
Astrantia minor
Silaus pratensis
Scabiosa Columbaria
Erigeron canadensis
Cacalia alpina
Carduus pratensis
Cichorium Intybus
Hieracium prælatum
Prenanthes purpurea
Campanula barbata
Campanula pumila ?
" Trachelium
Pyrola secunda
Monotropa Hypopitys
Echium vulgare
Solanum Dulcamara
" nigrum
Digitalis lutea
Veronica urticifolia
Melampyrum sylvaticum
Lycopus europæus
Salvia pratensis
Prunella grandiflora
Galeopsis Ladanum
Teucrium Chamædrys
Hippophaë rhamnoides
Listera ovata
Goodyera repens
Epipogum Gmelini
Epipactis rubra
Paris quadrifolia
Carex sylvatica
Setaria glauca
Oplismenus Crus-Galli
Molinia cærulea
Poa Balfourii
Festuca calamaria
Brachypodium pinnatum
Asplenium viride
Lastrea dilatata
Polypodium Dryopteris
" calcareum

Leaving the Giessbach with reluctance we joined our rowing-boats and reached the upper part of the lake, meeting some of the party who had gone by steamer to Brienz.

The party, driving and walking, reached Meiringen in the afternoon. Meiringen is a large village of the Oberland at the upper extremity of the Obere Hasli-Thal. We went to the Pension Ruof, kept by M. Fluchs, but found that he had only six beds to spare. M. Guthnick had recommended us to this person. It is a good place for a small party. We then went to the Hôtel du Sauvage, where we found ample accommodation. After table d'hôte, arranged our plants on paper.

Tuesday, 17*th August* 1858.

At 7 a.m., after breakfast, we left for Grimsel—porter to carry baggage and a person who engaged to be guide for three days. Saw the Reichenbach Waterfall near Meiringen. Proceeded up the valley and gradually ascended to Guttannen. Rested at the Chalet of Handeck, about one and a half hours' walk beyond this. After a fatiguing walk we reached the Hospice of the Grimsel at 4.30 p.m.

Wednesday, 18*th August* 1858.

At 8.30 a.m., after breakfast at the Hospice, we started on our alpine ramble with Fluk Melgior and his brother as guides. Passing the end of the little lake called Kleinensee, near the Hospice, we proceeded in full botanical equipment to ascend the Sidelhorn.

The boxes and field books were soon replenished with specimens. Roots were taken of some of the rarer and more beautiful plants ; and some of them, I hope, will ere long flourish in the Botanic Garden as memorials of our trip. Our movements up the mountain were slow, owing both to the botanising and the heat of the day. On reaching the summit of the Sidelhorn we had a magnificent view of the Alps ; the valley of the Grimsel on the one side and the valley of the Rhone on the other. The height of the mountain is about 8650 French feet. We then descended towards the valley with the view of visiting the Aar glaciers.

On the part of the mountain nearest the smaller glacier we

gathered the best plants, and were detained there a long time. Some of the party in place of botanising proceeded at once to the Ober-Aar Glacier. This glacier wants the extensive moraines of the Unter-Aar Glacier. It is distinctly icy throughout. We crossed the river on a rustic bridge near a chalet, the inhabitant of which, a shepherd boy, joined us in our exploration of the hill. Proceeding on the opposite bank of the stream we gathered many good plants, and then reached the side of the Unter-Aar Glacier. Here we had a good opportunity of seeing an extensive glacier with an enormous moraine country of masses of rock of all sizes covering the ice so thoroughly as to make one believe that there was nothing below but a mass of stones. The rocks were very sharp and angular. On walking on the glacier we found remarkable inequalities. In some places there were deep hollows which concealed some of the party from the rest and led to an unexpected separation. In these hollows we could see the icy nature of the glacier, and here and there were deep holes full of water with clear streams flowing. In other parts there were large hummocks covered with debris. In some instances we saw stones of small size which had formed cavities by the melting of the ice around them under the sun's influence. Leaves carried up by birds occasionally produce similar results. Sometimes when the debris is accumulated in these cavities a reverse process takes place and then the debris becomes raised up, forming a mound or hummock supported on ice. We were enabled to see the course of the glacier and to observe some of the phenomena which had led to Professor Forbes' valuable observations regarding the nature of glaciers and their movements. We returned to the Hospice about 7 p.m. tolerably fatigued.

Some of the plants seen near Grimsel were :—

Astrantia minor
Erigeron acris
„ canadensis
Carlina acaulis
Carduus defloratus
Phyteuma orbiculare
„ spicatum
Asclepias Vincetoxicum
Erythræa Centaurium
Gentiana pannonica
„ punctata
Rumex alpinus (abundant round Grimsel Hospice)
Veratrum album
Asplenium septentrionale

Some of the Sidelhorn plants were :—

Ranunculus aconitifolius
„ glacialis
„ pyrenaicus
Arabis alpina
„ bellidifolia
„ cærulea
Cardamine resedifolia
Viola biflora
Silene quadridentata
„ rupestris
Cerastium alpinum
Arenaria ciliata
Cherleria sedoides
Linum tenuifolium
Trifolium agrarium
„ alpestre
Geum montanum
Potentilla aurea
„ minima
„ reptans
Alchemilla alpina
„ pentaphyllea
Saxifraga aizoides
„ androsacea
„ aspera
„ cæsia
„ crustata
„ cuneifolia
„ muscoides
„ oppositifolia
„ rotundifolia
„ stellaris
Sedum rubens
Sempervivum arachnoideum
„ montanum
Astrantia minor
Gaya simplex
Meum Mutellina
Galium helveticum
Bellidiastrum
Aster alpinus
Gnaphalium supinum
Achillea serrata
„ Clavennæ
Chrysanthemum alpinum
Arnica montana
„ scorpioides
Apargia autumnalis
Campanula barbata
„ cenisia
Azalea procumbens
Primula longiflora
„ villosa
Androsace alpina
„ bryoides
„ Chamæjasme
„ helvetica
„ lactea
„ obtusifolia
„ villosa
Gentiana acaulis
„ alpina
„ bavarica
„ brachyphylla
„ campestris
„ verna
Veronica alpina
„ bellidifolia
„ saxatilis
Euphrasia alpina
Pedicularis cenisia
„ rostrata
Teucrium montanum
Polygonum viviparum
Salix reticulata
„ retusa
Juncus trifidus
Luzula nivea
„ spadicea
„ spicata
Carex atrata
„ capillaris

Carex firma
„ fœtida
„ montana
„ nigra
Phleum alpinum
„ Boehmeri
„ commutatum
„ Michelii
Agrostis alpina
„ rupestris
Allosorus crispus
Asplenium septentrionale
Pseudathyrium alpestre
Polystichum Lonchitis
Polypodium rhœticum

Some of the plants of the mountainous part near Ober-Aar Glacier :—

Myagrum saxatile
Gypsophila repens
Silene acaulis
Rosa alpina
Sedum atratum
Epilobium alpinum
„ alsinifolium
Galium sylvestre
Valeriana montana
„ tripteris
Scabiosa lucida
Gnaphalium norvegicum
Hyoseris fœtida
Tussilago alpina
Phyteuma hemisphæricum
Vaccinium uliginosum
„ Vitis-Idæa
Primula farinosa
Soldanella alpina
Euphrasia minima
Tozzia alpina
Thymus alpinus
Plantago alpina
Salix herbacea
„ Lapponum
„ prunifolia
Orchis nigra
Lloydia serotina
Juncus Jacquini
„ trifidus
„ triglumis
Elyna spicata
Sesleria cærulea
„ disticha
Poa alpina
„ Balfourii
„ laxa
„ nemoralis

On the low ground below the glacier we found *Epilobium rosmarinifolium.*

Thursday, 19*th August* 1858.

The morning was wet and misty. After paying our bill at the Hospice, we started at 8.30 and proceeded towards the Valais. After reaching the Col we descended by a very rough and slippery path to the valley of the Rhone. We visited the famous glacier whence comes the arrowy Rhone, which here is

very turbid—unlike its blue colour when issuing from the Lake of Geneva. We mounted on the glacier for a short way, saw some small crevasses, examined the beautiful vault of deep blue ice where the Rhone issues—some large pieces of ice had just fallen. Soon after our visit the rain began to cease and ere long the sun broke forth. We walked by the Valais to Obergestelen, where we rested for lunch, and thence to Münster, where we took up our quarters.

Many good plants were gathered on the way :—

Erysimum helveticum
Ononis Natrix
Bupleurum falcatum
" graminifolium
" ranunculoides
Athamanta cretensis
Laserpitium Siler
Gaya simplex
Artemisia campestris
Hieracium blattarioides
Hypochœris uniflora
Campanula thrysoides
Bromus gracilis
Melica ciliata

We had some difficulty in getting accommodation at Münster. Our host at the Croix d'Or, Jean Baptiste Guntren, however, was very attentive and polite. Our plants were put into paper and prepared so as to be sent to the care of M. Guthnick at Berne, who had kindly offered to take care of them and transmit to Edinburgh.

Friday, 20th August 1858.

Münster was left, after breakfast, this morning at 8.30. We reached Viesch, famous for its glacier, and remained there till 1.30. Left Viesch in five char-a-bancs holding five each besides the driver.

Passed Lax, the Massa, Aletsch (celebrated for its glacier). We reached Brigue in the evening. Our quarters were taken up in the Hôtel d'Angleterre. Despatched a parcel of plants to Guthnick at Berne.

Saturday, 21st August 1858.

Left Brigue at 6 a.m. in two large char-a-bancs, and travelled by the valley of the Rhone through a beautiful country to Visp or Vispach. The morning was fine and the view charming. Near

Visp noticed a large straight avenue of poplars, a mile or two in length. Stopped at the Hôtel du Soleil to breakfast.

After breakfast the party proceeded up the river Visp to Stalden; this took about one and a half hours or more. Here the valleys of the Saas and St. Niklaus separate. The latter, which goes to the right, led us to Zermatt. We picked many interesting lower country plants on the way :—

Biscutella lævigata	Salvia viscosa
Erigeron canadensis	Herminium Monorchis
Monotropa Hypopitys	Colchicum autumnale
Digitalis grandiflora	Stipa pennata
Hyssopus officinalis	

Leaving Stalden we walked to St. Niklaus, which usually takes two and a half hours more walking. In this part of the journey the Weisshorn is a conspicuous snowy mountain. Fir woods here and there and snowy patches seen. We rested at St. Niklaus for some time to take lunch. We reached Zermatt between 6 and 7 p.m., passing along an interesting valley.

We were thoroughly wet, and as our baggage had not arrived we had no alternative but to go to bed for a time. Nine of the party remained at the Hôtel du Mont Cervin, while the remaining 12 (3 being left at Visp) were accommodated at the Hôtel du Mont Rose, Seiler Frères.

Sunday, 22nd August 1858.

When we awoke in the morning we found the whole ground covered with newly-fallen snow to the depth of 3 or 4 inches. It was a remarkable sight at this time of the year. The sun broke out in the course of the morning and the snow began to melt rapidly, so that the ground became very disagreeable. The curé is a good naturalist and has made a collection of the plants of the mountains. The collection can be purchased. At the hotel there were two volumes of botanical specimens laid out for the inspection of travellers.

Monday, 23rd August 1858.

Day fine, sun shining and snow melting; still much snow covering the ground; notwithstanding, we resolved to start for

alpine botanising. We started after breakfast, about 9, with an excellent guide, Joseph Zum Taugwald, who knew something about the plants in the district. On going up the valley, not far from Zermatt, marks of polishing and striation are seen on some of the rocks. We made our way gradually through the wood and up the mountain to the Riffel Hôtel, kept by a brother of M. Seiler, who was also very kind and attentive. On rocks during the ascent to Riffel and near Zermatt gathered *Gentiana nivalis* and *Oxytropis campestris*. On reaching the hotel we arranged for beds, table d'hôte, &c., and then started on our way to the alpine heights. We walked through snow sometimes more than a foot deep up to the Gorner Grat, seeing only now and then a plant on some bare rock where the snow had melted; we were most annoyed at our inability to procure specimens, for we had all along looked to the hills in this quarter as our best botanical district.

After lunching on the Gorner Grat we prepared to descend. The greater number returned from the Gorner Grat to the Riffel, while Messrs. Buchan, A. Graham, self, and guide made an excursion to some rocks by the side of the Great Glacier, where the snow had melted more fully on the south and west. Mr Turnbull also accompanied us during part of the time. Here we gathered our best alpine plants :—

Phaca astragalina
Oxytropis campestris
" cærulea
" montana
Valeriana celtica
Artemisia glacialis
" lanata
Arnica scorpioides
Senecio uniflorus
Campanula cenisia
Gentiana nivalis
" glacialis
Veronica saxatilis
" alpina
Pinus Cembra (near Zermatt)

We returned to the hotel about 6 for table d'hôte. The effects of the sun's reflection from the snow was now visible on all our faces; some of us suffered very severely. We had intended to take another day's botanising here, visiting the Furggen glacier, close under the Matterhorn precipices, and the Zmutt glacier; but the effects of our adventure to-day were such as to make the party resolve to return to Zermatt. All were discouraged by the

want of success in the way of plant gathering, and the smarting of faces, necks, and eyes was not easily got over. Moreover, the guide said he could not conduct the party on the route we proposed without extra assistance, for the glaciers were not always safe. We accordingly sent our guide to M. Seiler at Zermatt to arrange for our breakfasting next day, while we slept at the Riffel.

Tuesday, 24th August 1858.

At 6.15 a.m. we descended to Zermatt to breakfast, getting a few plants on the way. Some of the party descended from the Riffel to Zermatt in one and a half hours. M. Seiler received us with his usual kindness. We paid a visit to the curé's house for the sake of seeing his plants, but found that he was not at home. About 9 we left Zermatt and walked down the valley. The melting of the snow had caused an increase in the streams, and in several instances the rude bridges required for the passage of horses were carried away. These rapid torrents carry down debris and trees with them and often render the roads impassable. At one point of our journey the repair of a bridge became necessary. This was accomplished by the party with the aid of guides and under the direction of Dr. Fayrer, whose experience in the crossing of rivers in India was most useful. To the astonishment of the guides a most effective bridge was made in a better style than they had ever seen before. We rested at St. Niklaus for lunch. There we met Dr. Sanderson and his wife. The Doctor, an old pupil, zealous physiologist, wrote article, "Vegetable Embryology," in Todd's Cyclopædia. Continued our walk to Visp, which was reached in the evening. To-day we were on foot 12 hours. The walk was about 34 or 36 miles. Took up our quarters at the Hôtel du Soleil.

Wednesday, 25th August 1858.

After breakfast, started at 9 in four voitures of different kinds for Martigny. Morning fine, allowing a good view of the valley of the Rhone.

We travelled by the Valais along the banks of the Rhone. Rested at Leuk, Gemmi Pass. We reached Sion in the after-

noon for lunch. We remained there two hours. This is the chief town of the Valais. We had a long drive to Martigny. Some time before we reached Martigny rain came on. The night was dark and stormy, with thunder and lightning, and did not promise well for a mountain trip next day. We took up our quarters at the Hôtel Clerc about 6.45, where we were well attended to and very comfortable. Put up our plants and despatched them to Guthnick at Berne.

Thursday, 26th August 1858.

Wind, rain and mist prevented us from attempting to cross the Tête Noire to Chamounix as we had intended. After some delay in the hope that the day might clear, we at last left Martigny about 10.30, some driving in the omnibus and some walking in the direction of Bex, where we meant to join the railway. The day was very wet, heavy showers every now and then. A number of plants were gathered, especially *Athyrium fontanum* by Mr. Fraser.

We proceeded by rail to Villeneuve, where we joined the steamer on the Lake of Geneva. We left Villeneuve at 12.30 and reached Geneva about 7 p.m. At first we proceeded to the Hôtel Couronne, but did not find sufficient accommodation there. Mr. Bell and Mr. Sconce got beds there. The rest went to the Hôtel de la Métropole—large and fine new hotel; abundance of beds ; rather expensive.

Friday, 27th August 1858.

After breakfast, went to Rue du Rhone for a photograph. Found that Messrs. Artaria & Carini, who were recommended as the best photographers, were not at home ; and accordingly, as our time was limited, we were compelled to take some other. Accidentally went to the rooms of a person near Artaria & Carini, M. Poncy. He took three photographs of the party, for which 81 francs were charged. These we brought home and they have since been used by Bryson for printing, but none have turned out good. Messrs. Bell & Sconce, who were at another hotel and whose residence we could not ascertain, missed us and got their photographs taken separately by the same artist. That

of Mr. Sconce is excellent. Called on De Candolle, 100 Cour St. Pierre. M. Alphonse de Candolle was not at home. Saw his son, who showed us the Candollean Library and the Herbarium superintended by Dr. Mueller. Interesting to see the mode in which the plants mentioned in the Prodromus were marked. De Candolle and Mueller accompanied us to the Botanic Garden, which is no longer superintended by Alphonse de Candolle, but in which there are many plants of interest. P. Maclagan, P. Graham, Williamson, Bell, and Sconce remained at Geneva. Dined at our hotel and left Geneva at 4.15 p.m. for Paris, 3rd class.

Saturday, 28th August 1858.

After a very uncomfortable night reached Paris about 12 noon, after twenty hours' travel. Took up quarters at Hôtel du Louvre; all accommodated.

Monday, 30th August 1858.

Left Paris at 6.30 for London. Twelve of party returned to London—five had been left in Geneva and seven in Paris. Reached Dover about 5 a.m. and London about 8 a.m. on 31st August 1858. Fayrer and Hill started for Edinburgh by 9 train, and reached it at 8 p.m.—thus going from Paris to Edinburgh in twenty-five and a half hours. Rest of party dispersed, and with two others I left by train at 7.30 p.m., third class, and after an uncomfortable journey reached Edinburgh at 7.30 a.m. on Wednesday, 1st September 1858.

LIST OF PLANTS COLLECTED DURING THE EXCURSION.

DICOTYLEDONES.

RANUNCULACEÆ.

Aconitum Lycoctonum
" Napellus
" paniculatum
Actæa spicata
Anemone alpina
" baldensis
" Halleri
" vernalis
Aquilegia alpina
" vulgaris
Caltha palustris
Clematis virginiana
" Vitalba
Hepatica triloba
Ranunculus aconitifolius
" acris

Ranunculus aquatilis
" Flammula
" glacialis
" montanus
" philonotis
" pyrenæus
Thalictrum majus
" minus
Trollius europæus

BERBERIDEÆ.

Berberis vulgaris

NYMPHÆACEÆ.

Nuphar luteum
Nymphæa alba

PAPAVERACEÆ.

Chelidonium majus
Papaver Decaisnei ?

FUMARIACEÆ.

Corydalis claviculata
Fumaria officinalis

CRUCIFERÆ.

Æthionema saxatile
Alyssum calycinum
" campestre
Arabis alpina
" arenosa
" bellidifolia
" cærulea
Biscutella coronopifolia
" lævigata
" saxatilis, var.
Bunias Erucago
Camelina sativa
Cardamine hirsuta
" resedifolia
Dentaria dentata
Diplotaxis tenuifolia
Draba frigida
Erysimum cheiranthoides
" ochroleucum
Iberis amara
Malcolmia maritima
Nasturtium officinale
" palustre
(near St. Niklaus)
Raphanus Landra ?
Sinapis alba
Sisymbrium officinale
" pyrenaicum
" Sophia
Thlaspi arvense
" sylvium

RESEDACEÆ.

Reseda lutea
" Phyteuma

CISTACEÆ.

Helianthemum obscurum
" vulgare

VIOLACEÆ.

Viola Allionii
" arenaria
" arvensis
" biflora
" calcarata
" lutea
" mirabilis
" tricolor

POLYGALACEÆ.

Polygala vulgaris and vars.

CARYOPHYLLACEÆ.

Agrostemma Flos-Jovis
Alsine fastigiata
„ rostrata
„ sedoides
„ setacea
Arenaria biflora
„ ciliata
„ fasciculata
„ laricifolia
„ norvegica
„ recurva
„ serpyllifolia
„ verna (A. Gerardi)
Cerastium alpinum
„ arvense
„ campanulatum
„ latifolium
„ strictum
„ trigynum
„ triviale
Cherleria sedoides
Dianthus actinopetalus
„ Carthusianorum
„ prolifer
„ sylvestris
Gypsophila repens
„ Saxifraga
Lychnis alpina
„ diurna
„ Flos-cuculi
Moehringia muscosa
Sagina apetala
„ procumbens
„ sp.? (vivip.)
Saponaria officinalis
„ Vaccaria
Silene acaulis
Silene inflata
„ muscipula
„ nocturna
„ nutans
„ Otites
„ rupestris
„ vallesia
Stellaria cerastoides
„ graminea
„ nemorum

PORTULACACEÆ.

Montia fontana

TAMARICACEÆ.

Myricaria germanica

HYPERICACEÆ.

Hypericum montanum

MALVACEÆ.

Althæa officinalis
Malva rotundifolia

LINACEÆ.

Linum angustifolium
„ tenuifolium
„ usitatissimum

GERANIACEÆ.

Erodium cicutarium
Geranium cinereum
„ columbinum
„ pratense
„ Robertianum
Oxalis corniculata

BALSAMINACEÆ.

Impatiens Noli-me-tangere

SAPINDACEÆ.

Acer campestre

LEGUMINOSÆ.

Astragalus chionophilus
„ Cicer
„ dasyglottis
„ depressus
„ leontinus
„ monspessulanus
„ Onobrychis
Coronilla Emerus and vars.
Genista germanica
„ sagittalis
„ tinctoria
Hippocrepis comosa
Lotus major
Medicago denticulata
„ falcata
„ sativa
Onobrychis sativa
Ononis arachnoidea
„ Natrix
Oxytropis campestris
„ cyanea
Phaca alpina
„ astragalina
Tetragonolobus siliquosus
Trifolium agrarium
„ alpinum
„ arvense
„ badium
„ cæspitosum
„ flexuosum
„ fragiferum
„ montanum
„ ochroleucum
Vicia Cracca

ROSACEÆ.

Agrimonia Eupatoria
Alchemilla alpina
„ pentaphyllea
„ vulgaris
Cotoneaster vulgaris
Dryas octopetala
Geum montanum
„ reptans
Potentilla ambigua
„ argentea
„ aurea
„ cinerea
„ grandiflora
Poterium Sanguisorba
Prunus Cerasus
Rosa spinulifolia
Rubus cæsius
Sanguisorba officinalis
Sibbaldia procumbens
Spiræa Aruncus

SAXIFRAGACEÆ.

Saxifraga aizoides
„ Aizoon
„ androsacea
„ aspera
„ bryoides
„ cæsia
„ cuneifolia
„ davurica
„ hypnoides
„ oppositifolia
„ rotundifolia
„ stellaris
„ umbrosa ?

GROSSULARIACEÆ.

Ribes petræum

CRASSULACEÆ.

Crassula rubens
Sedum album
„ atratum
„ dasyphyllum
„ reflexum
Sempervivum arachnoideum
„ montanum
„ tectorum

LYTHRACEÆ.

Lythrum Salicaria

ONAGRACEÆ.

Circæa lutetiana
Epilobium alpinum
„ alsinifolium
„ angustifolium
„ Dodonæi
„ Fleischeri
„ palustre
„ rosmarinifolium

CUCURBITACEÆ.

Bryonia dioica

UMBELLIFERÆ.

Astrantia minor
Athamanta cretensis
Bupleurum caricifolium
„ falcatum
„ pyrenaicum
„ stellatum
Daucus Carota
Gaya simplex
Laserpitium hirsutum
„ Siler
Ligusticum actæifolium
Meum Mutellina
Myrrhis odorata
Silaus pratensis

CAPRIFOLIACEÆ.

Linnæa borealis (St. Niklaus)
Lonicera alpigena

RUBIACEÆ.

Asperula aristata
„ cynanchica
„ hirta
„ taurina
Galium Bocconi
„ rubrum
„ sylvestre
„ verum

VALERIANACEÆ.

Valeriana celtica
„ montana
„ tripteris

DIPSACEÆ.

Asterocephalus Columbaria
Scabiosa pyrenaica

COMPOSITÆ.

Achillea atrata
„ macrophylla
„ Millefolium
„ nana
„ tomentosa
Achyrophorus maculatus
Antennaria alpina
„ Leontopodium

Anthemis montana
Arnica montana
" scorpioides
Aronicum glaciale
Artemisia Absinthium
" campestris
" glacialis
" Mutellina
Aster alpinus
" Amellus
Bellidiastrum Michelii
Carduus acaulis
" defloratus
Carlina acaulis
" vulgaris
Centaurea alba
" Jacea
" paniculata
" Scabiosa
Chrysanthemum alpinum
" coronopifolium
" frutescens
Cichorium Intybus
Cirsium oleraceum
Crepis aurea
" bulbosa?
Doronicum Pardalianches
Echinops sphærocephalus
Erigeron acris
" alpinus
" canadensis
" uniflorus
" Villarsii
Eupatorium cannabinum
Filago arvensis
Gnaphalium dioicum
Gnaphalium norvegicum
" pusillum
" sylvaticum
Hieracium angustifolium
" Bauhini
" blattarioides
" dentatum
" grandiflorum
" Halleri
" montanum
" obscurum
" præaltum
" Pilosella
" piloselloides
" prenanthoides
" rigidum
" staticifolium
Inula germanica
Lactuca perennis
" Scariola
" virosa
Leontodon Taraxacum
Prenanthes muralis
" purpurea
Senecio carniolicus
" erucifolius
" Fuchsii
" incanus
" uniflorus
Solidago Virgaurea
Tussilago alpina

CAMPANULACEÆ.

Campanula barbata
" cæspitosa
" carnica (Zermatt)
" garganica
" incisa
" linifolia

Campanula persicifolia
" Raineri
" rapuncu-
loides
" rhomboidalis
" Scheuchzeri
" speciosa
" Trachelium
Jasione montana
Phyteuma betonicifolium
" hemisphæri-
cum
" humile
" orbiculare
" pauciflorum
" spicatum

VACCINIACEÆ.

Vaccinium uliginosum

ERICACEÆ.

Arbutus Uva-ursi
Azalea procumbens
Calluna vulgaris
Erica carnea
Pyrola secunda
Rhododendron ferru-
gineum

MONOTROPEÆ.

Monotropa Hypopitys

PLUMBAGINEÆ.

Statice pubescens

PRIMULACEÆ.

Androsace carnea
" Chamæjasme
glacialis
obtusifolia
pennina
Primula farinosa
" latifolia
" viscosa
Soldanella alpina

OLEACEÆ.

Fraxinus excelsior

ASCLEPIADACEÆ.

Cynanchum Vincetoxi-
cum

GENTIANACEÆ.

Erythræa Centaurium
Gentiana acaulis
" alpina
" asclepiadea
" bavarica
" brachyphylla
" campestris
" ciliata
" glacialis
" nivalis
" obtusifolia
" Pneumonanthe
" punctata
" purpurea
" tenella
" verna

BORAGINACEÆ.

Cynoglossum officinale
" pictum
Echinospermum Lappula
Echium vulgare
Eritrichium nanum
Myosotis alpestris
Onosma echioides

CONVOLVULACEÆ.

Convolvulus arvensis
" sepium

SOLANACEÆ.

Hyoscyamus niger
Physalis Alkekengi
Solanum nigrum

SCROPHULARIACEÆ.

Anarrhinum bellidifolium
Bartsia alpina
Digitalis grandiflora
" lutea
Euphrasia lutea
" minima
" Odontites
" salisburgensis
Linaria alpina
" genistifolia
" minor
" vulgaris
Melampyrum sylvaticum
Pedicularis recutita
" rostrata
Rhinanthus Crista-galli
" major
Verbascum nigrum
" Thapsus
Veronica alpina
" bellidioides
" fruticulosa
" repens
" saxatilis
" spicata
" urticæfolia

VERBENACEÆ.

Verbena officinalis

LABIATÆ.

Ajuga genevensis
Calamintha alpina
Galeopsis Ladanum
Hyssopus officinalis
Lamium maculatum
Leonurus cardiaca
Lycopus europæus
Mentha sylvestris
Nepeta Cataria
Origanum vulgare
Prunella grandiflora
" hyssopifolia
Salvia glutinosa
Sideritis scordioides
" spinosa?
Teucrium Chamædrys
" montanum
" Scordium
Thymus alpinus

PLANTAGINEÆ.

Plantago alpina

PARONYCHIACEÆ.

Herniaria alpina
" glabra
Scleranthus annuus
" perennis

CHENOPODIACEÆ.

Chenopodium album
" Botrys
" crassifolium
Scleranthus annuus
" perennis

POLYGONACEÆ.

Oxyria reniformis
Polygonum Fagopyrum
" viviparum
Rumex Acetosella
" alpinus

ELÆAGNACEÆ.

Hippophaë rhamnoides

SANTALACEÆ.

Thesium alpinum

EUPHORBIACEÆ.

Euphorbia Cyparissias
„ platyphylla
„ segetalis
Mercurialis annua

URTICACEÆ.

Humulus Lupulus

PLATANACEÆ.

Platanus orientalis

CUPULIFERÆ.

Betula alba
Fagus sylvatica
Quercus Robur

AMENTIFERÆ.

Salix arenaria
„ herbacea
„ pyrenaica
„ reticulata
„ retusa

MONOCOTYLEDONES.

ORCHIDACEÆ.

Epipactis latifolia
„ rubra
Epipogum Gmelini
Goodyera repens
Habenaria albida
„ viridis
Herminium Monorchis
Listera ovata
Orchis nigra
„ odoratissima

LILIACEÆ.

Allium fallax
„ Schœnoprasum
Anthericum ramosum
Convallaria bifolia
Lloydia serotina

ASPARAGEÆ.

Maianthemum bifolium
Paris quadrifolia

MELANTHACEÆ.

Colchicum alpinum
„ autumnale
Tofieldia glacialis
„ palustris
Veratrum album

JUNCACEÆ.

Juncus alpinus
„ bufonius
„ filiformis
„ Jacquini
„ trifidus
Luzula campestris
„ lutea
„ nivea
„ pediformis
„ spadicea
„ spicata

ALISMACEÆ.

Butomus umbellatus
Sagittaria sagittifolia

POTAMEÆ.

Potamogetones

CYPERACEÆ.

Carex atrata
" brachystachys
" cæspitosa
" capillaris
" chordorrhiza
" ciliata
" curvula
" decipiens?
" ferruginea?
" firma
" fœtida
" frigida
" irrigua
" lagopina
" nigra
" remota
" tenuis
Elyna spicata
Eriophorum angustifolium
" capitatum
Scirpus alpinus
" Bæothryon

GRAMINEÆ.

Achnatherum Calamagrostis
Agrostis alpina
" rupestris
" setacea
" stolonifera
Avena Scheuchzeri
" sempervirens
" tenuis
Brachypodium pinnatum
Bromus arvensis
" grossus?
" tectorum
Cynodon Dactylon
Digitaria ciliaris
Festuca calamaria
" heterophylla
" Lemanii
" pumila
" tenella
Lagurus ovatus
Melica ciliata
Panicum miliaceum
Phleum alpinum
" asperum
" Boehmeri
" commutatum
" Michelii
Poa alpina
" Balfourii?
" cenisia
" nemoralis
Sesleria cærulea
" disticha
Setaria glauca
" verticillata
" viridis
Stipa capillata
" pennata
Trisetum distichophyllum

CONIFERÆ.

Juniperus Sabina
Pinus Cembra
" sylvestris

ACOTYLEDONES.

FILICES.

Asplenium septentrionale
" viride
Athyrium fontanum
Botrychium Lunaria
Ceterach officinarum
Cystopteris fragilis
Lastrea dilatata
Polypodium calcareum
Polystichum aculeatum
" Lonchitis
Pseudathyrium alpestre
Allosorus crispus
Asplenium lanceolatum

LYCOPODIACEÆ.

Lycopodium annotinum
" helveticum

MUSCI.

Aulacomnion androgynum
Bartramia pomiformis
Bryum Wahlenbergii
Dicranum scoparium
Funaria hygrometrica
Gymnostomum curvirostrum
Hedwigia ciliata
Hypnum Crista-castrense
" cupressiforme
Hypnum tenellum
" triquetrum
Leskea subrufa
Leucodon sciuroides
Mnium serratum
Neckera crispa
Orthotrichum
Pogonatum alpinum
" urnigerum
Polytrichum commune
" sexangulare
Racomitrium aciculare
" canescens
Sphagnum cymbifolium
Tortula ruralis
" tortuosa
Zygodon Mougeotii

LICHENES.

Alectoria jubata
Borrera furfuracea
Cetraria islandica
" juniperina
" nivalis
Cladonia rangiferina
Cornicularia vulpina
Parmelia caperata
" conspersa
" saxatilis
Peltidea polydactyla
Scyphophorus deformis
Stereocaulon paschale

EXCURSIONS IN 1859.

Holyrood, Arthur's Seat, Duddingston Loch.

Saturday, 14*th May* 1859.

Party of about 120 met at Holyrood Palace at 10.30 a.m., thence walked to Arthur's Seat, Hunters' Bog, Samson's Ribs,

Duddingston Loch. Returned by Dunsappie, top of Arthur's Seat, St. Anthony's Chapel, and reached Holyrood a little after 4 p.m.

Plants collected :—

Ranunculus aquatilis
" sceleratus
" Ficaria
Draba verna
Sisymbrium Thalianum
Helianthemum vulgare
Lychnis Viscaria
Stellaria Holostea
Alsine verna
Geranium sanguineum
Oxalis Acetosella
Anthyllis Vulneraria
Lathyrus macrorrhizus
Potentilla verna
Cratægus Oxyacantha
(early in flower)
Saxifraga granulata
Hippuris vulgaris
Anthriscus vulgaris
" sylvestris
Valerianella olitoria
Petasites vulgaris
Vaccinium Myrtillus
Myosotis collina
" versicolor
Veronica hederæfolia
" arvensis
" serpyllifolia
" Chamædrys
Lamium purpureum
" album
Mercurialis perennis
Salix alba
Carex vulgaris
" præcox
" riparia
Anthoxanthum odoratum
Asplenium Adiantum-nigrum
" Trichomanes
" Ruta-muraria
" septentrionale
Polypodium vulgare
Equisetum limosum

Penicuik, Auchendinny, Roslin.

Saturday, 21st May 1859.

Party of about 100 met at North British Railway Station at 8.45 a.m. and proceeded to Penicuik Station. Visited glen near Station. Saw Paper Mills at Valleyfield, walked by the banks of the Esk to Auchendinny and Roslin, which was reached about 4.30 p.m. Returned by train leaving Roslin Station at 5.30. Return tickets, 1s. 3d.

Numerous plants gathered, among which may be noticed :—

Cheiranthus Cheiri
Cardamine amara
" sylvatica
Sisymbrium Thalianum
Stellaria uliginosa
Moehringia trinervia

Prunus Padus
Ribes alpinum
Carum Carui
Myrrhis odorata
Adoxa Moschatellina
Vaccinium Myrtillus
Fraxinus excelsior
Veronica montana
Pedicularis sylvatica
Ulmus suberosa
Salix fragilis
„ cinerea
„ Caprea
Allium ursinum
Luzula pilosa
Carex sylvatica
Polypodium Dryopteris
„ Phegopteris
Equisetum umbrosum

Burntisland, Pettycur, Kinghorn.

Saturday, 28th May 1859.

Party of about 130 met at the Edinburgh, Perth, and Dundee Railway Station, and proceeded to Burntisland. Visited the Island, and walked by hills and shore to Pettycur, thence to Kinghorn and Kinghorn Loch, and returned by boat from Burntisland at 4.50 p.m. Return third class fare, 9d.

Among the plants collected were the following :—

Ranunculus aquatilis
„ hederaceus
Cheiranthus Cheiri
Cochlearia officinalis
Thlaspi arvense
Reseda lutea
„ Luteola
Viola canina
Cerastium glomeratum
„ arvense
Malva sylvestris
„ rotundifolia
Geranium sanguineum
Astragalus hypoglottis
Vicia lathyroides
(on Island)
Rosa spinosissima
Myrrhis odorata
Æthusa Cynapium
Sambucus nigra
Asperula taurina
Centranthus ruber
(near Aberdour)
Valerianella olitoria
Anthemis arvensis
Tragopogon minor
Cynoglossum officinale
Lithospermum arvense
Linaria Cymbalaria
Veronica polita
„ arvensis
„ Anagallis
Plantago Coronopus
Rumex aquaticus (near
Kinghorn Loch)
Hippophaë rhamnoides

Orchis mascula
Allium vineale
Pinus sylvestris
Botrychium Lunaria
Equisetum palustre
Hypnum rutabulum
Parmelia parietina
,, aquila
Lecanora Parella
Ramalina scopulorum
Ædidium senecionidis
Lycoperdon Bovista

Prestonpans, Tranent, Elphinston, Melville Hall, Cousland, Prestonhall, Crichton, Tynehead.

Saturday, 4th June 1859.

Morning rather unpromising. Party of 40 met at the North British Railway Station at 8 a.m. and proceeded to Prestonpans, thence walked to Tranent, Elphinston, Melville Hall, Cousland, Prestonhall, where Mr. Gorrie joined the party and Mr. Campbell from Glasgow; thence to Crichton and Tynehead. Return tickets, 2s.

Among the plants gathered were the following:—

Ranunculus arvensis (Cousland)
Berberis vulgaris
Nuphar luteum
Nymphæa alba (pond at Prestonhall)
Papaver Rhœas
,, dubium
,, Argemone
Fumaria micrantha
Sinapis alba
Stellaria uliginosa
Malva moschata (not in flower)
Geranium sylvaticum
Staphylea pinnata
Genista anglica (Tynehead)
Fragaria elatior (Prestonhall)
Agrimonia Eupatoria
Silaus pratensis (Cousland and near Melville Hall; not in flower)
Tragopogon minor
Vinca minor
Villarsia nymphæoides (pond at Prestonhall)
Anchusa sempervirens
Solanum Dulcamara
Veronica montana
Ajuga reptans (white, at Prestonhall)
Plantago media (Cousland)
Hippophaë rhamnoides (at Tynehead)
Salix aurita
,, Caprea
,, Helix
Neottia Nidus-avis
Orchis latifolia

Ornithogalum umbellatum (Prestonhall)
Luzula pilosa
„ sylvatica
Alisma Plantago
Eriophorum latifolium
Carex remota
Nardus stricta
Juniperus communis
Ophioglossum vulgatum (Prestonhall)
Botrychium Lunaria

Lanark, Cora Linn, Bonnington Falls, Cartland Crags, Banks of Mouse, Cleghorn.

Saturday, 11*th June* 1859.

Party of 143 met at the Caledonian Railway Station at 6.30 a.m. and proceeded to Lanark. Breakfasted at the Clydesdale Hotel (Irving). Walked with two guides to Cora Linn and Bonnington Falls, thence to Cartland Crags and the banks of the Mouse. Some of the party went to Stonebyres and walked by banks of Mouse to Cleghorn Junction. The greater part returned by train from Lanark at 4.35 p.m. Return tickets, 2s. 6d.; breakfast, 1s. 9d.: guides, 2d.

Among the plants collected were the following:—

Thalictrum flexuosum (woods, Cora Linn)
Trollius europæus
Aquilegia vulgaris (in profusion in woods near Cora Linn)
Aconitum Napellus
Nasturtium palustre (Clyde banks near Lanark)
Cardamine amara
Hesperis matronalis (banks of Mouse)
Vicia Orobus
„ sylvatica
Spiræa salicifolia (Bonnington)
Rubus corylifolius
Pyrus Aucuparia
Saxifraga oppositifolia
„ Geum (woods, Cora Linn)
Viburnum Opulus (Mouse River)
Galium boreale
„ pusillum (Cora Linn)
Antennaria dioica
Doronicum Pardalianches
Carduus heterophyllus
Hieracium Pilosella
„ murorum
„ vulgatum
Jasione montana
Pyrola minor
Rumex aquaticus (near Lanark)

Neottia Nidus-avis (Mouse)
Listera ovata
Orchis mascula
„ incarnata
„ latifolia
„ maculata
Gymnadenia conopsea
Convallaria majalis
Scirpus sylvaticus
Eriophorum latifolium
Carex remota
„ aquatilis
(banks of Mouse)
„ glauca
„ vulgaris
„ panicea
„ fulva
„ flava
„ hirta
„ paludosa
Carex ampullacea
Milium effusum
Avena pratensis
Melica nutans
„ uniflora
Poa nemoralis
Asplenium viride
Scolopendrium vulgare
Cystopteris fragilis
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Equisetum arvense
„ umbrosum
„ sylvaticum
„ palustre
„ limosum
„ hyemale
Lycopodium selaginoides
(Cora Linn)

Ladybank, Strathmiglo, Balvaird Castle, Glenfarg, Abernethy.

Saturday, 18*th June* 1859.

Party of between 50 and 60 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to Ladybank and Strathmiglo. Breakfasted there at Mr. Senior's Inn in two rooms. Met Mr. Barclay of Cupar, Dr. Lyall of Newburgh, Dr. Troup of Auchtermuchty, Mr. Henderson (a gardener) and his son. Walked to Balvaird Castle and Glenfarg. Met Mr. Barclay at the Bein Inn. Examined Glenfarg Woods, visited castle, and had a fine view of the Carse, the Earn, the Tay, Moncrieff Hill, Kinnoul Hill, and the Highland mountains. Reached Abernethy in time for the train at 3.15 p.m., and came to Edinburgh about 5.50 p.m. Return tickets, 3s. 3d.; breakfast, 1s. 6d.

Among the plants gathered were the following :—

Ranunculus Flammula
Papaver Argemone
Arabis hirsuta
Viola tricolor
„ lutea
Dianthus deltoides
Lychnis Viscaria
(abundant in Glenfarg)
Cerastium arvense
(near Strathmiglo)
Malva moschata (Glenfarg)
Geranium sanguineum
„ phæum
„ sylvaticum
„ lucidum
Genista anglica
(near Ladybank)
Prunus insititia
Comarum palustre
Sedum reflexum
(Balvaird Castle)
Anthemis arvensis
Matricaria Parthenium
Pyrola minor
Anagallis arvensis
Solanum Dulcamara
Antirrhinum majus
(Abernethy)
Scrophularia vernalis
(at Baivaird Castle)
Mentha viridis and var.
(in Glenfarg)
Origanum vulgare
Rumex sanguineus
„ viridis
(in Glenfarg)
Salix repens
„ fusca
Listera cordata
(hill near Abernethy)
Gymnadenia conopsea
Habenaria bifolia
Scirpus setaceus
Carex binervis
„ hirta
„ paludosa (Glenfarg)
Poa nemoralis
Nardus stricta
Asplenium Adiantum-nigrum
„ Trichomanes
„ Ruta-muraria
Athyrium Filix-fœmina
Cystopteris fragilis
Polystichum lobatum
„ aculeatum
Lastrea Oreopteris
Polypodium Dryopteris
Lycopodium Selago

Forteviot, Invermay, Muckersie Falls.

Saturday, 25th June 1859.

Party of between 50 and 60 met at Edinburgh and Glasgow Railway Station at 6.30 a.m. and proceeded by Scottish Central line to Forteviot. Breakfasted at Rutherford's Inn in two rooms. Met Dr. Stirling from Perth, Dr. Lorimer, and others, the latter

accompanied the party. Walked by banks of May to Invermay —met the gardener who showed the party through the grounds. Walked up the side of the river to the Muckersie Falls—then visited Clevage Hill, Clevage Loch, returned to Forteviot at 4.29, and reached Edinburgh at 7.50 p.m. Return tickets, 3s. 11d. Breakfast, 2s.

Among the plants collected were the following :—

Lepidium Smithii
Viola canina
Stellaria nemorum
Hypericum humifusum
Geranium sylvaticum
" pratense
Genista anglica
Trifolium medium
Spiræa salicifolia
Rubus saxatilis
Potentilla fruticosa
Circæa lutetiana
Sanicula europæa
Sambucus nigra
Viburnum Opulus
Solidago Virgaurea
Filago germanica
Antennaria dioica
Matricaria Parthenium
Erica Tetralix
Pyrola minor
Anagallis arvensis
Solanum Dulcamara
Mimulus luteus
Stachys Betonica
Littorella lacustris
Polygonum viviparum
Salix repens
Listera ovata
Epipactis latifolia
Orchis latifolia
" maculata
Gymnadenia conopsea
" albida
Habenaria bifolia
" chlorantha
Narthecium ossifragum
Scirpus lacustris
Carex sylvatica
Poa nemoraiis
Scolopendrium vulgare
Cystopteris fragilis
Equisetum umbrosum
Lycopodium clavatum
" alpinum

Grant's House, Cockburn Law, &c

Saturday, 2nd July 1859.

Party of 45 met at North British Railway Station at 8 a.m. and proceeded to Grant's House—met Mr. James Hardy of Penmanshiel along with two of the schoolmasters in the neighbourhood, and walked by Butterdean across the Eye by

Quixwood to the Abbey St. Bathan's and the Whitadder. Crossed the river by bridge and proceeded to Cockburn Law, 1049 feet above level of the sea. Visited Edin's Hold, an old Pictish or Saxon building, then crossed the Whitadder to the Retreat (belonging to Lord Wemyss) and walked through the woods to an old copper mine near the Straight Leap, and then by the road and moor to Grant's House, returning by train at 5.51 p.m. Return tickets, 2s. 6d.

Among the plants collected were the following :—

Ranunculus aquatilis
" hederaceus
" Flammula
Papaver somniferum
Cardamine amara
Hesperis matronalis
Viola palustris
" canina
Cerastium arvense
Stellaria nemorum
Geranium sylvaticum
" pratense
" dissectum
" lucidum
Genista anglica
Trifolium medium
" hybridum
Lotus major
Rubus suberectus
" nitidus
Potentilla reptans
Ribes rubrum
Sedum Telephium
Myriophyllum spicatum
Callitriche platycarpa
Sanicula europæa
Conium maculatum
Pimpinella Saxifraga
Galium palustre
Solidago Virgaurea
Antennaria dioica
Senecio sylvaticus
" viscosus
Pyrola media
Verbascum Thapsus
Veronica scutellata
Melampyrum pratense
Salix pentandra
" aquatica
Empetrum nigrum
Listera cordata
Gymnadenia conopsea
Scirpus setaceus
Blysmus compressus
Carex pulicaris
" remota
" pilulifera
" lævigata
" binervis
Phalaris arundinacea
Lolium italicum
Juniperus communis
Allosorus crispus
Lastrea Oreopteris
Polypodium Dryopteris
" Phegopteris
Lycopodium clavatum
" alpinum

Beattock, Garpol Linn, Beld Crag, Moffat.

Saturday, 9th July 1859.

Party of 66 met at the Caledonian Railway Station at 6.30 a.m. and proceeded to Beattock—breakfasted at the Beattock Inn (Miss Ramsay). Met the Rev. Mr. Little and proceeded with him to Garpol Linn. Also met the Rev. Dr. MacVicar. After visiting the Linn, went to the manse of Kirkpatrick-Juxta and saw Mr. Little's collection of living ferns. Then walked to the Beld Crag—Mr. Little met us there; afterwards proceeded to Moffat, visited the Well, and reached Beattock in time for the train at 5.22 p.m. Return tickets, 4s. Breakfast, 1s. 6d.

Some of the party visited the hills near Moffat, going to the district on Friday, 8th.

Among the plants collected were the following :—

Ranunculus hederaceus
Cardamine Impatiens
(Kirkpatrick-Juxta)
Viola hirta
Stellaria nemorum
Lepigonum rubrum
Tilia grandifolia
Genista tinctoria
Saxifraga stellaris
Sedum Rhodiola
„ villosum
Jasione montana
Pyrola secunda
Lysimachia Nummularia
(Kirkpatrick-Juxta)
Symphytum officinale
Linaria vulgaris
Habenaria chlorantha
Carex remota
„ lævigata
„ binervis
Milium effusum
Melica nutans
„ uniflora
Hymenophyllum Wilsoni
Allosorus crispus
(Moffat Hills)
Asplenium viride

Kilconquhar, Balcarres, Elie, Largo.

Saturday, 16th July 1859.

Party of between 40 and 50 met at Edinburgh Perth and Dundee Railway Station at 9.30 a.m. and proceeded to Kilconquhar, where we met the Rev. Mr. Milligan minister of

the parish, who acted as our guide; met also Mr. Barclay from Cupar, who accompanied us from Thornton Junction, and Mr. A. Wilkie of Leven. Visited Kilconquhar Loch and then walked to Balcarres; visited the Den and the high rock—whence we had a fine view. Passed Balcarres House and proceeded by Elie to Largo Links. Reached Largo in time for train at 6.39 p.m. Detained long at Thornton Junction, and did not reach Edinburgh till near 10 p.m.

Among the plants collected were the following :—

Ranunculus sceleratus
Nuphar luteum
(near St. Monans)
Arabis hirsuta
Crambe maritima (near Elie)
Viola canina (Largo Links)
Lychnis Githago
Sagina nodosa
Hypericum calycinum
" quadrangulum
" hirsutum
Euonymus europæus
Medicago sativa
Melilotus officinalis
Comarum palustre
Rosa rubiginosa
Ribes nigrum
Hippuris vulgaris
Epilobium hirsutum
" parviflorum
" montanum
Petroselinum sativum
Sium angustifolium
Pimpinella Saxifraga
Fœniculum vulgare
Œnanthe crocata
Bidens cernua
Centaurea Scabiosa
Campanula rapunculoides
Ligustrum vulgare
Cynoglossum officinale
Solanum Dulcamara
Linaria vulgaris
Veronica Anagallis
Atriplex angustifolia
" Babingtonii
Polygonum amphibium
Daphne Laureola
Habenaria viridis
Sparganium ramosum
Alisma Plantago
Scirpus lacustris
Carex disticha
" arenaria
" teretiuscula
" paniculata
" vulpina
" hirta
" ampullacea
Holcus mollis
Phragmites communis
Glyceria aquatica
Triticum repens
" junceum
Asplenium marinum
(near Elie)

Cathcart, Busby.

Saturday, 23rd July 1859.

Party of 20 met at the Edinburgh and Glasgow Railway Station at 7 a.m. and proceeded to Glasgow. Thence went by omnibus to Cathcart, met Mr. Keddie, also Mr. Crum's gardener, and the Cathcart schoolmaster, and walked by banks of the Cart through various properties, for which permission had been obtained. Visited Cathcart Castle. Crossed the Cart at different points. Walked along the banks of the Kethock and reached Busby about 2 p.m. Dined at Mr Crum's. Met the minister of Busby, Free Church Minister of East Kilbride, Dr. Ross of Busby, and others. Visited Mr. Crum's garden and houses. Left about 4 p.m. by omnibus for Glasgow, reaching Edinburgh by train at 5.30 p.m.

Among the plants gathered were the following :—

Trifolium medium
Vicia sylvatica
Rubus carpinifolius
Fragaria elatior
Agrimonia Eupatoria
Rosa villosa
„ canina, var.
„ arvensis
Sedum Telephium
„ acre (var., in woods)
Æthusa Cynapium
Arctium majus
Hieracium denticulatum
Pyrola secunda
(said to be got in woods near Busby)
Campanula latifolia
(chiefly white)
Symphytum officinale
Verbascum Thapsus
Veronica montana
Plantago maritima (on rock on banks of Cart)
Atriplex erecta
Polygonum Bistorta
Epipactis latifolia
Ruscus aculeatus
Alisma Plantago
Milium effusum
Poa nemoralis (a peculiar form like Poa Balfourii)
Bromus asper
Triticum caninum
Polypodium Dryopteris
„ Phegopteris
Ophioglossum vulgatum
(Cathcart woods)

Clova.

Friday, 12*th August* 1859.

J. H. Balfour, Thomas Barclay, William Bell, William Brand, J. B. Corbett, Alexander Graham, J. Labonté, Arthur Le Deant, John Linton, James M'Nab, T. Pougnet.

The above party of 11 left Edinburgh on Friday, 12th August, at 6 a.m. They travelled by the Edinburgh, Perth, and Dundee Railway, reached Perth about 9 a.m. and breakfasted there, arrangements having been made for them by Dr. Lauder Lindsay. They left Perth at 10.18 for Kirriemuir where they arrived about 1 p.m., the train being late. The party had return 3rd class tickets available for 14 days, price 7s. 8d.

At Kirriemuir young Findlay met the party with a cart and took charge of the baggage along with provisions for the Milltown of Clova. The party walked by Cortachy to Dykehead, where they rested for lunch. There is a great improvement in the place of late. In the woods on starting gathered *Pyrola media*, *Trientalis europæa*, *Listera cordata*. From Dykehead walked up the glen to Clova, which was reached about 7 p.m. Collected on the way *Saxifraga aizoides*, *Meum athamanticum*, *Gymnadenia albida*, *Lycopodium alpinum*, and a peculiar white-flowered variety of *Carduus heterophyllus*.

On arriving at Clova they were accommodated in the hall, where straw-beds were made up for the party, the forms, tables, and boards for the Clova festivities being called into requisition. Mr. M'Nab and Dr. Balfour had beds in the inn in consequence of the non-arrival of Lord Cranston and his keepers, who had secured all the accommodation at the inn for his shooting quarters. Found old Charles Findlay in good health, though older looking than formerly and somewhat deaf. Mary, his daughter, still takes an active charge in the inn. On our way up the glen met the Rev. Mr. Smith, the clergyman of the place. Clova is now to be made a parish extending about three miles below Milltown and about four miles above it.

Saturday, 13*th August* 1859.

Party started between 8 and 9 a.m. for Glen Dole. Went on the south side of the Esk. Met old John Ogilvy,

who knew George Don and had also met Drummond. He is over 80 years of age. Picked on the way *Malaxis paludosa* and *Gymnadenia albida.* Botanised on the north side of Glen Dole. Rain came on and continued all day. The party were thoroughly wet. Several returned early. The party examined Glen Dole ully and gathered :—

Silene acaulis
Astragalus alpinus
Rubus saxatilis
Dryas octopetala
Sibbaldia procumbens
Saxifraga oppositifolia
" stellaris
" hypnoides, var.
Epilobium angustifolium
" alsinifolium
" alpinum
Linnæa borealis
Erigeron alpinus
Gnaphalium supinum
Saussurea alpina
Hieracium alpinum
" Lawsoni
Sonchus alpinus
Arctostaphylos Uva-ursi
Pyrola media
Veronica saxatilis
Salix reticulatá
Carex atrata
Poa Balfourii
Festuca vivipara

Monday, 15*th August* 1859.

Several of the party this day were unable to take much exercise in the way of walking. The rest of the party started about 8.30 a.m. and crossed the bridge of Clova and then walked along the side of the Esk as far as the cottage where Isabella M'Kenzie lives, a person who has neither hands nor feet. The deformity is congenital. The arms end in rounded extremities without hands. The arm on the right side is shorter than that on the left. The legs are deficient from above the knees. She is intelligent, reads well, and is able to write by holding a pen in her teeth. She was 38 on Sunday, 14th August 1859. In the house where she resided I met the daughter of the former game-keeper (now dead) at Loch Callater, in whose house I once stayed for a night and whom I often visited on botanical excursions.

We then went on to Glen Fee, gathering in Glen Clova *Malaxis paludosa* and *Hieracium denticulatum.* Visited the Oxytropis cliff and gathered *Oxytropis campestris* in fruit and flower, *Epilobium angustifolium*, *Woodsia hyperborea.* This fern

seems to occur sparsely from the Oxytropis cliff up to the waterfall at the head of the glen. We got also variety of *Tofieldia palustris* and *Cystopteris fragilis*. Crossed over to the opposite side of the glen and endeavoured to get *Carex Grahami*, but did not succeed. The station of this plant seems to be lost.

Gathered :—

Rubus Chamæmorus
Sibbaldia procumbens
Cornus suecica
Gnaphalium supinum
Veronica alpina
Salix lanata
„ Lapponum
„ Myrsinites, var. arbutifolia
„ herbacea
Juncus trifidus
„ triglumis
Luzula spicata
Carex pulicaris
„ Vahlii
„ atrata
„ rigida
„ vaginata
„ pulicaris
Asplenium viride
Pseudathyrium alpestre, var. flexile
Polystichum Lonchitis

On our way home about 6 visited Robert Welsh at Acharn. His sister kindly gave us milk. The day was fine, very clear views, beautiful sunset.

Tuesday, 16*th August* 1859.

The morning was bright and seemed to promise well. Six of the party—Dr. Balfour, M'Nab, Graham, Bell, Linton, and Rutherford—started about 8.30 a.m., walked to Acharn, thence proceeded directly on the eastern side of Glen Dole to Jock's Road. Visited falls of White Water, and then walked along its banks for about a quarter of a mile, and turned to the west over the hills on the left at the place where there is a depression in the ridge, and reached at once Little Gilrannoch. Picked *Cochlearia grœnlandica*, *Lychnis alpina* (mostly in fruit), *Cherleria sedoides*, and *Armeria maritima*. On the stream coming from the hill the party gathered *Epilobium alsinifolium*, *Carex aquatilis*, *Alopecurus alpinus*, *Phleum alpinum*, and *Pseudathyrium alpestre*, var. Rain and mist had set in, and we were thoroughly drenched and very cold. Guided ourselves by compass. Returned to White Water, and walked along the banks in a northerly direction,

gathering *Sibbaldia procumbens*, *Epilobium alpinum*, *Gnaphalium supinum*, *Juncus castaneus*. In returning crossed to the Dole to join Jock's Road. Gathered *Rubus Chamæmorus* (sparingly in fruit), *Cornus suecica*, *Pseudathyrium alpestre* (in abundance) and some forms apparently *flexile*, also varieties of *Athyrium Filix-fœmina* and of *Lastrea dilatata*. On full-grown specimens of *Pseudathyrium alpestre* saw some fronds rather contracted bearing fructifications. Others were expanded and rounded in the *pinnæ* bearing no *sporangia*. It is probable that *P. flexile* is merely a barren state of the plant with the *pinnæ* more rounded and scattered. Plants of all varieties were taken for the Botanic Garden so as to enable us to determine them. Returned by Glen Dole and reached Clova about 6.30 p.m.

Wednesday, 17*th August* 1859.

This morning was very fine and warm, sun shone beautifully, and the views all around were splendid.

Ten of the party started at 9.30 for Loch Brandy ; Messrs. Le Deant and Labonté remained at home. The party visited Loch Brandy and ascended to the summit of the mountain, whence we had a splendid view of Lochnagar and all the mountains around. The distant views were particularly clear.

Among the plants gathered were :—

Thalictrum alpinum	Azalea procumbens
Subularia aquatica	Littorella lacustris
Cerastium alpinum	Salix herbacea
Potentilla alpestris	Sparganium natans
Sibbaldia procumbens	Pseudathyrium alpestre
Gnaphalium supinum	Polystichum Lonchitis
Saussurea alpina	Isoëtes lacustris
Lobelia Dortmanna	Polytrichum alpinum

On our return went to the Esk and gathered specimens of *Carduus heterophyllus*, *Hieracium denticulatum*, and *Carex aquatilis*. Dined at 5.30. About 6 p.m. Mr. Barclay appeared, having been detained at Cupar longer than he intended.

Thursday, 18*th August* 1859.

The party broke up to-day. Mr. M'Nab took charge of the party to Kirriemuir, while Dr. Balfour, Mr. Graham, and Mr.

Linton went to Ballater. Of the Kirriemuir party, Mr. Barclay and Mr. Pougnet went to Aberdeen and Peterhead, Mr. Le Deant and Mr. Labonté went to Perth, the rest to Edinburgh.

The Ballater party left Clova at 6.15 a.m. and ascended by Ben Driesh to the west of Loch Brandy. The hills were covered with mist. The party required the compass to guide them. The direction taken was N.N.E. The road was very rough, and the journey fatiguing. After three hours' travelling there was a partial clearance of the mist and part of Lochnagar was seen, which helped to direct the party. We joined the Glen Muick road between 4 and 5 miles from Ballater and reached the latter place about 12.45.

On the way we gathered :—

Pyrola media	Melampyrum sylvaticum
Trientalis europæa	Betula nana
Linaria repens	

On 19th August Mr. Graham and Mr. Linton visited Balmoral.
On 22nd August Dr. Balfour visited Lochnagar.

EXCURSIONS IN 1860.

Penicuik, Auchendinny, Roslin.

Saturday, 12th May 1860.

Party of 120 met at the North British Railway Station at 9 a.m. and proceeded to Penicuik, thence walked by banks of Esk to Auchendinny and Roslin and returned from Roslin Station at 5.30 p.m. Return tickets, 1s. 3d.

Vegetation very far behind its usual state at this season.

Collected :—

Polypodium Dryopteris	Equisetum umbrosum
„ Phegopteris (with scarcely a leaf expanded)	

50 or 60 species of flowering plants were gathered, besides many mosses and lichens, also *Morchella esculenta*.

Gorebridge, Arniston, Dalhousie.

Saturday, 19*th May* 1860.

Party of 110 met at the North British Railway Station at 11.25 a.m. and proceeded to Gorebridge, thence walked to Arniston, having permission from Mr. Dundas to visit his grounds. Walked along banks of Esk and reached Dalhousie at 5.16 p.m., returning to Edinburgh at 5.41 p.m. Return tickets, 1s.

Gathered the usual Arniston plants, amongst them :—

Aconitum Napellus
Draba muralis
(near the garden)
Chrysosplenium alternifolium
Doronicum plantagineum
Pulmonaria officinalis
Arum maculatum

North Queensferry, Inverkeithing, St Davids.

Saturday, 26*th May* 1860.

Party of 100 met at Granton Pier at 8 a.m. and proceeded to Queensferry by steamboat, thence walked to Inverkeithing and St. Davids, and returned to Queensferry, joining the boat about 6 p.m. Return tickets, 1s.; Granton Pier, 2d.; Queensferry Pier, 6d.—in all, 1s. 8d. Much thunder and lightning with heavy showers—rain and hail.

Among the plants gathered were :—

Erysimum orientale
(near Queensferry)
Camelina sativa
(near St. Davids)
Diplotaxis tenuifolia
Viola canina
Sedum villosum
Allium Schœnoprasum
(on shore near Inverkeithing)

Many sea-weeds. In all about 160 specimens collected.

Mid-Calder, Meadowbank, Dalmahoy, Ravelrig, Water of Leith, Currie.

Saturday, 2nd June 1860.

Party of 80 met at the Caledonian Station at 10.20 a.m. and proceeded to Mid-Calder, thence walked by Meadowbank to Dalmahoy, Ravelrig, Water of Leith, and Currie. Returned from Currie by train at 6.11 p.m. Fare, 1s.

Among the plants gathered were:—

Trollius europæus
Corydalis formosa
Viola canina
„ lutea
Geranium columbinum
Linnæa borealis
Pyrola minor
Trientalis europæa
Scrophularia vernalis
Listera cordata
Narcissus Pseudo-narcissus
Tulipa sylvestris
Equisetum hyemale
Agaricus campestris
„ fascicularis
Polyporus squamosus
Lycoperdon Bovista

Boldside, Abbotsford, Rymer's Glen, Eildon Hills, Melrose.

Saturday, 9th June 1860.

Party of 110 met at North British Railway Station at 7.30 a.m. and proceeded to Abbotsford Ferry, Boldside. Crossed the ferry, walked through the woods to Abbotsford—saw house and garden—(Jeffreys and his wife showing the former and the gardener showing the latter). Walked under direction of Robert Young, the gamekeeper, to Rymer's Glen, thence proceeded to the Eildon Hills, and walked to Melrose. Saw the Abbey, and returned by train at 3.53 p.m., reaching Edinburgh before 6 p.m. Return tickets, 2s. 6d.

At Abbotsford Ferry only ten were taken over each time in the boat, and this made us very late. The visit to Abbotsford House also consumed much time. The excursion was therefore much curtailed.

Among the plants gathered were the following:—

Sinapis alba
Geranium sylvaticum
Pyrus Aria
„ Aucuparia
„ Malus
(very large, in beautiful flower, near Eildons)
Valeriana dioica (Eildons)
Antennaria dioica
Anthemis arvensis
Vaccinium Vitis-Idæa
Symphytum officinale
(Abbotsford)
Myosotis sylvatica
(blue and white, in Abbotsford woods)
Veronica montana
Pinguicula vulgaris
Polygonum Bistorta
Listera cordata
Poa nemoralis
Juniperus communis
Allosorus crispus (Eildons)
Polypodium Dryopteris
Botrychium Lunaria
Lycopodium alpinum

Bridge of Earn, Moncrieff Hill, Orchardneuk, Kinfauns, Kinnoul Hill, Perth.

Saturday, 16*th June* 1860.

Party of 160 met at Edinburgh, Perth and Dundee Railway Station at 6 a.m. and proceeded to the Bridge of Earn, where the greater part breakfasted at Mrs. Hill's Inn and on the verandah; then the party walked to Moncrieff Hill conducted by Mr. Bisset, factor to Mr. Thomas Moncrieff, and accompanied by the gamekeeper; then proceeded to banks of the Tay at Orchardneuk, crossed the river in the fishing-boats, and walked to Kinfauns under the direction of the factor, Mr. Bell. A thunderstorm came on and the party were sheltered in the barn. Afterwards visited Kinfauns and Kinnoul Hill, walked to Perth, and returned by train at 6.15 p.m. Party met at Bridge of Earn:—Mr. John Sim, Mr. Sergeant, Dr. Laing, Rev. Mr. Kirkwood, also party from Perth Asylum, Mr. Christie, and others. Some of the party visited Scone and Methven. Return tickets, Bridge of Earn, 3s.; breakfast, 1s. 6d.; boat and ferry, 1d.; Perth to Bridge of Earn, 4d.—total, 4s. 11d.

Among the plants collected were the following :—

Ranunculus aquatilis
Berberis vulgaris
Nymphæa alba
Papaver dubium
„ Argemone
Fumaria micrantha
(abundant on Moncrieff and Kinnoul Hills)
Helianthemum vulgare
Viola sylvatica
„ canina
(on Moncrieff Hill)
Lychnis Flos-cuculi
Stellaria graminea
„ uliginosa
Mœhringia trinervia
Sagina procumbens
„ subulata
Spergula arvensis
Claytonia alsinoides (introduced at Moncrieff House)
Montia fontana
Malva moschata (near Perth)
„ rotundifolia
Tilia parvifolia
Geranium sanguineum
(Moncrieff Hill)
„ phæum
„ pratense
„ pyrenaicum
(Quarry near Perth)
„ molle
„ dissectum
„ columbinum
(abundant on rocks near Orchardneuk)
„ lucidum
„ Robertianum
(Moncrieff Hill)
Erodium cicutarium
(Moncrieff and Kinnoul Hills—very small on top of latter)
Trifolium arvense
„ striatum
(Quarry near Perth)
Prunus Avium
„ Padus
Fragaria elatior (Kinnoul)
Potentilla argentea
(Quarry near Perth)
Poterium Sanguisorba
(Quarry near Perth)
Rosa villosa
(Quarry near Perth)
„ systyla?
Pyrus Aucuparia
Aremonia agrimonioides
(Quarry near Perth)
Saxifraga umbrosa
(at Moncrieff House)
„ granulata
Sedum Telephium (Kinnoul)
„ album
(near Barnhill Toll)
„ acre
Myrrhis odorata
Œnanthe crocata
Peucedanum Ostruthium
(near Ochardneuk)
Cornus sanguinea
(Moncrieff)
Lonicera Xylosteum
Valerianella olitoria
(Quarry at Perth)

Dipsacus sylvestris
(Kinnoul)
Antennaria dioica
(Moncrieff Hill)
Inula Helenium
Anthemis arvensis
Tanacetum vulgare
Doronicum Pardalianches
Hieracium Pilosella
Vaccinium Oxycoccus
(Methven)
Erica cinerea
Pyrola minor
Moneses grandiflora
(woods at Scone)
Trientalis europæa
(Methven)
Cynoglossum officinale
" sylvaticum
(near Perth)
Anchusa sempervirens
Scrophularia vernalis
(in great quantity on wall on Moncrieff Hill)
Veronica hederæfolia
" arvensis
" serpyllifolia
" officinalis
" Chamædrys
" Beccabunga
" peregrina (naturalised near Perth)
Mentha sylvestris
Origanum vulgare
Lamium maculatum
(Barnhill Toll)
Scleranthus annuus
Chenopodium Bonus-Henricus
Rumex sanguineus
(Moncrieff Hill)
Carpinus Betulus
Salix fragilis, var. Russelliana
" Caprea
Populus nigra
Epipactis latifolia
Orchis latifolia
Narcissus poeticus
(Moncrieff)
Narthecium ossifragum
Lemna trisulca
Aira præcox
" flexuosa
Glyceria aquatica
(Moncrieff Hill)
Asplenium Adiantum-nigrum
" Trichomanes
Ceterach officinarum
(Kinnoul)
Lastrea spinulosa
(Methven)
Polypodium Dryopteris
Equisetum arvense
" palustre
" limosum
Lycopodium clavatum
(Moncrieff Hill)

Drem, Gullan, Luffness, Aberlady, Gosford, Longniddry.

Saturday, 23rd June 1860.

Party of 50 or 60 met at the North British Railway Station at 8 a.m. and proceeded to Drem, thence walked to Gullan, Luffness,

Aberlady, Gosford, and returned from Longniddry at 3.6 p.m. Return tickets, 1s. 4d.

Gathered many good plants :—

Cerastium arvense
Geranium sanguineum
" pusillum
Saxifraga tridactylites
(wall near Gosford)
Anagallis cœrulea
Cynoglossum officinale
Hyoscyamus niger
Utricularia vulgaris
Hippophaë rhamnoides
Listera ovata
Potamogeton rufescens
" obtusifolius
Botrychium Lunaria

Kincardine, Culross, Torryburn, Charlestown.

Saturday, 30th June 1860.

Party of 50 met at Granton at 8 a.m. and proceeded by the Stirling steamboat to Kincardine, thence walked by the shore to Culross, Torryburn, and Charlestown, where they joined the boat at 4.30 p.m. Return tickets—boat, 1s.; pier (Granton), 2d.; pier (Kincardine), 2d.

Among the plants gathered were the following :—

Corydalis claviculata
Lepidium Smithii
Lepigonum marinum
Circæa lutetiana
Conium maculatum
Apium graveolens
Dipsacus sylvestris
Matricaria Parthenium
Solanum Dulcamara
Rumex aquaticus
Populus alba
Gymnadenia conopsea
Scirpus maritimus
Carex vulpina
Hordeum pratense
" maritimum
Osmunda regalis

Kinross, Loch Leven, Benarty, Navity, Lochore, Lochgelly.

Saturday, 7th July 1860.

Party of about 100 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to Kinross by Thornton and Cowdenbeath. Reached Kinross about 9 and met Mr. Barclay (who had joined us at Thornton), the Rev. Mr. Peters, Mr. Little, Mr. Williamson, factor for Kinross Estate; as well as Messrs. A. Dickson, Ramsbotham, and Bell, who had been at the

Rumbling Bridge. Breakfasted in the Town Hall, which had been secured by Mrs. Archer of the Salutation Hotel, and after breakfast visited Kinross grounds and house. Had a fine view from top of house (Sir Graham Montgomery's). Visited the Island and Loch Leven Castle in boats. Landed at Kinross House pier and walked by the north and east shore of loch to Benarty. Went over the hill to Navity and Lochore, and joined the train at Lochgelly Station about 6.57 p.m. Return tickets, 2s. 10d.; breakfast, 1s. 6d.; share of boats, 3d.—in all, 4s. 7d.

Among the plants collected were the following:—

Ranunculus Flammula
" reptans
" acris
" repens
Cheiranthus Cheiri
Cardamine pratensis
Helianthemum vulgare
Viola lutea
Silene inflata
Lychnis diurna
Arenaria serpyllifolia
Radiola Millegrana
Geranium sylvaticum
Anthyllis Vulneraria
Lotus corniculatus
Vicia hirsuta
" sativa
Lathyrus macrorrhizus
Comarum palustre
Cratægus Oxyacantha
(in full flower)
Parnassia palustris
Sedum acre
Drosera rotundifolia
Conium maculatum
Bunium flexuosum
Chærophyllum temulum
Anthriscus sylvestris
Torilis Anthriscus
Galium Cruciata
" verum
Galium saxatile
" palustre
Valeriana officinalis
Antennaria dioica
Pyrola minor
Trientalis europæa
Pedicularis palustris
" sylvatica
Pinguicula vulgaris
Scleranthus annuus
Polygonum Convolvulus
" Persicaria
" viviparum
Salix repens
Listera ovata
Gymnadenia conopsea
Habenaria bifolia
" chlorantha
Iris Pseudacorus
Potamogeton gramineus
Carex disticha
" ovalis
" hirta
Triticum caninum
" repens
Asplenium Adiantum-nigrum
" Ruta-muraria
Cystopteris fragilis
Lycopodium clavatum

Canal, Slateford, Colinton, Bonaly, Pentlands, Habbie's Howe, Currie.

Saturday, 14*th July* 1860.

Party of between 25 and 30 met at the Canal Basin, Port Hopetoun, at 9 a.m., and walked by banks of Canal to Slateford, Colinton, Bonaly, Pentlands, Compensation Ponds, and Habbie's Howe, and returned towards Currie and Colinton, reaching Edinburgh about 6.15 p.m.

Among the plants collected were the following:—

Ranunculus aquatilis
Arabis hirsuta
Geranium phæum
" sylvaticum
" pratense
Trifolium medium
Rosa rubiginosa
" lutetiana
Sedum villosum
Epilobium angustifolium
Galium pusillum
Valeriana pyrenaica
Solidago Virgaurea
Matricaria Parthenium
Hieracium prenanthoides
Rumex viridis
Empetrum nigrum
Habenaria viridis
Potamogeton crispus
" pusillus
Carex stellulata
" pilulifera
" binervis
" fulva
Poa nemoralis
Festuca gigantea
" arundinacea
Triticum caninum
Juniperus communis
Cystopteris fragilis
Polystichum aculeatum
Lastrea Oreopteris
Lycopodium clavatum

Mr. C. Cowan stated that *Allosorus crispus* grows on Carnethy Hill, and *Rubus Chamæmorus* on the hills between Carnethy and the Black Hill.

Callander, Ben Ledi.

Saturday, 21*st July* 1860.

Party of about 100 met at the Scottish Central Railway Station at 6.30 a.m. and proceeded to Callander. Breakfasted there at M'Gowan's Inn, and then walked to Ben Ledi, and re-

turned by train at 6.25 p.m. Return tickets, 4s. 4d.; breakfast, 1s. 6d. Some of the party (12 or 15) went by a coach to the Trossachs and returned. The day was favourable, and many good plants were collected. Mr. Buchan, from Dunblane, accompanied the party, also several gardeners from the district. Mr. Skinner met us at Callander. He had arranged the breakfast with the innkeeper.

Among the plants gathered were the following :—

Thalictrum alpinum
Caltha minor, var.
Trollius europæus
Nuphar luteum } (loch at
Nymphæa alba } Callander)
Corydalis claviculata
Draba incana
Cochlearia officinalis, var.
Subularia aquatica
(Loch Lubnaig)
Viola lutea, var. purpurea
Silene acaulis
Stellaria uliginosa
Hypericum Androsæmum
(Leny)
„ humifusum
Tilia parvifolia
Vicia sylvatica
Prunus insititia
Rubus saxatilis
„ Chamæmorus
Alchemilla alpina
Sibbaldia procumbens
Saxifraga oppositifolia
„ nivalis
„ stellaris
„ aizoides
„ hypnoides
Sedum Telephium
„ anglicum
Lythrum Salicaria
Epilobium alsinifolium
Epilobium alpinum
Circæa alpina
Pimpinella magna
(Leny avenue)
Œnanthe crocata
Meum athamanticum
Cornus suecica
Galium boreale
„ Mollugo
Solidago Virgaurea
Antennaria dioica
Chrysanthemum segetum
Saussurea alpina
Hieracium alpinum
Apargia autumnalis
Lobelia Dortmanna
(Loch Lubnaig)
Vaccinium Vitis-Idæa
„ uliginosum
„ Oxycoccus
Armeria maritima
(Ben Ledi)
Lysimachia vulgaris
(Loch Lubnaig)
„ Nummularia
Gentiana campestris
Utricularia intermedia
Scutellaria galericulata
(Trossachs)
Polygonum viviparum
Oxyria reniformis
Myrica Gale

Quercus sessiliflora
Salix herbacea
Populus nigra
Empetrum nigrum
Listera cordata
Gymnadenia albida
Habenaria chlorantha
Narthecium ossifragum
Tofieldia palustris
Juncus trifidus
„ supinus
„ triglumis
Potamogeton obtusifolius
Rhynchospora alba
Carex dioica
„ stellulata
„ ovalis
„ rigida
„ vulgaris
„ glauca
„ irrigua? (Mr. A. Bell; something like C. limosa, but seems to be the irrigua)
„ præcox
„ pallescens
„ binervis
„ fulva
„ flava
„ Œderi
„ hirta
„ ampullacea
Milium effusum
Holcus mollis
Triodia decumbens
Poa montana
Triticum caninum
Nardus stricta
Hymenophyllum Wilsoni
Pteris aquilina
Allosorus crispus
Blechnum boreale
Asplenium viride
„ Trichomanes
Athyrium Filix-fœmina
Cystopteris fragilis
„ dentata
Polystichum Lonchitis
„ aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Botrychium Lunaria
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides
Isoëtes lacustris
(Loch Lubnaig)

Mr. A. Bell was of great assistance in showing us localities for rare plants. He picked *Carex irrigua* and *Vaccinium Oxycoccus*.

Aberfeldy, Moness.

August and *September* 1860.

Plants found near Aberfeldy, at Moness, and on hills near these places:—

Moness:—

Trollius europæus (woods)
Berberis vulgaris (woods)
Hypericum humifusum
Agrimonia Eupatoria
Rosa villosa
Saxifraga aizoides
(hills above)
Circæa alpina
Galium boreale
Solidago Virgaurea
Antennaria dioica
Carduus heterophyllus
Hieracium prenanthoides
Campanula latifolia
Arctostaphylos Uva-ursi
(hills above)
Trientalis europæa (Falls)
Melampyrum sylvaticum
(abundant)
Calamintha Clinopodium
Listera ovata (above)

Carex remota
„ pallescens
„ sylvatica
„ binervis
Milium effusum
Melica uniflora
Pteris aquilina
Blechnum boreale
Athyrium Filix-fœmina
„ „ var. convexum
Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Equisetum umbrosum
Lycopodium selaginoides
(above)

Near Aberfeldy:—

Corydalis claviculata
(top of cottages)
Prunus Padus

Rubus suberectus
Pyrus Malus

Fergan:—

Sagina subulata
Alchemilla alpina
Saxifraga oppositifolia
„ aizoides
Callitriche autumnalis
Vaccinium Vitis-Idæa
Arctostaphylos Uva-ursi

Sparganium natans
Carex pauciflora
„ pilulifera
Asplenium viride
Lycopodium Selago
„ clavatum
„ alpinum

Near Dull:—

Lamium album

Weem:—

Calamintha Clinopodium
Melica uniflora
Poa nemoralis (woods)
Pteris aquilina
Asplenium Adiantum-nigrum
" Trichomanes
Cystopteris fragilis
Polystichum aculeatum

In grounds at Taymouth:—

Nuphar luteum
Nymphæa alba
Spiræa salicifolia
Antennaria margaritacea
Botrychium Lunaria

Ben Lawers.

Tuesday, 4th September 1860.

Party, consisting of J. H. Balfour, W. Keddie, and W. Bell, left Aberfeldy at 7 a.m. for Lawers Inn, where they remained until Wednesday evening. On 4th September, visited Ben Lawers. Examined the rocks in the corrie, and returned to the inn about 7 p.m. The inn kept by W. Anderson and his daughter is very comfortable, there is a public room, a single-bedded and a double-bedded room.

The following are some of the plants collected on Ben Lawers:—

Thalictrum alpinum
Anemone nemorosa
Ranunculus acris
Caltha palustris
Trollius europæus
Draba incana
" verna
Cochlearia officinalis
" alpina
Viola lutea
Silene acaulis
Cerastium alpinum
Cherleria sedoides
Sagina subulata
Montia fontana
Oxalis Acetosella
Anthyllis Vulneraria
Rubus saxatilis
" Chamæmorus
Potentilla alpestris
Sibbaldia procumbens
Alchemilla alpina
Saxifraga oppositifolia
" nivalis
" aizoides
" hypnoides, var.
Parnassia palustris
Sedum Rhodiola

Epilobium alsinifolium
„ alpinum
Angelica sylvestris
(peculiar form)
Heracleum Sphondylium
(high up)
Cornus suecica
Galium boreale
Solidago Virgaurea
Erigeron alpinus
Antennaria dioica, var.
Gnaphalium pusillum
Saussurea alpina
Hieracium alpinum
„ Lawsoni
Apargia autumnalis, var.
Taraxaci
Vaccinium Vitis-Idæa
„ uliginosum
„ Myrtillus
Arctostaphylos Uva-ursi
Armeria maritima, var.
alpina
Veronica serpyllifolia
„ humifusa
„ saxatilis
Polygonum viviparum
Oxyria reniformis
Salix fusca, var. repens
„ reticulata
Empetrum nigrum
Tofieldia palustris
Juncus triglumis
Luzula spicata
Potamogeton oblongus
Carex pulicaris
„ ovalis
„ atrata
„ rigida
„ vulgaris
„ glauca
„ pilulifera
„ pallescens
„ binervis
„ fulva
„ flava
„ pulla
Phleum commutatum?
Agrostis vulgaris
Triodia decumbens
Poa alpina
„ Balfourii
Festuca vivipara
Juniperus communis
Woodsia hyperborea
(in considerable quantity on steep cliffs, very difficult of access)
Polystichum Lonchitis
Lastrea dilatata, var.
Polypodium alpestre

The station for *Cystopteris montana* was examined. No specimens were seen.

Wednesday, 5th September 1860.

This day again ascended Ben Lawers and went direct to the summit; fine view; clouds and sunshine; strong wind on top. After visiting summit and gathering *Saxifraga cernua*, *Draba rupestris*, and *Cochlearia alpina*, the party descended to the rocks below, where two large patches of snow were lying, one

of them $3\frac{1}{2}$ feet thick. *Saussurea alpina* was seen and *Woodsia*, also *Erigeron alpinus* and *Draba incana*.

Returned to the inn about 5 p.m. and reached Aberfeldy by coach about 9.30 p.m.

Schiehallion.

Friday, 7th September 1860.

Party consisting of J. H. Balfour, W. Keddie, and W. Bell, visited Schiehallion. Went by Weem, Dull, Coshieville, and Garth Castle to a farmhouse at the foot of the hill, where we ascended. Hill very precipitous; covered with quartz rocks, porphyry, and trap-dyke through it. Dry, barren hill about 3600 feet high.

Among the plants collected were the following:—

Thalictrum alpinum
Genista anglica
Rubus Chamæmorus
Saxifraga aizoides
" stellaris
" hypnoides
Hippuris vulgaris (near Loch of Kinnaird)
Cornus suecica
Pyrola media
Polygonum viviparum
Salix arbutifolia
Listera cordata
Tofieldia palustris

A specimen of *Polystichum Lonchitis* was gathered with 130 fronds on it.

Plants seen on the summit were:—

Rubus Chamæmorus (very high)
Vaccinium Myrtillus
Empetrum nigrum
Carex rigida
Festuca ovina vivipara
Lycopodium Selago

and the usual mosses and lichens, such as species of *Andreæa*, *Polytrichum*, *Hypnum denticulatum*, *Cladonia rangiferina*, *Cetraria islandica*, *Lecidea*, *Scyphophorus bellidiflorus*, *Trichostomum lanuginosum*.

EXCURSIONS IN 1861.

Canal, Slateford, Water of Leith, Colinton, Woodhall.

Saturday, 11*th May* 1861.

Party of about 120 met at the Canal Basin, Port Hopetoun, at 11 a.m., and proceeded by Canal banks to Slateford, then by banks of Water of Leith to Colinton and by road to Woodhall; returned about 5 p.m. to Edinburgh.

Among the plants collected were the following:—

Anemone nemorosa
Ranunculus auricomus
„ Ficaria
Berberis vulgaris
Corydalis solida
(walls near Slateford)
„ lutea
Barbarea vulgaris
Arabis hirsuta
Cardamine amara
„ pratensis
„ sylvatica
Draba verna
Viola sylvatica
Lychnis diurna
Stellaria Holostea
Mœhringia trinervia
Geranium phæum
„ molle
Prunus communis, var. spinosa
„ Avium
Geum rivale
Pyrus Aucuparia
Saxifraga granulata
Myrrhis odorata
Galium Cruciata
Valerianella olitoria
Doronicum Pardalianches
Primula vulgaris
Symphytum tuberosum
Veronica hederæfolia
Lamium amplexicaule
„ purpureum
„ album
Orchis mascula
Allium ursinum
Lilium Martagon
Arum maculatum
(woods near Slateford)
Scolopendrium vulgare
(Colinton)
Cystopteris fragilis
(near Woodhall)
Bryum capillare
Hypnum commutatum
„ striatum
„ ruscifolium
„ cupressiforme
„ rugosum

Burntisland, Aberdour.

Saturday, 18*th May* 1861.

Party of about 130 met at the Edinburgh, Perth, and Dundee Railway Station at 9.30 a.m. and proceeded to Burntisland, thence walked to Aberdour and returned to Burntisland for train at 4.50, reaching Edinburgh at 5.50 p.m. Return tickets, 8d.

Among the plants gathered were the following :—

Ranunculus auricomus
Cochlearia officinalis
" danica
Sisymbrium Thalianum
Lepidium Smithii
Thlaspi arvense
Viola hirta
" sylvatica
" canina
Silene maritima
Geranium sanguineum
" phæum
(Aberdour Castle and churchyard)
Medicago maculata
(Aberdour Castle, below the churchyard)
Poterium Sanguisorba
(not in flower)
Æthusa Cynapium
Valerianella olitoria
Armeria maritima
Primula veris
Primula elatior
Pulmonaria officinalis
Solanum Dulcamara
Veronica hederæfolia
Lamium amplexicaule
" incisum
" purpureum
" album
Plantago Coronopus
Rumex scutatus
Daphne Laureola
Mercurialis perennis
(both diœcious and monœcious)
Allium Scorodoprasum
" vineale
Arum maculatum
Blysmus rufus
Carex præcox
Sclerochloa loliacea
Scolopendrium vulgare
Botrychium Lunaria

Linlithgow, Carriden, Blackness Castle, Hopetoun, Niddrie Castle, Winchburgh.

Saturday, 25*th May* 1861.

Party of 80 met at the Edinburgh and Glasgow Railway Station at 7 a.m. and proceeded to Linlithgow. Visited the

Palace and Loch. Walked to Carriden, thence to Blackness Castle and Hopetoun Woods. Mr. M'Laren, the forester, accompanied the party through the woods, and Mr. Garvie, the gardener, conducted the party through the gardens and plant-houses. Walked to Niddrie Castle and Winchburgh, met train at 4.2 and reached Edinburgh about 5 p.m. Return tickets, 1s. 6d.

Among the plants collected were the following :—

Ranunculus aquatilis
" Flammula
Berberis vulgaris
Chelidonium majus
Draba verna (Blackness)
Sisymbrium Thalianum
Brassica Rapa
Lepidium Smithii
Viola lutea
Cerastium glomeratum
Acer campestre
(near Hopetoun)
Rosa rubiginosa
Pyrus Malus
Saxifraga tridactylites
(Blackness Castle)
Myriophyllum spicatum
Fraxinus excelsior
Symphytum officinale
(Carriden)
Linaria Cymbalaria
(Hopetoun)
Listera ovata
(barely in flower)
Epipactis latifolia
(not in flower)
Scirpus uniglumis
(Blackness)
Asplenium Ruta-muraria
Scolopendrium vulgare
(Carriden)
Ophioglossum vulgatum
(Hopetoun)

Lanark, Cora Linn, Bonnington Falls, Stonebyres, Cartland Crags.

Saturday, 1st June 1861.

Party of about 120 met at Caledonian Station at 6.30 a.m. and proceeded to Lanark, thence walked to Cora Linn and Bonnington Falls, as well as to Stonebyres and Cartland Crags, and returned by train leaving Lanark at 4.35 p.m. Return tickets, 2s. 6d.

Among the plants gathered were the following :—

Trollius europæus
Aquilegia vulgaris
Aconitum Napellus
Arabis hirsuta
Cardamine amara
Draba (Cora Linn)
Hesperis matronalis
Sisymbrium Thalianum
Geranium sylvaticum
„ lucidum
Trifolium filiforme
Vicia Orobus
Prunus Padus
Rubus saxatilis
Geum intermedium
Fragaria elatior
Pyrus Aucuparia
„ Malus
Saxifraga Geum
„ umbrosa, var. punctata
„ granulata
Ribes alpinum
Sedum acre
Circæa lutetiana
Sanicula europæa
Adoxa Moschatellina
Galium boreale
Antennaria dioica
Doronicum plantagineum
Campanula rotundifolia
Pyrola minor
Vinca minor
Melampyrum pratense
Salix Caprea
Neottia Nidus-avis
Listera ovata
Convallaria majalis
Luzula pilosa
Eriophorum latifolium
Carex paniculata
„ paludosa
Melica nutans
„ uniflora
Briza media
Pteris aquilina
Blechnum boreale
Asplenium viride
„ Trichomanes
Athyrium Filix-fœmina
Cystopteris fragilis
Polystichum lobatum
„ aculeatum
Lastrea Filix-mas
„ dilatata
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Equisetum arvense
„ umbrosum
„ sylvaticum
„ palustre
„ limosum
„ hyemale
Lycopodium selaginoides
Tortula tortuosa
„ ruralis
„ subulata
„ muralis
Orthotrichum crispum
Funaria hygrometrica
Leskea sericea
Isothecium alpecuroides
Hypnum striatum
„ commutatum
„ triquetrum
„ loreum
„ palustre
„ pseudotriquetrum
„ undulatum

Hypnum dendroides
Bartramia fontana
Ceratodon purpurascens
Fegatella conica
Lepraria flava
Alectoria jubata
Ramalina farinacea
Usnea barbata
Evernia prunastri
Peltidea aphthosa

East Linton, Prestonkirk, Tynningham, Belhaven, Dunbar.

Saturday, 8th June 1861.

Party of 82 met at the North British Railway Station at 8 a.m. and proceeded to East Linton, thence walked by Prestonkirk to Tynningham, where they met Mr. Lees, the gardener. Examined woods at Tynningham. Walked to Whitbery Point and mouth of Tyne. Crossed the river and walked by Sandy Bent to Belhaven, and then to Dunbar. Returned by train leaving Dunbar at 6.17 p.m. Return tickets, 2s.

Among the plants gathered were the following :—

Berberis vulgaris
(Tynningham)
Papaver Rhœas
„ dubium
„ Argemone
Fumaria capreolata
„ micrantha
„ officinalis
Arabis hirsuta
Sinapis alba
(near Tynningham)
Cakile maritima
Viola canina
(Whitbery Point)
Cerastium arvense
(Whitbery)
Lepigonum marinum
Astragalus hypoglottis
Onobrychis sativa
(near Belhaven)
Vicia sativa
Potentilla reptans
Poterium Sanguisorba
(Belhaven Links)
Saxifraga tridactylites
(Belhaven)
Sempervivum tectorum
(Tynningham)
Petroselinum sativum
Haloscias scoticum
Lonicera Caprifolium
(Prestonkirk)
Artemisia maritima
„ gallica
(mouth of Tyne)
Anagallis arvensis
Erythræa Centaurium
Cynoglossum officinale
Solanum Dulcamara
(Tynningham)
Hyoscyamus niger
Hippophaë rhamnoides
Neottia Nidus-avis
(woods, Tynningham)

Listera ovata
Epipactis latifolia
(not in flower)
Orchis incarnata
„ latifolia, var.
„ maculata
Habenaria chlorantha
Scirpus maritimus
Carex vulpina
Sclerochloa distans
Ophioglossum vulgatum
(Whitbery)
Botrychium Lunaria
(Belhaven Links)

Strathmiglo, West Lomond Law, Carlan Crags, Loch Leven, Lochgelly.

Saturday, 15*th June* 1861.

Party of about 90 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to Strathmiglo, arriving at 8.40. Breakfasted at Senior's Inn. He had secured a large hall for breakfast. Met Mr. Barclay and Mr. Ritchie from Cupar, Dr. Troup, Mr. Rutherford (the gardener at Falkland), and his son. Return tickets--Strathmiglo and Lochgelly, 2s. 6d.; breakfast, 1s. 4d.

After breakfast walked to West Lomond Law, ascended by stony ravine. Saw abundance of *Hymenophyllum Wilsoni*, *Sagina subulata*, *Saxifraga hypnoides*, and *Epilobium angustifolium*. Ascended to flat ground above and examined a pool there; got *Pilularia globulifera* and *Littorella lacustris*, also on the hill *Viola lutea*, and *Trientalis europæa*. Proceeded west to side of the West Law for *Allosorus crispus*. Descended into Glen Vale and ascended to Carlan Crags where *Oxytropis Halleri* was gathered. On the steep side saw *Equisetum umbrosum* and *Cystopteris fragilis*. Walked to shore of Loch Leven and gathered *Alyssum calycinum*, then walked to Lochgelly, which was reached at 3.40, in time for train at 3.42 p.m. Day oppressively hot, walk very long (about 18 or 20 miles); too much attempted in a short space of time.

The examination of Lomonds, Benarty, and Loch Leven require four trips.

Among the plants gathered were the following :—

Viola palustris
„ lutea
Sagina subulata
(W. Lomond)
Lepigonum rubrum
Genista anglica
(at Ladybank Station)
Oxytropis Halleri
(Carlan Crags)
Comarum palustre
Saxifraga granulata
„ hypnoides
Sedum villosum
Myriophyllum spicatum
Epilobium angustifolium
(W. Lomond)
Galium boreale
(W. Lomond)
Asperula taurina
(Mr. Barclay, near Cupar)
Filago germanica
Antennaria dioica
(W. Lomond)
Vaccinium Vitis-Idæa
„ Myrtillus
Trientalis europæa
Myosotis repens
(W. Lomond)
Lamium Galeobdolon
(near Lochgelly)
Polygonum Bistorta
„ viviparum
Empetrum nigrum
Listera cordata
(W. Lomond)
Gymnadenia albida
(Lomonds)
Potamogeton perfoliatus
„ crispus
Carex pilulifera
„ binervis
„ hirta
Avena pratensis
Hymenophyllum Wilsoni
(W. Lomond)
Allosorus crispus
(W. Lomond)
Cystopteris fragilis
Polypodium Phegopteris
(W. Lomond)
Botrychium Lunaria
Equisetum umbrosum
(Carlan Hill)
Lycopodium Selago
(W. Lomond)
„ clavatum
Pilularia globulifera
(W. Lomond)

Perth, Methven, Almond Bank, Bridge End, Scone, Kinnoul.

Saturday, 29th June 1861.

Party of 110 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. Dr. Leycock with about 12 pupils joined the party with the view of visiting the Asylum at Perth. The party was thus partly botanical and partly psychological. They proceeded to Perth, where breakfast was provided by Mr.

Pople at the station. Afterwards they went by rail to Almond Bank, where the forester of Mr. J. Smythe of Methven met them. They visited Methven Bog and Methven Woods, Bank of Almond, and returned to Perth in time for the train at 3 p.m Some of the party waited till 6.20 p.m. and examined Bridge End, Kinnoul Hill, and Scone Woods. Return tickets, 3s. 6d. ; rail to Almond Bank, 3d. ; breakfast, 1s. 6d—total, 5s. 3d. Mr. White, son of Dr. F. J. White, accompanied the party and acted as guide.

Among the plants gathered were the following :—

Papaver somniferum (Almond Bank)
Fumaria micrantha Almond Bank)
Cerastium arvense (Almond Bank)
Lepigonum rubrum
Hypericum humifusum (near Almond Bank)
Malva moschata (near Perth)
Geranium pyrenaicum (Bridge End)
Trifolium hybridum (between Almond Bank and Perth)
Anthyllis Vulneraria
Ornithopus perpusillus (Near Methven Bog)
Rubus saxatilis (Methven Woods)
Potentilla argentea (Bridge End)
Poterium Sanguisorba (Bridge End)
Sedum Telephium
Circæa alpina
Cicuta virosa (Methven Bog)
Viburnum Opulus
Gnaphalium sylvaticum
Matricaria Parthenium
Pyrola minor
Moneses grandiflora (Scone)
Trientalis europæa (Methven)
Vinca minor
Myosotis cæspitosa
„ palustris
Solanum Dulcamara
Linaria vulgaris
Mimulus luteus (near Perth)
Mentha sylvestris (near Perth)
Utricularia minor (Methven Bog)
Humulus Lupulus (Almond Bank)
Neottia Nidus-avis (Methven)
Paris quadrifolia (Methven)
Sparganium ramosum
Scheuchzeria palustris (Methven Bog)
Carex irrigua (Methven Bog)
„ limosa (Methven Bog)
Lastrea spinulosa (Methven Bog)
Polypodium Dryopteris
„ Phegopteris (Methven)

St. Andrews.

Saturday, 6th July 1861.

Party of 80 or 90 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to St. Andrews, which was reached about 9.30 a.m. The Provost of St. Andrews, Mr. Ireland, Mr. C. Howie, Mr. Barclay, Dr. Watson Wemyss, Mr. Blair, teacher, Cupar, and Mr. Wallace, a student, met us. Breakfasted in the old Town Hall, breakfast being provided by Mr. Davidson of the Star Hotel. Return tickets, 3s. 3d. Breakfast, 1s. 6d. After breakfast, visited the United College, then went to Castle and Kirkhill, Harbour, Kirkhill rocks and Cave, and the Rock and Spindle. Returned to St. Andrews in time for the 3.20 train, reaching Edinburgh about 6.40 p.m.

Among the plants gathered were the following:—

Thalictrum minus
Papaver Argemone
Fumaria micrantha
Silene noctiflora
Lychnis Githago
Sagina maritima
Lepigonum marinum
Trifolium striatum
Haloscias scoticum
Anthemis Cotula
Centaurea Scabiosa
Solanum nigrum
Scrophularia aquatica
Gymnadenia conopsea
Carex vulpina
Sclerochloa maritima (on wall at Harbour)
Sclerochloa loliacea (on wall at Harbour)
Hordeum pratense
Elymus arenarius
Equisetum variegatum — These by Mr. Howie from Tentsmuir
Lycopodium selaginoides — These by Mr. Howie from Tentsmuir

North Berwick, Dirleton, Gullan, Luffness, Drem.

Saturday, 13th July 1861.

Party of about 30 met at the North British Railway Station at 10.15 a.m. and proceeded by train to North Berwick, thence walked by the Links to Dirleton, Gullan, Luffness, and Drem. Returned by train from Drem at 6.50 p.m. Return tickets, 1s. 9d.

Among the plants gathered were the following :—

Fumaria micrantha
Arabis hirsuta
Reseda lutea
Silene conica
„ noctiflora
Geranium pusillum
Melilotus officinalis
Trifolium arvense
Sedum album
Hippuris vulgaris
Callitriche platycarpa
Smyrnium Olusatrum
Helosciadium repens
Carduus nutans
Onopordon Acanthium (Gullan)
Thrincia hirta
Anagallis tenella
Convolvulus arvensis
Solanum Dulcamara
Hyoscyamus niger
Limosella aquatica
Veronica Anagallis
Utricularia vulgaris
Calamintha Acinos
Marrubium vulgare (Gullan)
Ballota fœtida
Rumex conglomeratus
Hippophaë rhamnoides
Listera ovata
Habenaria viridis
Scirpus lacustris
Carex disticha
„ arenaria
„ teretiuscula
„ paniculata
Triodia decumbens
Equisetum variegatum
Lycopodium selaginoides
Chara hispida
Uredo segetum
Cladonia rangiferina

Bridge of Allan, Keir, Kippenross, Kippendavie, Wharrie Glen, Stirling.

Saturday, 20th July 1861.

Party of 70 met at the Edinburgh and Stirling Railway Station at 6.25 a.m. and proceeded to the Bridge of Allan to breakfast (Philps' Inn). Visited the Wells and Mr. Macfarlane's Museum. Then walked to Keir with Mr. Niven, the gardener. Then to Kippenross, Kippendavie, Wharrie Glen and Bridge and Stirling Castle. Returned from Stirling by train at 5.48 p.m.

Dr. Browne and the Rev. Mr. Morrell from Henley, with Mr. Wylie, accompanied us. Dr. Paterson and Major Hay met us at Bridge of Allan. Dr. Wilson also went with us. Return tickets, 3s. 3d. Breakfast, 1s. 11d.

The following were some of the plants gathered :—

Aquilegia vulgaris
(Stirling Castle)
Chelidonium majus
(near Dunblane)
Brassica Rapa
Trifolium hybridum
Ornithopus perpusillus
(Dunblane)
Rubus rhamnifolius
Agrimonia Eupatoria
Sedum Telephium
„ album
(Stirling Castle)
Circæa lutetiana
„ alpina
Conium maculatum
Petroselinum sativum
Æthusa Cynapium
Silybum Marianum
(Stirling Castle)
Lactuca virosa
Trientalis europæa
(near Dunblane)
Atropa Belladonna
Hyoscyamus niger
Verbascum Thapsus
„ Lychnitis
Linaria repens
Calamintha Clinopodium
Stachys arvensis
Rumex viridis
Listera Nidus-avis
„ cordata
(near Dunblane)
Paris quadrifolia

EXCURSIONS IN 1862.

Merchiston, Colinton, Slateford, Canal.

Saturday, 10th May 1862.

Party of about 120 met at the Middle Walk of the Meadows at 11 a.m. and proceeded to Merchiston and Colinton. Visited the woods and returned by Slateford and the banks of the Canal.

The usual plants were gathered. Among others may be noticed :—

Anemone nemorosa
Ranunculus auricomus
Cardamine amara
Euonymus europæus
Saxifraga umbrosa
„ granulata
Adoxa Moschatellina
Lonicera Xylosteum
Valeriana pyrenaica
Valerianella olitoria
Chenopodium Bonus-Henricus
Orchis mascula
Equisetum arvense

Also specimens of *Stigmaria ficoides.*

Penicuik, Auchendinny, Roslin.

Saturday, 17*th May* 1862.

Party of about 100 met at the North British Railway Station at 11.45 a.m. and proceeded to Penicuik. Visited Mr. Cowan's Paper Mills. Walked by banks of Esk to Auchendinny and Roslin, and returned by train at 6.42 p.m. Tickets, 1s. 3d.

Among the plants gathered were :—

Ranunculus auricomus
Arabis hirsuta
Cardamine amara
" pratensis
" hirsuta
" sylvatica
Viola palustris
" sylvatica
" tricolor
Stellaria uliginosa
Lathyrus macrorrhizus
Chrysosplenium alternifolium
Pyrola minor
Linaria vulgaris
Daphne Laureola
Salix alba
" cinerea
" Caprea
Neottia Nidus-avis
Orchis mascula
Carex pendula
Melica nutans
" uniflora
Polypodium Dryopteris
" Phegopteris
Equisetum arvense
" umbrosum
" sylvaticum
" palustre
" hyemale

In all about 100 species.

Mid-Calder, Kaimes Hill, Dalmahoy, Ravelrig, Water of Leith, Balerno, Currie.

Saturday, 24*th May* 1862.

Party of about 80 met at the Caledonian Railway Station at 10.20 and proceeded to Mid-Calder, then walked by Meadowbank to Kaimes Hill and Dalmahoy, Ravelrig, Water of Leith, Balerno, and Currie, whence they returned at 6.11 p.m. Return tickets, 1s.

Among the plants collected were :—

Ranunculus hederaceus
„ auricomus
Trollius europæus
Aquilegia vulgaris (banks of Water of Leith)
Aconitum Napellus
Viola palustris
„ sylvatica
„ canina
„ tricolor
„ lutea
Sagina subulata
Geranium columbinum
Saxifraga Geum (banks of Water of Leith)
Saxifraga hypnoides
Linnæa borealis
Galium Mollugo
Valeriana pyrenaica
Antennaria dioica
Trientalis europæa
Anchusa sempervirens
Polygonum Bistorta
Salix Russelliana
Arum maculatum
Carex curta
Equisetum hyemale

Kinghorn, Burntisland.

Saturday, 31*st May* 1862.

Party of 80 met at the Edinburgh, Perth, and Dundee Railway Station at 9.30 and proceeded to Kinghorn, then walked by the shore to Burntisland, and returned from Burntisland by boat at 4.50 p.m. Return tickets, 1s.

Among the plants gathered were the following :—

Papaver Argemone
Cardamine hirsuta
Alyssum calycinum
Cochlearia danica
Lepidium Smithii
Thlaspi arvense
Reseda lutea
Geranium sanguineum
Astragalus hypoglottis
„ Glyciphyllos
Saxifraga umbrosa
Sambucus nigra
Centhranthus ruber
Valerianella olitoria
Senecio viscosus
Anagallis arvensis
Cynoglossum officinale
Scrophularia vernalis
Plantago maritima
„ Coronopus
Hippophaë rhamnoides
Carex arenaria
Phleum arenarium
Sclerochloa maritima
„ rigida
„ loliacea
Festuca bromoides

Dalkeith, Musselburgh.

Saturday, 7th June 1862.

Party of 60 met at North British Railway Station at 10.35 a.m. and proceeded to Dalkeith. Visited gardens and grounds under direction of Mr. Prentice, and then walked by banks of Esk to Musselburgh. Returned by train at 3.40 p.m. Return tickets, 1s. 1d.

Among the plants gathered were the following :—

Aconitum Napellus
Cochlearia officinalis
Stellaria nemorum
Honckenya peploides
Geum intermedium
Ilex Aquifolium
Sanicula europæa
Cornus sanguinea
Adoxa Moschatellina
Petasites albus (Inveresk)
Armeria maritima
Lysimachia nemorum
Fraxinus excelsior
Myosotis sylvatica
Lathræa Squamaria
Polygonum Bistorta
Rumex sanguineus
Rumex viridis
Humulus Lupulus (Inveresk)
Salix Russelliana
" alba
" Smithiana
" Helix
Populus alba
Listera Nidus-avis
Luzula nivea
Carex muricata (Dalkeith grounds)
" pendula
" hirta
Milium effusum
Poa nemoralis

North Queensferry, Ferry Hills, Inverkeithing.

Saturday, 14*th June* 1862.

Party of about 36 met at Newhaven at 11 a.m. and proceeded to Queensferry, examined Ferry Hills, walked to Inverkeithing, and returned by boat about 5 p.m. Return tickets, 9d.; Granton pier, 2d. ; ferry-boat, 6d.

Among the plants gathered were :—

Thalictrum majus
Sagina maritima
Trifolium striatum
Astragalus Glyciphyllos
Vicia lutea (abundant)
Spiræa Filipendula
Sedum villosum
Sambucus Ebulus
Allium Scorodoprasum

Cockburnspath, Dunglass, Pease Dene.

Saturday, 21*st June* 1862.

Party of 70 met at North British Railway Station at 8 a.m. and proceeded to Cockburnspath. Visited Dunglass by permission of Sir James Hall, walked by shore to the Cove and Pease Dene, and returned from Cockburnspath at 5.58. Return tickets, 2s.

Among the plants gathered were :—

Glaucium luteum
Hypericum calycinum
Mertensia maritima
Lamium Galeobdolon
Neottia Nidus-avis
Carex pendula
Polystichum angulare

Numerous seaweeds.

Perth, Kinnoul Hill, Kinfauns, Orchardneuk, Moncrieff Hill, Bridge of Earn.

Saturday, 28*th June* 1862.

Party of about 90 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to Perth. Breakfasted at John Dunbar's Railway Station Refreshment Rooms. Walked to Kinnoul Hill, Kinfauns, crossed the Tay to Orchardneuk, and then walked over Moncrieff Hill to Bridge of Earn. Left the station at Bridge of Earn at 3.10 p.m. Return tickets, 3s. 6d. Breakfast, 1s. 6d.

Among the plants gathered were the following :—

Chelidonium majus
Fumaria micrantha
Nasturtium officinale
(4-5 feet long)
Hesperis matronalis
(in great quantity on Moncrieff Hill)
Reseda Luteola
(one specimen 7 feet high)
Sagina subulata
Malva moschata
Geranium phæum
„ pratense
„ pyrenaicum
„ columbinum
Erodium cicutarium
Euonymus europæus
Vicia lathyroides
Potentilla hirta
„ argentea

Rosa rubiginosa
„ systyla
Pyrus Aria
Sedum Telephium
„ villosum
„ album
Cornus sanguinea
Viburnum Opulus
Dipsacus sylvestris
Inula Helenium
Chrysanthemum Leucanthemum (with white tubular florets of the ray)
Doronicum Pardalianches
Sonchus asper (6 ft. high)
Campanula rapunculoides
Moneses grandiflora (Scone)
Cynoglossum montanum
Antirrhinum majus
Scrophularia vernalis
Mimulus luteus (shore of Tay near Kinfauns)
Lamium maculatum (Kinfauns)
Euphorbia Lathyris (Orchardneuk)
Humulus Lupulus (Orchardneuk)
Listera cordata
Habenaria chlorantha
Ceterach officinarum
Lastrea Oreopteris

Beattock, Garpol Linn, Beld Crag, Moffat.

Saturday, 5th July 1862.

Party of about 80 met at the Caledonian Railway Station at 6.20 a.m. and proceeded to Beattock. Breakfasted there, then walked to Garpol Linn, thence to Beld Crag and Moffat. Returned by train at 4.52 p.m. Return tickets, 4s. Breakfast, 1s. 6d.

Among the plants collected were the following :—

On hillside on way to Garpol :—

Geranium sylvaticum
Drosera rotundifolia
Galium palustre
Valeriana dioica
Antennaria dioica
Myosotis cæspitosa
Myrica Gale
Listera cordata
„ ovata
Orchis latifolia, var. incarnata
Gymnadenia conopsea
Gymnadenia albida
Habenaria bifolia
Narthecium ossifragum
Scirpus cæspitosus
Carex stellulata
„ remota
„ pilulifera
Lastrea Oreopteris
Lycopodium clavatum
„ alpinum
„ selaginoides
Splachnum ampullaceum

In Garpol Linn :—

Aquilegia vulgaris
Geranium lucidum
Rubus saxatilis
Jasione montana (in great profusion by roadsides about Beattock)
Pyrola minor
„ secunda
Melampyrum pratense
Veronica scutellata
Habenaria bifolia
„ chlorantha
Carex lævigata
Melica nutans
„ uniflora
Hymenophyllum Wilsoni
Allosorus crispus
Asplenium viride
Athyrium Filix-fœmina, var. convexum
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Lycopodium Selago
Blindia acuta
Orthotrichum Drummondii
Bartramia fontana
Zygodon Mougeotii
Tortula tortuosa
Neckera crispa
Sticta fuliginosa
„ pulmonaria
„ sylvatica
Nephroma resupinata
Alectoria jubata

Dunfermline, Town Wood, Loch Fittie, Black Loch, Carnack Loch.

Saturday, 12*th July* 1862.

Party of 26 met at the Edinburgh, Perth, and Dundee Railway Station at 6 a.m. and proceeded to Dunfermline. Breakfasted at Milne's Hotel. Visited Mr. Hunt's place at Pittencross; saw ruins, also old abbey, and Robert Bruce's grave. Walked to Town Wood, then to Loch Fittie, Black Loch at Hillhead, and Carnack Loch. Returned by train at 4.32 p.m. Return tickets, 2s. Breakfast, 1s. 6d.

Among the plants collected were the following :—

At Loch Fittie :—

Nuphar luteum
Drosera rotundifolia
Vaccinium Oxycoccus
Trientalis europæa
Alisma Plantago
Scirpus lacustris
„ sylvaticus
Carex aquatilis (in very great quantity. This is the first time it has been observed within twenty miles of Edinburgh)
Lastrea spinulosa

At Black Loch :—

Nuphar luteum
Nymphæa alba
Cicuta virosa
Veronica scutellata
Carex teretiuscula

In Loch Carnack :—

Potamogeton pectinatus
Chara flexilis

On roadside, about one mile from Dunfermline :—

Pyrola media

Drem, Gullan, Luffness, Aberlady, Gosford, Longniddry.

Saturday, 19*th July* 1862.

Party of 20 met at the North British Railway Station at 10.15 a.m. Proceeded to Drem, then walked to Gullan, Luffness, Aberlady, Gosford, and Longniddry—returning by train at 7.2 p.m. Messrs. White and James proceeded to North Berwick and Tantallon. Return tickets, 2s.

Among the plants gathered were the following :—

Ranunculus circinatus
Nasturtium palustre
Lepidium latifolium
Silene noctiflora
Cerastium arvense
Sagina nodosa
Geranium pusillum
Trifolium fragiferum
Potentilla reptans
Saxifraga tridactylites
Hippuris vulgaris
Helosciadium repens
Pulicaria dysenterica
Centaurea Scabiosa
Specularia hybrida
Anagallis tenella
Erythræa Centaurium
„ pulchella
Limosella aquatica
Utricularia vulgaris
Atriplex littoralis
Salicornia herbacea
Suæda maritima
Lemna trisulca
Potamogeton densus
„ pusillus
Scirpus lacustris
„ maritimus
Blysmus rufus
Carex extensa
Chara hispida
„ vulgaris

Callander, Ben Ledi.

Saturday, 26*th July* 1862.

Party of about 45 met at Glasgow Railway Station at 6.25 a.m. Proceeded to Callander. Breakfasted at M'Gowan's Hotel, then walked to Ben Ledi. Left Callander at 7.15 p.m.

The following plants were collected :—

Thalictrum alpinum
Ranunculus acris
Caltha palustris, var. minor
Trollius europæus
Corydalis claviculata
Draba incana
Silene acaulis
Vicia sylvatica
Rubus saxatilis
„ Chamæmorus
Alchemilla alpina
Saxifraga oppositifolia
„ *nivalis*
„ stellaris
„ aizoides
„ hypnoides
Sedum Rhodiola
Circæa alpina
Pimpinella magna
Angelica sylvestris
Cornus suecica
Lonicera Periclymenum
Galium boreale
Scabiosa succisa
Solidago Virgaurea
Gnaphalium sylvaticum
„ supinum
Carduus heterophyllus
Vaccinium Vitis-Idæa
„ Oxycoccus
Melampyrum montanum
Polygonum viviparum
Oxyria reniformis
Myrica Gale
Gymnadenia albida
Juncus triglumis
Luzula spicata
Carex rigida
„ irrigua
Triodia decumbens
Juniperus communis
Hymenophyllum Wilsoni
Allosorus crispus
Asplenium viride
Cystopteris dentata
Polystichum Lonchitis
Botrychium Lunaria
Lycopodium alpinum

EXCURSIONS IN 1863.

Tynehead, Borthwick, Gorebridge.

Saturday, 16*th May* 1863.

Party of 100 met at the North British Railway Station at 11.40 a.m. Proceeded to Tynehead, thence walked to Borthwick, and returned from Gorebridge at 5.27 p.m. Return tickets, 1s. 2d.

Among the plants collected were :—

Anemone nemorosa
Caltha minor
Viola palustris
Genista anglica
Geum rivale (white)
Myrrhis odorata
Vaccinium Myrtillus
Anchusa sempervirens
Empetrum nigrum
Listera cordata
Arum maculatum
Carex paniculata
„ paludosa
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Lycopodium clavatum
Equisetum arvense
„ sylvaticum
„ palustre
„ limosum
Cladonia rangiferina

Kinghorn and Burntisland.

Saturday, 23rd May 1863.

Party of 83 met at the Princes Street Station of the Edinburgh Perth, and Dundee Railway at 9.40 a.m. Proceeded to Kinghorn, thence walked to Burntisland. Returned from Burntisland by boat at 4.39 p.m. Return tickets, 1s.

Among the plants collected were :—

Clematis Vitalba (hills above Burntisland)
Papaver Argemone
Cheiranthus Cheiri
Barbarea vulgaris
Cochlearia danica
Armoracia rusticana
Hesperis matronalis (near Kinghorn)
Thlaspi arvense
Helianthemum vulgare
Viola hirta
Cerastium tetrandrum
„ semidecandrum
„ arvense
Lavatera arborea (Kinghorn)
Malva rotundifolia
Geranium sanguineum
Astragalus hypoglottis
„ Glyciphyllos
Vicia lathyroides
Fragaria elatior (Kinghorn)
Carum Carui
Haloscias scoticum
Centranthus ruber
Leontodon lævigatus
Tragopogon pratensis (between Kinghorn and Pettycur, Mr. Rodger)
Polemonium cæruleum (Kinghorn and Pettycur, in quantity)
Anchusa sempervirens

Myosotis collina
Echium vulgare
Linaria Cymbalaria
Veronica polita (Kinghorn)
Salvia Verbenaca
Lamium amplexicaule
„ intermedium
Euphorbia Helioscopia
Parietaria officinalis
Endymion nutans
Carex ampullacea
Sclerochloa maritima
„ loliacea

Penicuik, Auchendinny Woods, The Esk, Roslin.

Saturday, 30*th May* 1863.

Party of 38 met at the North British Railway Station, Edinburgh, at 11.45 a.m. Proceeded to Penicuik. Walked through Penicuik Glen and Auchendinny Woods by the banks of the Esk to Roslin Station. Returned by train passing Roslin at 6.42 p.m. Return tickets, 1s. 3d.

Among the plants collected were:—

Anemone nemorosa
Ranunculus auricomus
Trollius europæus
Aquilegia vulgaris
Aconitum Napellus
Cardamine amara
Brassica Rapa
Lychnis dioica
Stellaria Holostea
„ uliginosa
Geranium sylvaticum
„ pratense
Oxalis Acetosella
Acer campestre
Vicia sepium
Geum intermedium
Fragaria elatior
Saxifraga umbrosa
„ granulata
Chrysosplenium alternifolium
Sanicula europæa
Asperula odorata
Centaurea montana
Pyrola minor
Vinca minor
Symphytum tuberosum
Humulus Lupulus (behind Greenlaw Barracks)
Neottia Nidus-avis
Endymion nutans
Scirpus sylvaticus
Carex remota
„ pendula
„ sylvatica
„ ampullacea
Melica uniflora
Blechnum boreale
Athyrium Filix-fœmina
Polystichum aculeatum
Lastrea Oreopteris
Polypodium vulgare
„ Dryopteris
„ Phegopteris
Equisetum umbrosum
Tortula nivalis
„ tortuosa

Currie, Water of Leith, Colinton.

Saturday, 6th June 1863.

A party of 30 met at the Caledonian Railway Station at 10 a.m. We intended to have visited Ravelrig and Dalmahoy, but as the day was wet and unpromising proceeded to Currie and walked back to Edinburgh, following the banks of the Water of Leith to Colinton. Reached Edinburgh about 4 p.m. Railway ticket to Currie, 5½d.

The following were among the plants collected:—

Anemone nemorosa
Ranunculus fluitans
Aquilegia vulgaris
Aconitum Napellus
Berberis vulgaris
Meconopsis cambrica
Corydalis lutea
Barbarea vulgaris
Cardamine amara
Alliaria officinalis
Silene inflata
Stellaria Holostea
Geranium phæum
„ sylvaticum
„ dissectum
„ lucidum
Euonymus europæus
Geum intermedium
Fragaria elatior
Saxifraga umbrosa
„ granulata
„ hypnoides
Myriophyllum spicatum
Sanicula europæa
Valeriana pyrenaica
Matricaria Parthenium
Petasites fragrans
Doronicum Pardalianches
Polemonium cæruleum
Symphytum tuberosum
Polygonum Bistorta
Rumex viridis
Populus alba
„ tremula
Melica uniflora
Scolopendrium vulgare

Kilconquhar, Elie, Earl's Ferry.

Saturday, 13th June 1863.

Party of 53 proceeded by the train leaving Edinburgh at 9.40. Met Rev. Mr. Wood, of Elie. Visited Kilconquhar Loch, thence walked towards the shore east of Elie and along the coast to that town, and as far as Earl's Ferry. Returned by train leaving Kilconquhar at 4.45 p.m., reaching Edinburgh about 7.20 p.m. Return tickets, 2s. 6d. Mr. Barclay, Cupar, joined the party.

The chief plants collected were:—

Thalictrum minus
Diplotaxis tenuifolia
Cakile maritima
Cerastium semidecandrum
Lepigonum marinum
Astragalus hypoglottis
Saxifraga tridactylites (Kilconquhar)
Œnanthe crocata
Haloscias scoticum
Viburnum Lantana (woods, Kilconquhar)
Silybum Marianum (railway banks)
Symphytum officinale (Elie)
Lithospermum arvense
Lamium amplexicaule
„ intermedium
Beta maritima (Elie)
Listera ovata
Orchis latifolia, var. incarnata
Carex disticha
„ vulpina (shore of Kilconquhar Loch)
„ distans
Alopecurus agrestis (Elie)

Newtown, Dryburgh Abbey, Banks of Tweed, Melrose.

Saturday, 20th June 1863.

Party of 83 met at the North British Railway Station at 9.45 a.m. and proceeded to Newtown. Visited Dryburgh Abbey Banks of Tweed, and Melrose Abbey. Returned by train leaving Melrose at 4.19 p.m. Return ticket, 2s. 6d.

The following were some of the principal plants collected:—

Clematis Vitalba
Thalictrum minus
„ flexuosum
Ranunculus auricomus
Aquilegia vulgaris
Papaver dubium
Cheiranthus Cheiri
Barbarea vulgaris
Cochlearia officinalis
Hesperis matronalis
Viola odorata
Dianthus barbatus
Stellaria nemorum
Malva moschata
Geranium sanguineum
„ sylvaticum
Vicia sylvatica
Geum intermedium
Poterium Sanguisorba
Sanicula europæa
Hedera Helix
Lonicera Xylosteum
Valeriana dioica
Dipsacus sylvestris
Solidago Virgaurea
Matricaria Parthenium
Doronicum Pardalianches
Pyrola media

Pyrola minor
Ligustrum vulgare
Vinca minor
Anchusa sempervirens
Myosotis sylvatica
Echium vulgare
Verbascum Thapsus
Melampyrum pratense
Lathræa Squamaria
Mentha viridis
Plantago media
Rumex viridis
Populus tremula
Convallaria majalis
Cryptogramme crispa
Polystichum lobatum

Bridge of Earn, Glenfarg, Ochil Hills (Castle Law), Ramsheugh.

Saturday, 27th June 1863.

Party of 100 met at the Princes Street Station of the Edinburgh, Perth, and Dundee Railway at 6 a.m. Proceeded to Bridge of Earn. After breakfast at Hill's Hotel, visited Glenfarg, Ochil Hills (Castle Law), Ramsheugh. Returned from Bridge of Earn by train passing at 4.40 p.m. Mr. Barclay and Mr. Bowmont from Cupar, and Rev. Mr. Kirkwood and Dr. Laing, Bridge of Earn, joined the party. Return tickets, 3s. Breakfast, 1s. 6d.

The following were among the plants collected:—

Papaver dubium
Cardamine amara
Viola lutea
Lychnis Viscaria
Montia fontana
Hypericum humifusum
Malva moschata
Geranium sylvaticum
" lucidum
Anthyllis Vulneraria
Vicia sativa
Saxifraga granulata
Sedum villosum
Lonicera Periclymenum
Antennaria dioica
Matricaria Parthenium
Campanula latifolia
Ligustrum vulgare
Gentiana campestris
Myosotis cæspitosa
Solanum Dulcamara
Pedicularis sylvatica
Pinguicula vulgaris
Polygonum viviparum
Rumex sanguineus, var. viridis
Salix repens
Gymnadenia conopsea
" albida
Habenaria bifolia
" chlorantha
Iris Pseudacorus
Allium ursinum
Lemna minor
Carex panicea

Carex Œderi
Alopecurus geniculatus
Melica uniflora
Blechnum boreale
Cystopteris fragilis
Cystopteris dentata
Polystichum lobatum
" aculeatum
" angulare
Botrychium Lunaria

Mr. White, who proceeded to Perth, collected the following additional species:—

Euonymus europæus
Sedum album
Cynoglossum sylvaticum
Linaria repens
Mimulus luteus
Carex remota
Ceterach officinarum

Kielder Castle, Dead Water Fell.

Saturday, 4th July 1863.

Party of 80 met at North British Railway Station at 6.40 a.m. Proceeded to Kielder (Northumberland). Breakfast at Kielder Castle. Visited the woods in the neighbourhood of the Castle, Dead Water Fell (a hill of between 1600 and 1800 feet altitude), and the mineral well. Returned by train passing Kielder at 7.13, and reached Edinburgh about 10.30 p.m. Return tickets, 3s. 6d. Breakfast, 2s.

The following were among the plants collected:—

Trollius europæus
Aquilegia vulgaris
Corydalis claviculata
Cardamine amara
Cerastium glomeratum
Montia fontana
Geranium sylvaticum
Spiræa salicifolia
Rubus Chamæmorus
Sedum villosum
Drosera rotundifolia
Senecio aquaticus
Carduus heterophyllus
Vaccinium Vitis-Idæa
Erica Tetralix
Myosotis cæspitosa
Veronica scutellata
Pedicularis sylvatica
Melampyrum pratense, var. montanum
Pinguicula vulgaris
Salix herbacea
Empetrum nigrum
Listera cordata
" ovata
Orchis latifolia
Gymnadenia conopsea
Habenaria viridis

Lemna minor
Eriophorum vaginatum
„ angustifolium
Carex pulicaris
„ stellulata
„ pilulifera
„ pallescens
„ binervis
Alopecurus geniculatus
Hymenophyllum Wilsoni
Cryptogramme crispa
Blechnum boreale
Scolopendrium vulgare
Lastrea Oreopteris
„ spinulosa
Botrychium Lunaria
Equisetum maximum
Lycopodium Selago

North Berwick, Bass Rock, Tantallon Castle, North Berwick Links, Dirleton.

Saturday, 11*th July* 1863.

Party of 46 met at the North British Railway Station at 8 a.m. Proceeded to North Berwick, visited the Bass Rock, Tantallon Castle, North Berwick Links, and Dirleton, and returned by train reaching Edinburgh at 7.45 p.m. Return tickets, 1s. 9d.; boat to Bass, 1s.

The following were among the plants collected :—

Thalictrum minus
Fumaria micrantha
„ parviflora
(Dirleton)
Lepidium latifolium
(Tantallon)
Reseda lutea (Dirleton)
Silene noctiflora (Dirleton)
Lavatera arborea (Bass)
Trifolium arvense
„ hybridum
Astragalus hypoglottis
Vicia sylvatica
Potentilla reptans
Agrimonia Eupatoria
Rosa rubiginosa
Sedum album
(Dirleton Castle)
Conium maculatum
Smyrnium Olusatrum
Helosciadium repens
Haloscias scoticum
Scabiosa Columbaria
(Canty Bay)
Filago germanica
Senecio viscosus
Centaurea Scabiosa
Thrincia hirta
Tragopogon minor
Campanula glomerata
Ligustrum vulgare
(Tantallon)
Erythræa Centaurium
Gentiana Amarella
„ campestris
Cynoglossum officinale

Echium vulgare
Convolvulus sepium
Hyoscyamus niger
Veronica Anagallis
Beta maritima (Bass)
Polygonum Convolvulus
„ aviculare, var. littorale
Parietaria erecta
Habenaria viridis
Sclerochloa rigida
Festuca Myuros
Elymus arenarius
Equisetum variegatum

Rumbling Bridge, Devil's Mills, Cauldron Linn.

Saturday, 18*th July* 1863.

Party of about 60 met at Edinburgh, Perth, and Dundee Railway Station at 6.15 a.m. and proceeded to Rumbling Bridge. Breakfasted at Rumbling Hotel. Visited Devil's Mills, Rumbling Bridge, then Cauldron Linn. Returned from Rumbling Bridge at 4, and reached Edinburgh about 8 p.m. Return tickets, 2s. 6d. Breakfast, 1s. 6d.

The following were among the plants collected :—

Trollius europæus
Cardamine amara
Dianthus barbatus
Stellaria nemorum
Geranium lucidum
Trifolium medium
Lotus major
Vicia sylvatica
Prunus communis
„ domestica
Spiræa salicifolia
Rubus saxatilis
Saxifraga umbrosa
„ hypnoides
Epilobium angustifolium
Circæa alpina
Pimpinella Saxifraga
Angelica sylvestris
Archangelica officinalis
Viburnum Opulus
Lonicera Periclymenum
Galium palustre
Petasites fragrans
Campanula latifolia
Ligustrum vulgare
Symphytum officinale
Mentha velutina
„ sylvestris
Calamintha Clinopodium
Galeopsis versicolor
Rumex sanguineus
„ viridis
„ aquaticus
Neottia Nidus-avis
Listera ovata
Paris quadrifolia
Carex remota
„ sylvatica
Milium effusum
Blechnum boreale
Asplenium Trichomanes
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris

Pitlochry, Killiecrankie.

Saturday, 25th July 1863.

Party of 52 met at Princes Street Station of the Edinburgh Perth, and Dundee Railway at 6.15 a.m. Proceeded to Pitlochry. Breakfasted at Perth Railway Station; arrived at Pitlochry about 11.30. Returned from Pitlochry about 5.20, and reached Edinburgh about 10 p.m. Return tickets, 5s. Breakfast, 1s. 6d. Dr. Irvine acted as guide to the party.

Among the plants collected at Killiecrankie, &c., were the following:—

Thalictrum flexuosum
Sagina nodosa
Geranium pratense
Trifolium medium
Vicia sylvatica
Rubus saxatilis
Agrimonia Eupatoria
Saxifraga aizoides
Parnassia palustris
Drosera rotundifolia
Circæa alpina
Angelica sylvestris
Galium boreale
Scabiosa succisa
Solidago Virgaurea
Gnaphalium sylvaticum
Senecio sylvaticus
Carduus heterophyllus
Centaurea Cyanus
Hieracium cerinthoides
" prenanthoides
Hieracium boreale
Vaccinium Vitis-Idæa
Erica Tetralix
Gentiana campestris
Echium vulgare
Myrica Gale
Quercus sessiliflora
Salix repens
Populus tremula
Empetrum nigrum
Gymnadenia albida
Narthecium ossifragum
Juncus supinus
Juniperus communis
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
" Phegopteris
Lycopodium Selago
" selaginoides

Clova.

Monday, 3rd August 1863.

Party consisting of J. H. Balfour, Thomas L. Brunton, R. Cadell, Frederick Churchill, K. M. Downie, J. A. Dunsmure, L. Dunsmure, P. Neill Fraser, H. M. Harvey, J. Irving, R. Lightfoot, James M'Grigor, Harrison Mitchell, F. Naylor, Charles P.

Nicolson, George A. Panton, John Rankine, James Thomson, and William Thomson, met at the Edinburgh, Perth, and Dundee Railway Station on Monday, 3rd August, at 9.40 a.m. and proceeded to Perth, and then by the North Eastern Railway. They intended to go to Kirriemuir, for which they had return tickets for 7s. 6d. The party were carried on by the train to Forfar. They were astonished to find themselves at Forfar, and on asking an explanation they were told that the train did not stop at Kirriemuir Junction. Ultimately Kirriemuir was reached about 5 p.m.

After taking lunch in the Commercial Inn, the party started in a brake with two horses, a carriage and pair, and two dog-carts. Reached the inn at Clova about 7.15, having taken about two hours in coming from Kirriemuir. The inn at Clova is now kept by Mr. Barnes and his wife, and is a nice building, much improved and with plenty of beds. We were all accommodated in six rooms, most of them with double beds and four of the rooms with two in each. We dined on arrival, and in the evening walked to the bridge and gathered *Carex aquatilis* and *Carduus heterophyllus*. On the way we all picked *Meum anthamanticum*, and near the inn *Anchusa sempervirens*.

Tuesday, 4th August 1863.

Started this morning at 8, and walked on the western side of the Esk to Glen Dole gathering *Alchemilla alpina*, *Trientalis europæa*, *Malaxis paludosa*, *Gymnadenia albida*. Botanised on the rocks to the west of Glen Dole, and gathered :—*Silene acaulis*, *Rubus saxatilis*, *Saxifraga aizoides*, *S. stellaris*, *S. oppositifolia*, *S. hypnoides*, *Sedum Rhodiola*, *Saussurea alpina*, *Gnaphalium supinum*, *Arctostaphylos Uva-ursi*, *Pyrola secunda*, *Veronica alpina*, *Salix rupestris*, *S. reticulata*.

Visited Astragalus cliff. Messrs. Irving, J. Thomson, and Nicolson ascended the cliff and gathered *Astragalus alpinus* in flower. At the cliff we gathered also *Dryas octopetala*, *Erigeron alpinus*, and *Vaccinium uliginosum*. Near the cliff was abundance of *Polypodium alpestre*. Ascended to top of hill, gathered *Rubus Chamæmorus*, *Cornus suecica*, and *Carex rariflora*. Descended into Glen Fiadh and gathered *Oxytropis campestris* and *Salix Lapponum*. Visited Robert Welsh at Acharn. Returned to Clova between 7 and 8 p.m.

Wednesday, 5th August 1863.

This morning at 8 started for Braedownie, then walked up Glen Dole and by Jock's Road to the White Water. Examined the station for *Mulgedium alpinum*, but failed in getting specimens. Went to the original station near the waterfall and found here *Asplenium Filix-fœmina* and *Polypodium alpestre.* Afterwards went along the White Water. Visited Little Gilrannoch; meant to go to Canlochan but were prevented by rain and mist. Returned to White Water and then by Glen Dole to Acharn, Braedownie, and Clova.

Among the plants gathered were :—

Thalictrum alpinum
Cochlearia grœnlandica
Lychnis alpina
Cherleria sedoides
Rubus Chamæmorus
Sibbaldia procumbens
Epilobium alsinifolium
„ alpinum
Cornus suecica
Gnaphalium supinum
„ pusillum
Saussurea alpina
Hieracium alpinum
Apargia autumnalis, var. Taraxaci
Vaccinium uliginosum
Armeria alpina
Trientalis europæa (in flower)
Veronica serpyllifolia
Veronica humifusa
„ alpina
Tofieldia palustris
Juncus trifidus
„ triglumis
Carex rigida and var. between it and C. vulgaris
„ aquatilis
„ rariflora
„ pilulifera
„ capillaris
Alopecurus alpinus
Phleum alpinum
Polypodium alpestre
Lycopodium Selago
„ annotinum
„ alpinum
„ selaginoides

Thursday, 6th August 1863.

Started at 9 this morning for Loch Brandy and the hills around it. Gathered :—*Lobelia Dortmanna, Sparganium ramosum, Isoëtes lacustris, Chara flexilis.* Some of the party sailed in the boat on Loch Brandy. The key of the boat was given by Mr. Barnes, the innkeeper. The rest of the party ascended the rocks and gathered *Potentilla alpestris, Hieracia* of many kinds

and *Carex stictocarpa*; on the summit *Azalea procumbens* and *Salix herbacea*; also *Cerastium alpinum* below the summit. Mr. Cadell and Mr. H. Mitchell got into a difficult position on the high crumbling rocks. Mr. Cadell with great difficulty was enabled to extricate himself and descended, but Mr. Mitchell got into such a dangerous position that we had to send to the inn for ropes. Mr. Lightfoot and Mr. Barnes, senr., came up with ropes and we were enabled to extricate Mr. Mitchell. Mr. Irving descended with a rope to give Mr. Mitchell assistance. Mr. Churchill was very kind and daring in his aid. We also were indebted to Mr. J. Thomson and others of the party. Before the ropes arrived we handed down some wine and water to Mr. Mitchell, and we pulled up his botanical box and field-book by means of string and our straps. By uniting all our straps we were able through Mr. Churchill's kind services to throw a long strap to Mr. Mitchell and thus give him confidence until the ropes arrived. We were occupied for about three hours with Mr. Mitchell. He remained for at least two hours or two and a half hours in his perilous position. On returning to the inn we went to the marshy spot near John Ogilvy's and picked *Tofieldia palustris*. Afterwards saw John Ogilvy, who is now nearly 85 years of age. We also called on the Rev. Mr. Smith, and had the pleasure of seeing him and Dr. Steel of Thornton in the evening.

Friday, 7th August 1863.

This morning 16 of the party went by dog-carts and carts to Acharn, and then walked to Glen Fee. Examined the rocks all round the Glen. The day was very misty, and we were thoroughly wet on the hills. We were unable to visit the head of Glen Prosen as I had intended.

Among the plants gathered were the following:—*Cochlearia officinalis*, *Oxytropis campestris*, *Saussurea alpina*, *Veronica alpina*, *Poa Balfourii*, and many other alpine species.

Saturday, 8th August 1863.

This morning at 4 a cart was despatched with all the baggage for Kirriemuir. The morning was very wet and misty. The

Messrs. Dunsmure, Brunton, Nicolson, and Lightfoot remained at Clova with the view of walking to Braemar. The rest of the party started at 8.30 (after breakfast) for Kirriemuir in a brake and two dog-carts, and reached the town in time for the train at 11.40. At Forfar the Prince and Princess of Wales passed in a train for the North. The party reached Perth about a quarter of an hour behind time. All proceeded to Edinburgh except Dr. Balfour, who went to Callander. The weather improved much in the evening.

Strathyre, Loch Lubnaig, Ben Ledi.

Wednesday, 12th August 1863.

Mr. Naylor joined me this morning at Strathyre and we proceeded towards Ben Ledi. Sailed on Loch Lubnaig as far as the foot of the loch and saw abundance of *Nymphæa alba*, *Myriophyllum spicatum*, *Scirpus lacustris*, also *Nuphar pumilum* and *Subularia aquatica*. Collected also *Meum athamanticum*. Began the ascent of the hill not far from the farmhouse. On the left hand of the stream, ascending about 100 yards beyond the top of the wood, we gathered some specimens of *Malaxis paludosa*. Got *Hymenophyllum Wilsoni* on a singular piece of detached rock.

The best way to ascend with the view of collecting alpine plants is to go up the stream from the Hymenophyllum rock to the left. The ascent is steep. You reach a cold wet corrie, and above are fine rocks producing alpine plants, such as:—

Thalictrum alpinum
Cochlearia officinalis
(alpine forms)
Silene acaulis
Sibbaldia procumbens
Alchemilla alpina
Saxifraga oppositifolia
Saxifraga nivalis
" stellaris
" aizoides
Sedum Rhodiola
Gnaphalium supinum
Hieracium alpinum and vars.
Salix herbacea

Also some good alpine mosses, as *Andreæa*.

Examined also rocks on side of Lubnaig at a considerable elevation on Ben Ledi. Left about 12.30 p.m. Reached

the top of Ben Ledi between 4 and 5. Left the top at 5 and got to Strathyre about 8.15 p.m.: beautiful day; fine view, most extensive.

Killin, Bridge of Lochay, Meall Ghaordie.

Thursday, 13*th August* 1863.

This morning Mr. Naylor and self went in a conveyance about 9 a.m. to Killin. Drove about three miles up the Lochay to Duncrook, where the horse was put up. Ascended Meall Ghaordie and visited the rocks on a shoulder projecting into Glen Lyon. The day was delightful, and there was a splendid view from the summit. The hill itself is not very productive, but the rocks looking into Glen Lyon are very fine and produce many alpine plants as :—

Potentilla alpestris	Salix herbacea
Sibbaldia procumbens	„ reticulata
Saxifraga oppositifolia	Juncus trifidus
„ nivalis	„ triglumis
„ stellaris	Carex capillaris
Sedum Rhodiola	„ pulla
Gnaphalium supinum	Avena pratensis
Saussurea alpina	„ alpina
Hieracium alpinum	Asplenium viride
Bartsia alpina	Cystopteris fragilis
Polygonum viviparum	„ dentata
Oxyria reniformis	Polystichum Lonchitis

We searched for *Cystopteris montana*, but were unsuccessful owing, principally, to want of time. The rocks would require five or six hours for full examination.

These rocks are most easily visited from Glen Lyon. By going to them from the Lochay the party need not go to the top of the mountain, but merely to the knoll on the right of the summit and then down towards Glen Lyon. The rocks are well worthy of a full examination, and I have no doubt that they are the rocks mentioned by Backhouse as producing *Cystopteris montana*. We returned to Duncrook about 6.30 p.m. After partaking of

refreshments, we left about 7 for Lochay Inn. Here we got a change of horse and proceeded to Strathyre, which we reached about 9.30 p.m.

Killin, Ben Lawers.

Friday, 14*th August* 1863.

This morning, about 9, started in a conveyance with Mr. Naylor for Killin and Ben Lawers. Morning dull and mist on the top of the hills, which continued all day. Rain came on at night. We took three and a half hours to reach Lawers Inn. Met there Mr. Harvey, the brother-in-law of Mr. Naylor. Ascended Ben Lawers as far as Loch na Ghait. Proceeded to examine the rocks at the head of the loch. We failed in getting *Cystopteris montana*, although we examined the spot where it was previously found by myself and party. We did not go to the *Woodsia* rocks as our time was limited.

Among the plants gathered were the following :—

Draba incana
Cochlearia officinalis
Silene acaulis
Cerastium alpinum
„ latifolium
Cherleria sedoides
Saxifraga oppositifolia
„ nivalis
„ stellaris
Sedum Rhodiola
Hieracium alpinum
Armeria maritima
Salix herbacea
„ reticulata

Juncus trifidus
„ triglumis
Luzula spicata
Carex atrata
Poa alpina
„ Balfourii
„ vivipara
Asplenium viride
Cystopteris montana, vars.
Polystichum Lonchitis
Polypodium alpestre
„ Dryopteris
„ Phegopteris

Returned to Lawers Inn about 6, and after refreshments returned to Strathyre. The night becoming very rainy, Mr. Naylor and Mr. Harvey remained at Lawers Inn with the intention of going on to Kenmore, and then to Aberdeen and Inverness.

Ben Shean.

Monday, 17*th August* 1863.

Ascended Ben Shean (sounded Ben Shee-an) on opposite side of valley from Strathyre.

After visiting the summit walked along the ridge towards the glen leading up to Balquhidder. Had a fine view of Loch Lubnaig, Loch Earn, and Loch Voil. The hill is not of sufficient height for good alpine plants. *Saxifraga aizoides* and *Alchemilla alpina* were the chief sub-alpine species.

Balquhidder, Loch Voil.

Wednesday, 19*th August* 1863.

After breakfast proceeded with Mr. Thomas Bayley, Andrew Balfour, and Colin Campbell by King's House and Balquhidder to Loch Voil. In the churchyard at Balquhidder is the tombstone of Rob Roy close to the entrance of the old church, which is in complete ruins. Drove along the side of Loch Voil opposite to Mr. David Carnegie's house, and along the north side of Loch Doyne to the farm of James Stewart, who has 16,000 acres of sheep farm from the Earl of Moray. Had a fine view of the braes of Balquhidder. Reached the farm about 12. Mr. Bayley, Andrew Balfour, and Colin Campbell went to fish in the river and on Loch Doyne, while I ascended Ben An, the highest hill in the district, rising to 3400 or 3700 feet, according to Mr. Stewart. The hill is a promising one and would require very complete examination. I spent from 12 to 6 p.m. on it examining the rocks, especially near the summit. The best rocks are those on the east side—some large massive rocks. There I saw a considerable quantity of *Draba rupestris* in fine fruit.

Among the plants gathered were :—

Thalictrum alpinum	Sibbaldia procumbens
Caltha minor	Alchemilla alpina
Cerastium alpinum	Saxifraga oppositifolia
„ latifolium	„ stellaris

x

Saxifraga aizoides
„ hypnoides
Sedum Rhodiola
Epilobium alpinum
Gnaphalium supinum
Hieracium alpinum and vars.
Apargia Taraxaci
Leontodon Taraxacum (peculiar var.)
Azalea procumbens (summit of ridge)
Euphrasia officinalis, var. gracilis
Oxyria reniformis
Salix herbacea
Juncus trifidus
„ triglumis
Luzula spicata
Carex rigida
„ depauperata
Aira cæspitosa, var. alpina and vivipara
Poa Balfourii
Juniperus nana
Cryptogramme crispa
Cystopteris dentata
Polystichum Lonchitis
Lastrea dilatata (alpine vars.)
Polypodium Phegopteris

There is abundance of *Corydalis claviculata* on the thatched roofs of houses near Mr. Stewart's farmhouse, also fine specimens of *Montia fontana*, *Callitriche platycarpa*, and *Ranunculus hederaceus*. In the loch are *Nymphæa alba*, *Sparganium natans*, *Arundo Phragmites*.

Saturday, 23rd August 1863.

About 12 to-day I started with my son, Andrew, for a high hill behind Strathyre. It attains a considerable elevation, and is made up of large masses of crumbling rocks which have tumbled down in great quantities. The rocks are by no means safe to climb. Few plants were gathered :—*Saxifraga stellaris*, *Saxifraga aizoides*, *Cryptogramme crispa*, *Lastrea dilatata*, *vars.*

Callander.

Tuesday, 8th September 1863.

Drove to Callander from Strathyre. Visited Leny grounds and saw the Falls.

Among the plants seen were the following :—

Clematis Vitalba
Aconitum Napellus
Berberis vulgaris
„ Aquifolium
Cardamine sylvatica
Tilia europæa
Ilex Aquifolium
Euonymus europæus
Acer Pseudo-platanus
„ campestre
„ saccharinum (some of the maples with fine autumn tints)
Æsculus Hippocastanum
Staphylea trifolia
Cytisus Laburnum
Prunus Laurocerasus
„ lusitanica
„ domestica
„ spinosa
Spiræa Ulmaria
Rubus Idæus
Cratægus Oxyacantha
Philadelphus coronarius
Ribes alpinum
Sedum Telephium
Circæa lutetiana
Pimpinella magna
Hedera Helix
Sambucus nigra
Aucuba japonica
Viburnum Opulus
Lonicera Periclymenum
Symphoricarpus racemosus
Valeriana pyrenaica
Solidago Virgaurea
Inula Helenium
Tussilago Farfara
Carduus heterophyllus
Hieracium vulgatum
Campanula Trachelium
Primula vulgaris
Lysimachia nemorum
Syringa vulgaris
Fraxinus excelsior
Ligustrum vulgare
Symphytum officinale
Scrophularia nodosa
Veronica montana
Prunella vulgaris
Stachys sylvatica
Teucrium Scorodonia
Ajuga reptans
Polygonum Bistorta
Rumex conglomeratus
Buxus sempervirens
Ulmus montana
Humulus Lupulus
Betula alba
Alnus glutinosa
Corylus Avellana
Quercus Robur
Castanea vesca
Fagus sylvatica
Carex sylvatica
Bromus asper
Brachypodium sylvaticum
Pinus austriaca
„ Cembra
„ sylvestris
Abies pectinata
Cedrus Libani
Pteris aquilina
Blechnum boreale
Athyrium Filix-fœmina
Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
Osmunda regalis

Loch Lubnaig, Glen Ample.

Thursday, 10*th September* 1863.

Went about a mile along the shore of Loch Lubnaig, and then turned to the left and went along by the stream which comes from the top of Glen Ample. Visited the glen, and ascended the hill on the left and went over this to Strathyre.

There are some good moist rocks on which interesting plants were gathered. Among the plants collected on the rocks, near the stream, and high up, were the following:—

Alchemilla alpina
Saxifraga oppositifolia (in flower)
„ aizoides
Antennaria dioica, var.
Hieracium Lawsoni
„ prenanthoides
Oxyria reniformis
Melica nutans
Triticum caninum
Asplenium viride
„ Trichomanes
Cystopteris fragilis and vars.
Polystichum Lonchitis
Lastrea Oreopteris

Stuc-a-Chroin.

Friday, 11*th September* 1863.

Left this morning at 11.30 a.m. Drove to Edinample, and thence about 1½ miles up Glen Ample. Then ascended Stuc-a-Chroin. This is the hill next in height to Ben Voirlich, which is the highest in the district. The summit of the hill was reached about 2.45 p.m.

On the summit we gathered:—

Alchemilla alpina
Vaccinium Myrtillus
Carex rigida
Festuca vivipara
Polystichum alpinum
Lycopodium Selago
Dicranum scoparium
Trichostomum lanuginosum
Lecidea geographica

On the rocks below :—

Thalictrum alpinum	Gnaphalium supinum
Cerastium alpinum	Tofieldia palustris
Rubus Chamæmorus	Cryptogramme crispa
Sibbaldia procumbens	Polystichum Lonchitis
Saxifraga oppositifolia	Lastrea dilatata
„ stellaris	Lycopodium Selago
„ aizoides	„ alpinum
„ hypnoides	„ selaginoides
Sedum Rhodiola	Splachnum mnioides
Epilobium alpinum	

Returned to Strathyre at 6 p.m., having left the lower part of the cliffs at 4.30.

Wednesday, 16th September 1863.

Near Stronvar, on the shores of Loch Voil, gathered *Osmunda regalis.* On the rocks at the Black Island, where the Calair Burn from Glen Buckie divides, we got *Hymenophyllum Wilsoni.* At Donald Ferguson's house, Stronvar, saw a peculiar *Dahlia,* half yellow and half purple, on the same capitulum.

Near King's House observed some peculiar varieties of *Athyrium Filix-fœmina.*

Ben Voirlich.

Saturday, 26th September 1863.

This morning, about 9.30 a.m., started from Strathyre for Ardvoirlich House. Ascended Ben Voirlich. The day was fine at starting, but between 12 and 1 the rain and sleet came on with wind and tempest; this continued at intervals, with occasional clear blinks.

The summit was reached about 2, and for half-an-hour the party enjoyed a fine view of the mountains and lochs around, but after that mist came on and continued all afternoon.

The weather interfered much with botanising. Reached Ardvoirlich House about 4.30 p.m.

Among the plants on the hill may be mentioned :—

Rubus Chamæmorus
Sibbaldia procumbens
Alchemilla alpina
Saxifraga aizoides and other alpine Saxifragæ
Gnaphalium supinum
Azalea procumbens (on ridge leading down to Ardvoirlich Cottage)
Lastrea dilatata (peculiar alpine form)
Lycopodium Selago
„ alpinum
„ selaginoides

All the ordinary alpine species were seen. Near the Ardvoirlich Waterfall *Hymenophyllum Wilsoni* was gathered.

EXCURSIONS IN 1864.

Gorebridge, Arniston, Dalhousie.

Saturday, 14th May 1864.

A party of 110 met at the Waverley Station at 12.30 p.m. and proceeded to Gorebridge, then walked to Arniston, and proceeded by the banks of the Esk to Dalhousie Station. Returned from Dalhousie Station by train at 7.27 p.m. Return ticket, 1s.

The following were among the plants collected :—

Anemone nemorosa
Ranunculus hederaceus
„ auricomus
Aquilegia vulgaris
Aconitum Napellus
Barbarea vulgaris
Cardamine amara
Alliaria officinalis
Viola palustris
Stellaria nemorum
Geranium sylvaticum
Oxalis Acetosella
Lotus corniculatus
Vicia sepium
Prunus Padus
Geum rivale
Saxifraga Geum
„ umbrosa
„ granulata
Chrysosplenium oppositifolium
„ alternifolium
Ribes alpinum
„ rubrum
„ nigrum
Sanicula europæa
Myrrhis odorata

Adoxa Moschatellina
Viburnum Lantana
Asperula odorata
Tussilago Farfara
Doronicum plantagineum
Vaccinium Myrtillus
Pyrola minor
Primula veris
Vinca minor
Symphytum officinale
„ tuberosum
Pulmonaria officinalis
Myosotis sylvatica
„ collina
Veronica montana
Lathræa Squamaria
Buxus sempervirens
Salix alba
Salix cinerea
„ Caprea
„ Helix
Orchis mascula
Galanthus nivalis
Allium ursinum
Luzula sylvatica
„ campestris
Potamogeton crispus
Carex glauca
Blechnum boreale
Polypodium Dryopteris
„ Phegopteris
Equisetum maximum
„ limosum
Peziza coccinea
Morchella esculenta

Burntisland, Aberdour.

Saturday, 21*st May* 1864.

Party of 110 met at Scotland Street Station at 9.40 a.m. and proceeded to Burntisland. Visited Aberdour, and returned by train at 3.3 p.m. Return tickets, 8d.

The following were among the plants collected :—

Thalictrum minus
„ flexuosum
Ranunculus bulbosus
Berberis vulgaris
Cheiranthus Cheiri
Barbarea vulgaris
Cochlearia danica
Sisymbrium Thalianum
„ officinale
Alliaria officinalis
Lepidium Smithii
Thlaspi arvense
Reseda Luteola
Helianthemum vulgare
Viola hirta
„ sylvatica
„ canina
„ tricolor
Polygala vulgaris
Silene maritima
Cerastium tetrandrum
„ semidecandrum
Arenaria trinervia
Honckenya peploides
Sagina maritima
Geranium phæum

Erodium cicutarium
Trifolium procumbens
" filiforme
Astragalus hypoglottis
Vicia sepium
Prunus spinosa
Geum urbanum
" rivale
Fragaria elatior
Cratægus Oxyacantha
Saxifraga granulata
Myrrhis odorata
Sambucus nigra
Sherardia arvensis
Valerianella olitoria
Tussilago Farfara
Petasites vulgaris
Senecio vulgaris
Hieracium Pilosella
" vulgatum
Leontodon palustris
Sonchus oleraceus
Armeria maritima
Primula caulescens
Anchusa sempervirens
Myosotis arvensis
Solanum Dulcamara
Linaria Cymbalaria
Antirrhinum majus
Veronica hederæfolia
" Beccabunga
Salvia Verbenaca
Nepeta Glechoma
Lamium incisum
Plantago maritima
" Coronopus
Hippophaë rhamnoides
Parietaria officinalis
Salix Caprea
Orchis mascula
Endymion nutans
Luzula congesta
Triglochin maritimum
Blysmus rufus
Trisetum flavescens
Sclerochloa maritima
" loliacea
Asplenium Adiantum-nigrum
" Trichomanes
" Ruta-muraria
Athyrium Filix-fœmina
Lastrea Filix-mas
" dilatata
Polypodium vulgare

Mid-Calder, Meadowbank, Dalmahoy Hills, Water of Leith, Currie.

Saturday, 28th May 1864.

Party of 80 met at the Caledonian Railway Station at 10.20 a.m. and proceeded to Mid-Calder; then walked to Meadowbank, Dalmahoy Hills, Water of Leith, and Currie. Returned from Currie at 6.11 p.m. Return tickets, 1s.

Among the plants collected were the following :—

Ranunculus hederaceus
Trollius europæus
Aconitum Napellus
Nymphæa alba
Meconopsis cambrica
Draba verna
Sisymbrium Thalianum
Helianthemum vulgare
Viola canina
„ lutea
Silene inflata
Cerastium glomeratum
Tilia grandifolia
Geranium sylvaticum
„ lucidum
Oxalis Acetosella
Prunus Padus
Geum intermedium
Saxifraga granulata
„ hypnoides
Ribes rubrum
„ nigrum
Drosera rotundifolia
Myriophyllum spicatum
Callitriche platycarpa
Myrrhis odorata
Galium saxatile
Asperula odorata
Pyrola minor
Trientalis europæa
Menyanthes trifoliata
Polemonium cæruleum
Anchusa sempervirens
Myosotis versicolor
Salix Smithiana
Corallorrhiza innata
Orchis mascula
„ latifolia
„ maculata
Allium ursinum
Luzula sylvatica
Arum maculatum
Lemna minor
Potamogeton oblongus
Eriophorum vaginatum
„ angustifolium
Carex curta
„ pilulifera
„ panicea
„ ampullacea
Nardus stricta
Asplenium Adiantum-nigrum
Equisetum limosum
„ hyemale
Andreæa Rothii
Bryum nutans
„ cæspititium
Lecanora Parella
„ tartarea
„ hæmatomma
Sticta scrobiculata
Peltidea aphthosa
Cetraria glauca
Usnea florida
Alectoria jubata
Cornicularia bicolor

Drem, Gullan, Longniddry.

Saturday, 4th June 1864.

Party of 90 met at the North British Railway Station at 8 a.m. and proceeded to Drem, then walked to Gullan and Long-

niddry, and returned by train at 3.36. Reached Edinburgh at 4.20 p.m. Return ticket, 1s. 4d.

The following were among the plants collected :—

Thalictrum minus
Ranunculus circinatus
Papaver dubium
„ Argemone
Cheiranthus Cheiri
Cochlearia officinalis
Brassica campestris
Viola hirta
„ canina
Lychnis vespertina
Cerastium semidecandrum
„ arvense
Honckenya peploides
Linum catharticum
Geranium sanguineum
„ phæum
„ pusillum
„ dissectum
Erodium cicutarium
Ilex Aquifolium
Astragalus hypoglottis
Potentilla reptans
Pyrus Aria
Hippuris vulgaris
Callitriche platycarpa
Hydrocotyle vulgaris
Symrnium Olusatrum
Sium angustifolium
Œnanthe crocata
Sambucus nigra
Galium palustre
Valerianella olitoria
Carduus tenuiflorus
Centaurea Scabiosa
Apargia hispida
Armeria maritima
Glaux maritima
Vinca major
Menyanthes trifoliata
Cynoglossum officinale
Lycopsis arvensis
Myosotis collina
Solanum Dulcamara
Scrophularia vernalis
Veronica Beccabunga
Utricularia vulgaris
Pinguicula vulgaris
Lamium amplexicaule
„ intermedium
Atriplex Babingtonii
Hippophaë rhamnoides
Euphorbia Helioscopia
Listera ovata
Orchis mascula
„ latifolia
„ maculata
Iris Pseudacorus
Sparganium ramosum
Triglochin maritimum
Potamogeton natans
„ rufescens
Eleocharis multiflora
Blysmus rufus
Carex disticha
„ teretiuscula
„ vulpina
Equisetum palustre

Alloa, Lornshill Woods, Menstrie, Blairlogie, Airthrey, Abbey Crag, Stirling.

Saturday, 11*th June* 1864.

Party of 75 met at the Edinburgh and Glasgow Railway Station at 6.25 a.m. and proceeded to Alloa. Met Mr. John Dawson, Dr. Duncanson, Dr. Wilson, Dr. Brotherston, Rev. Mr. Hallens, Mr. Clark, Sheriff-Substitute, and other members of the Alloa Natural History Society, who joined us at breakfast in the Royal Oak (Mr. Thomas). Return tickets, 3s.; breakfast, 1s. 6d. After breakfast, walked by Lornshill Woods (picking *Corallorrhiza innata*) to Menstrie and the glen near it. Thence to Blairlogie and along the foot of the Ochils to Airthrey. Visited the grounds under guidance of Mr. Fraser, the factor for Lord Abercrombie. Went to the Abbey Crag, and walked to Stirling. Returned thence by train at 5.48 p.m.

Among the plants collected were the following :—

Ranunculus aquatilis
" hederaceus
Berberis vulgaris
Corydalis claviculata
Cardamine amara
Viola palustris
Lychnis vespertina
" Viscaria
Sagina subulata
Montia fontana
Geranium sylvaticum
" lucidum
Trifolium striatum
Ornithopus perpusillus (Menstrie)
Saxifraga hypnoides
Sedum Telephium
" anglicum
" reflexum
Callitriche verna
Sanicula europæa
Conium maculatum
Senecio viscosus
Hieracium Pilosella
" vulgatum
Hypochœris radicata
Lactuca virosa
Erica Tetralix
Pyrola minor
Villarsia nymphæoides (Airthrey pond)
Symphytum tuberosum
Myosotis cæspitosa
Echium vulgare
Atropa Belladonna
Melampyrum pratense
Pinguicula vulgaris
Euphorbia Helioscopia
Salix aurita
Corallorrhiza innata
Habenaria chlorantha
Iris Pseudacorus
Luzula congesta
Triglochin maritimum
Carex muricata
" stellulata

Carex ovalis
„ pilulifera
Alopecurus geniculatus
Aira præcox
Phragmites communis
Koeleria cristata
Melica uniflora
Glyceria aquatica
Juniperus communis
Hymenophyllum Wilsoni (Menstrie)
Blechnum boreale
Asplenium Adiantum-nigrum
Cystopteris fragilis
Polystichum aculeatum
Lastrea Oreopteris
„ spinulosa
„ dilatata
Polypodium Dryopteris
„ Phegopteris
Equisetum palustre
„ limosum
Lycopodium clavatum

Hawick, Denholm, Hassendean, Minto Crags, Newton.

Saturday, 18*th June* 1864.

Party of 85 met at the Waverley Station at 6.25 a.m. and proceeded to Hawick. Met Mr. J. A. Murray of the Academy and Mr. Wilson with his son. Breakfasted at the Crown Hotel. Afterwards walked by Cavers to Denholm Dene, Denholm, and Hassendean; then a pilot engine took the party at 5.30 to Newton, reaching there in time for the 6 p.m. train. Return tickets, 2s. 6d.; breakfast, 1s. 6d. Mr. A. Craig Christie visited Minto Crags and gathered *Lychnis Viscaria*, *Asplenium germanicum*, and *A. septentrionale*.

Among the plants collected were the following :—

Aquilegia vulgaris
Corydalis claviculata
Fumaria capreolata
Cardamine hirsuta
„ sylvatica
Alliaria officinalis
Brassica campestris
Viola palustris
„ hirta
Stellaria nemorum
Geranium sylvaticum
„ pyrenaicum
„ lucidum
Euonymus europæus
Trifolium medium
Anthyllis Vulneraria
Vicia sylvatica
Rubus nemorosus
Geum intermedium
Comarum palustre
Pyrus Malus
Saxifraga hypnoides
Sedum villosum
Sempervivum tectorum
Hippuris vulgaris
Callitriche platycarpa

Epilobium hirsutum
Circæa lutetiana
Conium maculatum
Pimpinella Saxifraga
Silaus pratensis
Peucedanum Ostruthium
Adoxa Moschatellina
Lonicera Caprifolium
Asperula odorata
Valeriana dioica
Carduus heterophyllus
Campanula latifolia
Pyrola minor
Lysimachia vulgaris
Vinca minor
Menyanthes trifoliata
Polemonium cæruleum
Anchusa sempervirens
Myosotis cæspitosa
„ palustris
Linaria vulgaris
Veronica polita
„ agrestis
Melampyrum sylvaticum
Pinguicula vulgaris
Stachys ambigua
„ sylvatica
Atriplex erecta
Polygonum Bistorta
Rumex viridis
Euphorbia Helioscopia
Neottia Nidus-avis
Epipactis latifolia
Orchis latifolia
Habenaria viridis
Eriophorum angustifolium
Carex dioica
„ disticha
„ teretiuscula
„ curta
„ ovalis
„ panicea
„ sylvatica
„ fulva
„ flava
„ hirta
„ ampullacea
Phalaris arundinacea
Trisetum flavescens
Avena pubescens
Cynosurus cristatus
Glyceria aquatica
Brachypodium sylvaticum
Blechnum boreale
Scolopendrium vulgare
Lastrea dilatata
Equisetum palustre
„ limosum
Hypnum aduncum
„ dendroides

East Linton, Tynningham, Binning Wood.

Saturday, 25th June 1864.

Party of 57 met at the Waverley Station and proceeded to East Linton. Thence walked to Tynningham. Met Mr. Lees. Visited the garden and houses, and walked towards the mouth of the Tyne and the shore. Walked through Binning Wood to East Linton, and returned by train at 3.10 p.m. Return tickets 2s. Many seeds were picked on rocks off St. Baldred's, and near this abundance of *Ophioglossum vulgatum*.

Among the other plants gathered were the following :—

Papaver dubium
„ Argemone
Fumaria micrantha
Sinapis alba
Viola hirta
Lepigonum marinum
Malva rotundifolia
Linum catharticum
Geranium sanguineum
Trifolium hybridum
Rubus cæsius
Potentilla reptans
Agrimonia Eupatoria
Rosa rubiginosa
„ arvensis
Sempervivum tectorum
Conium maculatum
Lonicera Caprifolium
Aster Tripolium
Hieracium vulgatum
Apargia autumnalis
Tragopogon minor
Erica Tetralix
Glaux maritima
Erythræa Centaurium
Cynoglossum officinale
Symphytum tuberosum
Myosotis collina
Solanum Dulcamara
Linaria Cymbalaria
Antirrhinum majus
Veronica agrestis
Euphrasia officinalis
Lamium intermedium
Ballota fœtida
Plantago Coronopus
Atriplex Babingtonii
Salicornia herbacea
Suæda maritima
Rumex sanguineus
Hippophaë rhamnoides
Buxus sempervirens
Humulus Lupulus
Parietaria erecta
Populus alba
„ tremula
Neottia Nidus-avis
Listera ovata
Orchis latifolia
„ maculata
Iris Pseudacorus
Ornithogalum umbellatum
Juncus Gerardi
Triglochin maritimum
Scirpus maritimus
Trisetum flavescens
Lolium italicum
Triticum repens
Taxus baccata
Blechnum boreale
Asplenium Adiantum-nigrum
Athyrium Filix-fœmina
Lastrea dilatata
Equisetum palustre

Newburgh, Lindores Loch, Abdie, Denmiln, Mare's Crag, Ochils, Lochmill.

Saturday, 2nd July 1864.

Party of 55 met at the Scotland Street Station at 6.30 a.m. and proceeded to Lindores Loch, walked round it to Abdie,

Macduff's Castle, Denmiln, and the Mare's Crag. Reached Newburgh about 10.18 a.m. for breakfast at Mr. Sutcliffe's George Hotel. Visited Dr. Lyall's collection of ferns, and saw Mr. Lang. Mr. Anderson of the Commercial Bank also accompanied us. Walked by the Ochils to Lochmill, and returned to Newburgh at 4.35 p.m. Return tickets, 2s. 6d.; breakfast, 1s. 3d.

The following were among the plants collected :—

Ranunculus Flammula
" hirsutus (Pitcaithly)
Papaver dubium
" Argemone
Fumaria capreolata
" micrantha
Sisymbrium Thalianum
Reseda Luteola
Helianthemum vulgare
Viola tricolor
" arvensis
Silene inflata
Malva moschata
" rotundifolia
Geranium dissectum
Ononis arvensis
Trifolium medium
Anthyllis Vulneraria
Vicia hirsuta
" Cracca
Agrimonia Eupatoria
Saxifraga granulata
Epilobium angustifolium
Hydrocotyle vulgaris
Scandix Pecten-Veneris
Galium saxatile
Asperula odorata
Valerianella olitoria
Anthemis arvensis
Matricaria inodora
Senecio sylvaticus
Hieracium Pilosella
Vaccinium Myrtillus
Erica cinerea
Menyanthes trifoliata
Lycopsis arvensis
Linaria vulgaris
Scrophularia nodosa
Digitalis purpurea
Pedicularis palustris
Rhinanthus Crista-galli
Galeopsis versicolor
" Tetrahit
Lamium amplexicaule
Teucrium Scorodonia
Scleranthus annuus
Chenopodium album
Polygonum amphibium
" viviparum
Euphorbia Helioscopia
Humulus Lupulus
Orchis latifolia
Iris Pseudacorus
Juncus effusus
Luzula sylvatica
Alisma Plantago
Carex hirta
" ampullacea
Phalaris arundinacea
Blechnum boreale
Lastrea Oreopteris
Polypodium Dryopteris

In Lindores Loch :—

Ranunculus circinatus
„ aquatilis
Nuphar luteum
Comarum palustre
Littorella lacustris
Typha latifolia
Sparganium ramosum
„ simplex
Scirpus lacustris
Glyceria aquatica

On Mare's Crag :—

Dianthus deltoides
Sagina subulata
Geranium sanguineum
„ columbinum
Geranium lucidum
Ornithopus perpusillus
Potentilla argentea

At Denmiln :—

Verbascum Lychnitis

In Lochmill :—

Nuphar luteum
Nymphæa alba
Potamogeton natans
Potamogeton heterophyllus
„ crispus

Dumfries, Caerlaverock Castle.

Saturday, 9th July 1864.

Party of 54—along with 30 of Dr. Leycock's pupils, making in all 84—met at the Caledonian Railway Station at 7.45 a.m. and proceeded to Dumfries. Then proceeded in carriages to the Crichton Institute, where breakfast was provided by Dr. Gilchrist. Walked by banks of Nith to Caerlaverock Castle, and returned by carriage to Dumfries in time for train at 6 p.m. for Edinburgh, which was reached about 9.30 p.m. Return tickets, 5s.

Among the plants collected were the following :—

Ranunculus sceleratus
Berberis vulgaris
Cheiranthus Cheiri
Cochlearia officinalis
Iberis amara
Crambe maritima
Silene maritima
Sagina maritima
Lepigonum marinum
Hypericum dubium

OFFICIAL COPY. Number X.

NOTES

FROM THE

ROYAL BOTANIC GARDEN, EDINBURGH.

DECEMBER 1902.

CONTENTS.

	Page.
The Royal Botanic Garden	i
List of Staff	ii
Rules and Regulations	iii
Historic Notice	v
Features of the Garden. With Key Plan	ix
Teaching in the Garden	xi
History of the Royal Botanic Garden, Edinburgh. Botanical Excursions made by Professor John Hutton Balfour in the Years from 1840 to 1878 inclusively,	365
Title and List of Contents to Vol. II., 1902.	

GLASGOW:

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE

By JAMES HEDDERWICK & SONS,

AT "THE CITIZEN" PRESS, ST. VINCENT PLACE.

SOLD AT THE GARDEN,

And to be purchased, either directly or through any Bookseller, from

OLIVER & BOYD, Edinburgh.

[PRICE NINEPENCE.]

[*All rights reserved.*]

Malva sylvestris
Genista tinctoria
Anthyllis Vulneraria
Vicia sativa
Comarum palustre
Hydrocotyle vulgaris
Conium maculatum
Carum verticillatum
Sium angustifolium
Œnanthe fistulosa
„ Lachenalii
„ crocata
Lonicera Periclymenum
Galium palustre
Valeriana officinalis
Gnaphalium sylvaticum
Senecio tenuifolius
Carduus palustris
Thrincia hirta
Jasione montana
Campanula rotundifolia
Armeria maritima
Glaux maritima
Anagallis arvensis
„ tenella
Samolus Valerandi
Ligustrum vulgare
Erythræa Centaurium
„ littoralis
Myosotis cæspitosa
Convolvulus sepium
Solanum Dulcamara
Melampyrum pratense
Mentha velutina
Plantago maritima
Atriplex Babingtonii
Polygonum lapathifolium
Iris fœtidissima
„ Pseudacorus
Allium vineale
Juncus glaucus
„ maritimus
Lemna minor
Triglochin palustre
„ maritimum
Potamogeton oblongus
Scirpus maritimus
Blysmus rufus
Carex vulpina
„ lævigata
„ distans
„ extensa
Phalaris arundinacea
Glyceria fluitans
„ aquatica
Lepturus filiformis
„ incurvatus
Asplenium Adiantum-nigrum
„ Trichomanes
Fontinalis antipyretica

Anstruther, Pittenweem, St. Monans, Elie.

Saturday, 16*th July* 1864.

Party of 35 met at Scotland Street Railway Station at 6.30 a.m. and proceeded to Anstruther. Breakfasted at Robertson's Commercial Inn. Met Mr. Barclay, the Rev. R. Colvin, Mr. C. Howie, and subsequently Rev. Walter Wood and Mr. Michie. The party was thus in all forty. Walked by the shore to Pittenweem and visited old monastery and caves. Passed through St.

Monans and visited Elie Harbour. Returned by train from Elie at 4.20 p.m. Return tickets, 2s. 6d.; breakfast, 1s. 6d.

Among the plants collected by the party were the following:—

Thalictrum minus
Ranunculus sceleratus
Papaver Argemone
Fumaria capreolata
" micrantha
Sisymbrium Sophia
Sinapis alba
Diplotaxis muralis
Senebiera didyma
" Coronopus
Lepidium ruderale
Silene noctiflora
Lychnis Flos-cuculi
" Githago
Malva rotundifolia
Geranium sanguineum
" pratense
Genista anglica
Trifolium scabrum
Astragalus hypoglottis
Sedum anglicum
Conium maculatum
Smyrnium Olusatrum
Pimpinella Saxifraga
Anthriscus vulgaris
Haloscias scoticum
Archangelica officinalis
Anthemis Cotula
Tanacetum vulgare
Senecio vulgaris
" sylvaticus
Carduus tenuiflorus
Silybum Marianum
Centaurea Scabiosa
Apargia autumnalis
Lactuca muralis
Erica cinerea
Anagallis arvensis
Erythræa Centaurium
Echium vulgare
Hyoscyamus niger
Atriplex littoralis
" erecta
" Babingtonii
Polygonum littorale
Fagopyrum esculentum
Euphorbia Helioscopia
Orchis pyramidalis
" latifolia
Habenaria viridis
Alopecurus agrestis
Phleum pratense
" arenarium
Polypogon monspeliensis
Psamma arenaria
Trisetum flavescens
Sclerochloa procumbens
" rigida
" loliacea
Serrafalcus commutatus
Triticum junceum
Asplenium marinum
Botrychium Lunaria

Callander, Ben Ledi, Loch Lubnaig.

Saturday, 23rd July 1864.

Party of 94 met at the Waverley Station at 6.5 a.m. and proceeded to Callander. Breakfasted at MacGowan's Dread-

nought Hotel. Afterwards walked to summit of Ben Ledi, going as far as Loch Lubnaig, ascending by the Stank Burn. Examined rocks at summit. Returned to Callander at 6.15 to tea. Left by train at 7 p.m. for Edinburgh. Return tickets, 4s. 4d.; breakfast, 1s. 6d.; tea, 1s. 3d.

Among the plants gathered were the following:—

Thalictrum alpinum
Nuphar lutea
Nymphæa alba
Corydalis claviculata
Cochlearia officinalis, var.
Subularia aquatica
Viola lutea, var.
Silene acaulis
Montia fontana
Hypericum humifusum
Tilia parvifolia
Vicia sylvatica
Rubus saxatilis
Sibbaldia procumbens
Alchemilla alpina
Rosa arvensis
Saxifraga oppositifolia
" nivalis
" stellaris
" aizoides
" hypnoides
Parnassia palustris
Sedum Rhodiola
Drosera rotundifolia
Callitriche autumnalis
Epilobium alsinifolium
Circæa alpina
Hydrocotyle vulgaris
Pimpinella magna
Angelica sylvestris
Galium boreale
" saxatile
Solidago Virgaurea
Gnaphalium sylvaticum
" supinum
Achillea Ptarmica
Senecio sylvaticus
" aquaticus
Centaurea Cyanus
Hieracium boreale
Lobelia Dortmanna
Vaccinium Oxycoccus
Erica Tetralix
" cinerea
Gentiana campestris
Myosotis repens
Veronica scutellata
Littorella lacustris
Polygonum viviparum
Myrica Gale
Salix aurita
" viminalis
" herbacea
Empetrum nigrum
Malaxis paludosa
Listera cordata
Gymnadenia conopsea
" albida
Habenaria chlorantha
Narthecium ossifragum
Juncus supinus
" triglumis
Luzula spicata
Sparganium natans
Potamogeton prælongus
Carex pulicaris
" stellulata
" curta
" irrigua
" binervis

Carex Œderi
„ vesicaria
Triodia decumbens
Molinia cærulea
Festuca vivipara
Brachypodium sylvaticum
Juniperus communis
Hymenophyllum Wilsoni
Allosorus crispus
Asplenium viride
Polystichum Lonchitis
Lastrea spinulosa
Polypodium Dryopteris
Polypodium Phegopteris
Equisetum limosum
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides
Andreæa alpina
Pogonatum alpinum
Tortula tortuosa
Bartramia pomiformis
Splachnum ampullaceum
Hypnum loreum

Loch Lomond, Inverarnan, Ben Voirlich, Ben More, Cobbler, Ben Ime.

Tuesday, 9th August 1864.

Party, consisting of J. H. Balfour, Francis Walter Moinet, John P. Gordon, P. Neill Fraser, T. L. Brunton, and James Thomson, left Edinburgh at 9.15 a.m. for Stirling, Balloch, and Loch Lomond—having procured return tickets available for ten days for 6s. 8d. They were detained for half-an-hour by the number of passengers going north. On board the Loch Lomond steamer met Mr. Elliot of Wolflee and his daughter and Captain Hector Macneil. Day very showery. Most of the passengers left at various places on the loch instead of taking the complete tour. Reached Inverarnan about 3.30 p.m., and were comfortably accommodated by Mr. M'Nab, the innkeeper. After dinner walked for two or three miles up Glen Falloch, and returned about 8.30 p.m. Gathered *Malaxis paludosa* and *Rhynchospora alba*. Weather very wet, also chilly. Fire required at night.

Wednesday, 10*th August* 1864.

Day fine. Breakfasted at 7.30, and at 8.15 a.m. started for Ben Voirlich. Ascended on the northern side. Visited the loch and had a fine view from the summit of Ben Lomond; Ben Lui, Ben Oss, Ben More, Ben A'an, Ben Ledi, Ben Lawers, Ben Venue,

hills on the side of the Lochay, hills in Glencoe and Ben Ime, all seen distinctly. Occasional showers passed over the hills, which added to the effect. After descending the hill walked along the banks of the Falloch to Inverarnan and reached the inn about 6 p.m.

Among the plants gathered were the following :—

Thalictrum alpinum
Silene acaulis
Cerastium alpinum
Lotus major (very fine and large)
Sibbaldia procumbens
Alchemilla alpina
Saxifraga oppositifolia
" stellaris
" aizoides
" hypnoides
Lythrum Salicaria
Epilobium alpinum
Solidago Virgaurea
" " var. cambrica
Gnaphalium supinum
Saussurea alpina
Hieracium Lawsoni
" umbellatum
Apargia autumnalis
Lysimachia vulgaris
Stachys ambigua
Littorella iacustris
Polygonum viviparum
Salix herbacea
Juncus trifidus
" triglumis
Luzula spicata
Potamogeton natans
Carex rigida
" pallescens
Aira cæspitosa vivipara
Poa alpina vivipara
Festuca vivipara
Hymenophyllum Wilsoni
Cryptogramme crispa
Asplenium viride
Polypodium alpestre
Cystopteris fragilis
" dentata
Polystichum Lonchitis
Lastrea dilatata and vars.
Isoëtes lacustris

Thursday, 11*th August* 1864.

Breakfasted at 7.30 a.m. and started at 8 in a drag with two horses for the foot of Ben More. Drove nine miles on the road to Killin to a spot about two miles beyond Crianlarich, where there is a farm called Ben More Farm. The tolls were very heavy, there being two which were charged 2s. each. Reached foot of Ben More about 9.30. Ascended towards the rocky part of the hill. Day was remarkably fine, and the view very extensive.

Ben More, although rising above 3800 feet, was found to be very unproductive. The chief plants gathered were :—

Sibbaldia procumbens
Saxifraga oppositifolia
" stellaris
" aizoides
" hypnoides
Epilobium alpinum
Solidago Virgaurea
Antennaria dioica
Gnaphalium supinum
Saussurea alpina
Polygonum viviparum
Salix herbacea
Cystopteris fragilis
Lycopodium Selago
" clavatum
" selaginoides

The party, after remaining for some time on the summit of Ben More, proceeded to Ben A'an, a mountain close to it and nearly as high. The rocks looking to the north-east were very promising and yielded some good plants.

Among others may be noted :—

Draba rupestris
Cochlearia grœnlandica
Sagina nivalis
Saxifraga nivalis
Armeria maritima
Veronica humifusa
Carex pulla
Aira cæspitosa vivipara
Poa alpina
" Balfourii
Polystichum Lonchitis

Descended to Ben More Farm at 4.30 and met our drag. Returned to Inverarnan at 6 p.m.

Friday, 12*th August* 1864.

Another fine day. Started by the steamboat at 6.15 a.m. for Tarbet. Return tickets, 1s. Walked to Arrochar and then breakfasted. Afterwards ascended the Cobbler and Ben Ime.

Among the plants collected were the following :—

Nasturtium palustre
Draba incana
Sibbaldia procumbens
Saxifraga oppositifolia
" stellaris
" aizoides
" hypnoides
Sedum Rhodiola
Carum verticillatum
Aster Tripolium
Gnaphalium supinum
Saussurea alpina
Hieracium alpinum
" Lawsoni

Armeria maritima
Scutellaria galericulata
Stachys ambigua
Polygonum viviparum
Salix herbacea
Juncus trifidus
„ triglumis
Luzula spicata
Carex rigida
Aira cæspitosa
Poa Balfourii
Hymenophyllum Wilsoni
Cryptogramme crispa
Polystichum Lonchitis
Lastrea dilatata and vars.
Polypodium Dryopteris
„ Phegopteris

Descended from Ben Ime into the glen leading into Inverglas, but unfortunately turned off to the right and had a long and fatiguing walk to Arrochar, in place of reaching the shore of Loch Lomond as we intended.

Reached Tarbet at 6 p.m. in time for the boat to Inverarnan. Met Dr. Philip Malyon and his wife and Mr. John Maclagan on board. Reached the inn about 7.30 p.m.

Saturday, 13*th August* 1864

The party broke up to-day. Some started about 10 a.m. and walked along the shore of Loch Lomond to Tarbet, where they met the boat for Edinburgh about 2.20 p.m. and returned to Edinburgh by Stirling. On their walk they gathered :—

Hypericum humifusum
Drosera anglica
Scutellaria galericulata
Littorella lacustris
Osmunda regalis

Neighbourhood of Dunkeld.

Thursday, 19*th August* 1864.

Visited hills near Dalguise House about five and a half miles from Dunkeld.

Among the plants gathered were the following :—

Genista anglica
Vaccinium Vitis-Idæa
Arctostaphylos Uva-ursi
(very abundant)
Trientalis europæa
Pteris aquilina
Blechnum boreale
Asplenium Trichomanes
Athyrium Filix-fœmina
Cystopteris fragilis

Polystichum aculeatum
Lastrea Oreopteris
„ Filix-mas
„ dilatata
„ Fœnisecii ?
Polypodium vulgare
Polypodium Dryopteris
„ Phegopteris
Lycopodium Selago
„ clavatum
„ alpinum

The hills are not of great elevation.

In a pond on the hills :—

Hippuris vulgaris
Peplis Portula
Juncus uliginosus

Ballinluig, Dalnaspidal, Sow of Athole, Dalwhinnie.

Friday, 20th August 1864.

Proceeded to Ballinluig, and thence by train to Dalnaspidal, which was reached about 1 p.m. Ascended Sow of Athole.

Gathered :—

Rubus Chamæmorus
Sibbaldia procumbens
Alchemilla alpina
Saxifraga stellaris
„ aizoides
Cornus suecica
Gnaphalium supinum
Azalea procumbens
Phyllodoce cærulea (past flowering)
Lycopodium Selago
„ annotinum (abundant)
„ clavatum
„ alpinum

On the summit :—

Calluna vulgaris (dwarf)
Azalea procumbens

The *Phyllodoce* was gathered about three-quarters of the way up the hill on the side next to Dalnaspidal. Carried with me some seeds of the *Phyllodoce cærulea* from the Botanic Garden and sowed them on the spot where the plant was growing. There might be some seeds of *Phyllodoce empetrifolia* amongst them, as both plants are growing together in the Botanic Garden. Walked on to Dalwhinnie. Good inn kept by Pullar. Ben Alder—a high hill near, on side of Loch Ericht—worth visiting. Returned by train, which reached Dalguise at 6.5 p.m.

Dalguise, Dunkeld, Murthly, Birnam.

Saturday, 21*st August* 1864.

Walked by the hills behind Dalguise to Dunkeld and then to Stenton Rock. Gathered a few common ferns. Could not see *Asplenium germanicum*, vegetation much withered. Crossed by Miller's boat to Murthly grounds and walked to Birnam. Then by train to Dalguise at 5 p.m.

Killiecrankie.

Monday, 23*rd August* 1864.

Visited Killiecrankie and gathered *Lathyrus niger*. The station of this plant nearly destroyed by the railway cutting. Great part of the plant covered with rubbish. Met William Mackintosh, the guide, who had been at Glen Tilt when the botanists were stopped in 1847. He asked us to visit his cottage, and gave us milk, also a specimen of *Cryptogramme crispa* from a neighbouring hill. Walked through the glen and through Faskally grounds to Pitlochry, meeting Mr. Barbour of Bonskeid on the way. Returned to Dalguise at 6.5 p.m.

Ben Lawers.

Thursday, 25*th August* 1864.

Left Dalguise at 9.30 a.m. by coach for Aberfeldy, Kenmore, and Lawers Inn, which was reached about one. Ascended Ben Lawers. Day remarkably fine, although there were a few showers, one of them a shower of hail. Gathered abundance of *Sagina nivalis* and other Saginas. Did not meet with *Alsine rubella*. On summit of hill found :—

Draba incana	Saxifraga nivalis
„ rupestris	„ cernua
Cerastium alpinum	Leontodon Taraxacum
Cherleria sedoides	Myosotis alpestris

and all the ordinary alpine species.

Returned to Lawers Inn at 7 p.m. Remained there all night. Next morning walked to Kenmore to breakfast, and returned to Dalguise about 12 noon.

EXCURSIONS IN 1865.

Penicuik.

Saturday, 13*th May* 1865.

Day very wet. Party of 40 met at the North British Railway Station at 8 a.m. and proceeded to Penicuik. Visited the glen and Mr. Cowan's paper works, and returned by train at 11.35 a.m. Among the plants collected were the following :—

Anemone nemorosa
Ranunculus auricomus
Caltha palustris
Viola sylvatica
Oxalis Acetosella
Lathyrus macrorrhizus
Prunus spinosa
" Padus
Geum rivale
Chrysosplenium alternifolium
Tussilago Farfara
Pyrola minor
Primula vulgaris
Symphytum tuberosum
Mercurialis perennis
Salix cinerea
Neottia Nidus-avis
Luzula sylvatica
Blechnum boreale
Athyrium Filix-fœmina
Polypodium vulgare
" Dryopteris
" Phegopteris
Equisetum arvense
" umbrosum
" sylvaticum
Neckera complanata
Peltidea scutata
Calicium chrysocephalum
Alectoria jubata
Morchella esculenta

Kinghorn, Burntisland.

Saturday, 20*th May* 1865.

Party of 80 met at 9.30 a.m. at Edinburgh, Perth, and Dundee Station, and proceeded to Kinghorn. Walked by shore to Burntisland. Some visited Kinghorn Loch. Returned by boat at 3 p.m.

Among the plants collected were the following:—

Ranunculus heterophyllus
" hederaceus
" bulbosus
Fumaria pallidiflora
Cheiranthus Cheiri
Barbarea vulgâris
Arabis hirsuta
Alyssum calycinum
Cochlearia danica
Armoracia rusticana
Brassica campestris
Thlaspi arvense
Helianthemum vulgare
Viola canina
Silene maritima
Cerastium tetrandrum
" semidecandrum
" arvense
Honckenya peploides
Linum catharticum
Geranium molle
Vicia hirsuta
" lathyroides
Ribes rubrum
" nigrum
Myrrhis odorata
Anthriscus vulgaris
Centranthus ruber
Valerianella olitoria
Leontodon lævigatus
Armeria maritima
Primula elatior
Myosotis collina
Linaria Cymbalaria
Veronica hederæfolia
" polita
" arvensis
" serpyllifolia
Salvia Verbenaca
Lamium amplexicaule
" intermedium
" purpureum
" incisum
Plantago maritima
" Coronopus
Hippophaë rhamnoides
Urtica urens
Salix alba
Orchis mascula
Endymion nutans
Luzula multiflora
Potamogeton lucens
Sclerochloa maritima
" loliacea
Asplenium Adiantum-nigrum
" Ruta-muraria
Botrychium Lunaria
Equisetum limosum
Grimmia leucophæa
" Schisti
" maritima

North Berwick, Canty Bay, Tantallon Castle, Bass.

Saturday, 27th May 1865.

Party of 60 met at the Waverley Station at 8 a.m. and proceeded to North Berwick. Walked by the shore to Canty

Bay. Some visited the Bass, others went to Tantallon Castle, others visited North Berwick Law. Returned by train at 2.55 p.m. Return tickets, 1s. 6d.

Among the plants gathered were the following :—

Papaver Argemone
Cheiranthus Cheiri
Amoracia rusticana
Lepidium latifolium
Reseda Luteola
Viola sylvatica
Silene maritima
Lychnis vespertina
Honckenya peploides
Linum catharticum
Geranium molle
Anthyllis Vulneraria
Astragalus hypoglottis
Vicia sylvatica
Geum urbanum
Cratægus Oxyacantha
Saxifraga granulata
Conium maculatum
Sambucus nigra
Valerianella olitoria
Petasites fragrans
Leontodon lævigatus
Armeria maritima
Primulâ caulescens
„ veris
Anchusa sempervirens
Lycopsis arvensis
Myosotis collina
Veronica serpyllifolia
Lamium amplexicaule
Plantago Coronopus
Humulus Lupulus
Orchis mascula
Ornithogalum umbellatum
Carex arenaria
Psamma arenaria
Elymus arenarius
Blechnum boreale
Asplenium Adiantum-nigrum
Botrychium Lunaria

Cockburnspath, Pease Dene, Dunglass Dene.

Saturday, 3rd June 1865.

Party of 62 met at Waverley Station at 8 a.m. and proceeded to Cockburnspath. Walked to Pease Bridge and Dene, along the shore to Dunglass Dene, and returned by train at 2.33 p.m., reaching Edinburgh at 3.35 p.m.

Among the plants collected were the following :—

Ranunculus hederaceus
Papaver Argemone
Glaucium luteum
Cardamine amara
Cochlearia officinalis
Alliaria officinalis
Brassica campestris
Helianthemum vulgare
Silene maritima
Stellaria Holostea
Arenaria trinervia
Honckenya peploides

Sagina procumbens
Geranium sylvaticum
Erodium cicutarium
Ilex Aquifolium
Acer campestre
Anthyllis Vulneraria
Astragalus hypoglottis
Vicia sativa
Geum urbanum
Saxifraga granulata
Sanicula europæa
Scandix Pecten-Veneris
Anthriscus sylvestris
Œnanthe crocata
Asperula odorata
Eupatorium cannabinum
Anthemis arvensis
Carduus tenuiflorus
Hieracium Pilosella
Armeria maritima
Lysimachia nemorum
Symphytum tuberosum
Lycopsis arvensis
Myosotis sylvatica
„ collina
„ versicolor
Veronica hederæfolia
„ polita
„ arvensis
„ serpyllifolia
„ montana
„ Beccabunga
Lamium amplexicaule
„ intermedium
„ incisum
„ album
Atriplex Babingtonii
Rumex sanguineus, var. viridis
Hippophaë rhamnoides
Orchis mascula
„ latifolia
„ maculata
Allium ursinum
Endymion nutans
Luzula sylvatica
Triglochin palustre
„ maritimum
Carex vulpina
„ pendula
Anthoxanthum odoratum
Alopecurus geniculatus
Pinus sylvestris
Asplenium marinum
Scolopendrium vulgare
Polystichum angulare
Equisetum limosum
Isothecium alopecurum
Neckera complanata
Hypnum aduncum
Bryum nutans
Anomodon viticulosus
Sticta sylvatica

St. Boswells, Melrose, Dryburgh, Eildon Hills.

Saturday, 10*th June* 1865.

Party of 90 met at the Waverley Station at 9.45 a.m. and proceeded by train to St. Boswells. Walked by banks of Tweed to Melrose. Some visited Dryburgh and Eildon Hills. Returned by train passing Melrose at 4.2 p.m. Return tickets, 2s. 6d.

Among the plants collected were the following :—

halictrum flexuosum
Ranunculus heterophyllus
Aquilegia vulgaris
Fumaria pallidiflora
Cheiranthus Cheiri
Barbarea vulgaris
Cochlearia officinalis (Melrose Abbey)
Viola odorata
„ tricolor
Stellaria nemorum
Arenaria serpyllifolia
Linum catharticum
Geranium lucidum
Anthyllis Vulneraria
Geum intermedium
Potentilla reptans
Ribes alpinum
Circæa alpina
Galium boreale
Asperula odorata
Dipsacus sylvestris
Doronicum Pardalianches
Hieracium Pilosella
Lysimachia nemorum
Symphytum officinale
Anchusa sempervirens
Myosotis sylvatica
Echium vulgare
Verbascum Thapsus
Scrophularia nodosa
Veronica serpyllifolia
Lathræa Squamaria
Pinguicula vulgaris
Plantago media
Orchis latifolia
Allium ursinum
Ornithogalum umbellatum
Juncus effusus
Luzula sylvatica
Carex vulgaris
Melica uniflora
Juniperus communis
Taxus baccata
Pinus sylvestris
Allosorus crispus
Asplenium Adiantum-nigrum
„ Trichomanes
„ Ruta-muraria
Polystichum aculeatum
Neckera complanata
Anomodon viticulosus
Parmelia pulverulenta
Ramalina fastigiata

Dolphinton.

Saturday, 17th June 1865.

Party of 65 met at the Waverley Station at 8 a.m. and proceeded to Dolphinton. Examined the boggy ground in the neighbourhood and the woods. Lunched with Mr. Mackenzie of Dolphinton House. Returned by train at 2.20 p.m. Return tickets, 1s. 9d.

Among the plants collected were the following :—

Berberis vulgaris
Meconopsis cambrica
Cardamine palustris (double)
Viola palustris
„ lutea
Cerastium arvense
Spergula arvensis
Linum catharticum
Sedum villosum
Drosera rotundifolia
Cornus sanguinea
Antennaria dioica
Achillea Ptarmica
Senecio aquaticus
Apargia autumnalis
Vaccinium Oxycoccus
Erica Tetralix
Pyrola minor
Primula farinosa
Menyanthes trifoliata
Myosotis cæspitosa
Pedicularis sylvatica
Orchis incarnata
„ latifolia
„ maculata
Luzula congesta
Eriophorum polystachyon
„ latifolium
Carex disticha
„ panicea
„ ampullacea
Botrychium Lunaria

North Queensferry, South Queensferry, Ferry Hills, Inverkeithing, Dalmeny, Almond Bridge.

Saturday, 24th June 1865.

Party of 24 met at Granton at 8.30 a.m. and proceeded by steamboat to North Queensferry. Examined hills near Ferry. Walked towards Inverkeithing. Crossed the Ferry to South Queensferry. Walked by Dalmeny Park and Almond Bridge to Edinburgh. Pier, 2d. Steamboat, 6d. Pier at Queensferry, 6d. Ferry across, 6d. Mr. Gray joined the party at Queensferry.

Among the plants gathered were the following :—

Thalictrum flexuosum
Papaver dubium
Brassica campestris
Thlaspi arvense
Cakile maritima
Reseda lutea
„ Luteola
Helianthemum vulgare
Sagina maritima
Lepigonum marinum
Malva rotundifolia
Geranium sanguineum
Acer campestre
Medicago sativa
Trifolium hybridum
Vicia lutea

Spiræa salicifolia
„ Filipendula
Geum intermedium
Potentilla reptans
Ribes alpinum
Sedum villosum
Hydrocotyle vulgaris
Pimpinella Saxifraga
Anthriscus vulgaris
Œnanthe crocata
Lonicera Periclymenum
Aster Tripolium
Doronicum Pardalianches
Carduus tenuiflorus
„ acanthoides
Campanula rotundifolia
Erica cinerea
Pyrola minor
Armeria maritima
Glaux maritima
Echium vulgare
Linaria Cymbalaria
Digitalis purpurea
Plantago maritima
„ Coronopus
Hippophaë rhamnoides
Euphorbia Helioscopia
Neottia Nidus-avis
Listera ovata
Goodyera repens
Epipactis latifolia
Orchis latifolia
„ maculata
Allium vineale
Lemna minor
Triglochin maritimum
Asplenium viride, var. varians

Largo, Elie.

Saturday, 1st July 1865.

Party of 46 met at the Edinburgh, Perth, and Dundee Railway Station at 6.25 a.m. and proceeded to Largo. Met Mr. Howie, who had made arrangements for breakfast in the Schoolhouse of Upper Largo (or the Kirkton of Largo). Mrs. Ireland, baker in the village, provided the breakfast. The arrangements were most satisfactory. After breakfast walked by shore to Elie and gathered very good plants. Return tickets, 2s. 6d.; breakfast, 1s. 6d.

Among the plants gathered were the following :—

Thalictrum minus
Ranunculus sceleratus
Papaver Argemone
Sinapis nigra
Diplotaxis tenuifolia
„ muralis
Senebiera didyma
„ Coronopus
Thlaspi arvense
Reseda lutea
Lepigonum marinum
Malva rotundifolia

Linum usitatissimum
Geranium sanguineum
Melilotus officinalis
Trifolium arvense
„ hybridum
Astragalus hypoglottis
„ Glyciphyllos
Agrimonia Eupatoria
Sedum reflexum
Hydrocotyle vulgaris
Œnanthe crocata
Valerianella dentata
Matricaria inodora, var. maritima
Centaurea Scabiosa
Anagallis tenella
Mertensia maritima
Echium vulgare
Lycium barbarum
Atriplex littoralis
Salsola Kali
Listera ovata
Orchis incarnata
Habenaria viridis
Sparganium ramosum
Scirpus maritimus
Blysmus rufus
Schœnus nigricans
Carex pulicaris
„ incurva
Phalaris arundinacea
Psamma arenaria
Triodia decumbens
Koeleria cristata
Sclerochloa distans
Asplenium marinum
Botrychium Lunaria
Equisetum variegatum
Chara vulgaris
Hypnum giganteum
„ lycopodoides

Leslie, Prinlaws, West Lomond Hill, Bishop Hill, Glen Vale, Loch Leven.

Saturday, 8th July 1865.

Party of 50 met at the Edinburgh, Perth, and Dundee Station at 6.25 a.m. and proceeded to Leslie. Mr. Wylie of Prinlaws met the party and entertained them to breakfast in the School-room at Prinlaws. Mr. Barclay from Cupar was there. Dr. Grainger-Stewart and Rev. Mr. Colvin were of the party. After breakfast the party walked to the West Lomond Hill and the Bishop Hill, Glen Vale, and Loch Leven. Return tickets, 2s.

Among the plants collected were the following :—

Hypericum pulchrum
Trifolium medium
Lotus major
Vicia Cracca
Vicia sepium
Rosa tomentosa
Saxifraga hypnoides
Sedum villosum

Drosera rotundifolia
Epilobium alsinifolium
Pimpinella Saxifraga
Galium saxatile
Scabiosa Succisa
Antennaria dioica
Achillea Ptarmica
Anthemis arvensis
Carduus heterophyllus
Crepis paludosa
Campanula rotundifolia
Vaccinium Vitis-Idæa
Linaria vulgaris
Scrophularia nodosa
Digitalis purpurea
Polygonum Persicaria
Rumex aquaticus
Euphorbia Helioscopia
Corylus Avellana
Empetrum nigrum
Listera cordata
Habenaria viridis
„ bifolia
„ chlorantha
Narthecium ossifragum
Juncus acutiflorus
Luzula multiflora, var. congesta
Triglochin palustre
Carex pauciflora
„ ovalis
„ pilulifera
„ binervis
„ flava
Agrostis pumila
Molinia cærulea
Cryptogramme crispa
Blechnum boreale
Cystopteris fragilis
Lastrea Oreopteris

Lochmaben.

Saturday, 15*th July* 1865.

Party of 44 met at the Caledonian Railway Station at 7.45 a.m. and proceeded to Lochmaben, which was reached about 11. Met Sir Wm. Jardine, the Rev. Dr. Liddell of Lochmaben, Dr. Gilchrist and friend from Dumfries, Dr. Grierson from Thornhill, and Mr. Gray from Dumfries. The Rev. Wm. Graham and the Rev. R. Colvin were in the party. Forty-four sat down to breakfast in John White's Commercial Hotel. Afterwards walked round Castle Loch to Bruce's Castle and then by Kirk Loch and Lochmaben. Railway tickets, 5s.; breakfast, 1s. 6d.

The following were among the plants collected :—

Ranunculus circinatus
„ reptans
„ Lingua
Nymphæa alba
Nuphar lutea
Corydalis claviculata
Viola palustris
Hypericum maculatum
„ pulchrum
Malva rotundifolia

Rubus suberectus
Sempervivum tectorum
Hippuris vulgaris
Myriophyllum spicatum
Callitriche autumnalis
Peplis Portula
Lythrum Salicaria
Cicuta virosa
Carum verticillatum
Sambucus Ebulus
Gnaphalium sylvaticum
Bidens cernua
„ tripartita
Senecio sylvaticus
„ erucifolius
„ aquaticus
Jasione montana
Vaccinium Oxycoccus
Andromeda polifolia
Myosotis cæspitosa
Veronica scutellata
Scutellaria galericulata
Stachys ambigua
Littorella lacustris
Myrica Gale
Typha angustifolia
Alisma Plantago
„ ranunculoides
Scirpus lacustris
Carex Œderi
Phalaris arundinacea
Asplenium Adiantum-nigrum
Chara flexilis

Aberfeldy and Ben Lawers.

Friday, 21st July 1865.

Party, consisting of John Archibald, J. H. Balfour, C. B. Black, James G. Black, M.A., T. L. Brunton, J. W. Burman, Alex. Craig Christie, Edward Clondsley, Robert P. Colvin, William Craig, Jas. H. Cunningham, John Drysdale, John K. Duncanson, James J. Fulton, Alexander Glendinning, George Low, William Boydell Lowe, John Murray, J. F. Naylor, Robert Pouget, Gilbert C. A. Stuart, James Thomson, G. A. Tibson, James Watters, George Waugh, and J. T. Wightman, met at the Edinburgh, Perth, and Dundee Railway Station at 1.10 p.m. and proceeded by train to Aberfeldy. Return ticket, 6s. 6d. Went to Mackenzie's Breadalbane Arms Inn. Visited the Falls of Moness, and gathered—

Campanula latifolia
Trientalis europæa
Melampyrum sylvaticum
Hymenophyllum Wilsoni
Asplenium viride

Took tea at the inn. Mr. Naylor, Mr. G. Stuart, Mr. R. Black, and Mr. Duncanson started in a drosky at 12 p.m., and pro-

ceeded to Ben Lawers to see the sun rise and to meet the remainder of the party in the morning.

Saturday, 22nd July 1865.

Party rose at 3 a.m., and at 4 proceeded by stage coach (holding twenty-two) to Lawers Inn. Botanised on Ben Lawers and returned to Lawers Inn about 2 p.m., whence they returned to Aberfeldy about 4. After tea returned by train at 4.40, reaching Edinburgh about 10 p.m. The weather was excellent, although very hot.

The following are some of the plants collected :—

Draba incana
„ rupestris
Cochlearia alpina
Silene acaulis
Cerastium alpinum
Sagina saxatilis
„ nivalis
Hypericum calycinum
Rubus saxatilis
„ Chamæmorus
Sibbaldia procumbens
Saxifraga oppositifolia
„ nivalis
„ stellaris
„ cernua
Epilobium alsinifolium
„ alpinum
Galium boreale
Gnaphalium sylvaticum
„ supinum
Carduus heterophyllus
Saussurea alpina
Apargia Taraxaci
Campanula latifolia
Trientalis europæa
Myosotis alpestris
Veronica humifusa
Calamintha Clinopodium
Polygonum viviparum
Oxyria reniformis
Salix Lapponum
„ herbacea
„ reticulata
Narthecium ossifragum
Tofieldia palustris
Juncus biglumis
„ triglumis
Luzula spicata
Carex dioica
„ rigida
Milium effusum
Aira alpina
Holcus mollis
Poa alpina
Hymenophyllum Wilsoni
Pteris aquilina
Cryptogramme crispa
Asplenium viride
„ Trichomanes
Polypodium alpestre
„ Phegopteris
Cystopteris fragilis
Polystichum Lonchitis
Botrychium Lunaria
Lycopodium Selago
„ clavatum
„ alpinum
„ selaginoides

Clova.

Wednesday, 2nd August 1865.

Party, consisting of J. H. Balfour, John K. Duncanson, W. R. M'Nab, F. Naylor, Gilbert C. A. Stuart, and M. Watson, met at the Edinburgh, Perth, and Dundee Railway Station on Wednesday, 2nd August, at 9.45 a.m., and proceeded to Kirriemuir. Return tickets, 7s. 6d. From Kirriemuir the whole party went in conveyances, leaving Kirriemuir about 3 and reaching Clova about 6 p.m. They were accommodated at Mr. Barnes' inn—the Ogilvy Arms.

Thursday, 3rd August 1865.

Started at 8 a.m. in two conveyances for Acharn (Robert Welsh). Thence walked up Glen Dole and by Jock's Road along the banks of the White Water to a point not far from Canness. Visited Little Gilrannoch, and returned by the Astragalus cliff and Glen Dole to Clova, which was reached about 7 p.m. The party intended to go to Canlochan, but they found the distance too great. All the ordinary alpine plants were collected, and among special plants were the following:—

Cochlearia officinalis
" alpina
Lychnis alpina
Cherleria sedoides
Sibbaldia procumbens
Dryas octopetala
Epilobium alsinifolium
" alpinum
Cornus suecica
Erigeron alpinus
Gnaphalium supinum
Mulgedium alpinum (in full flower, below the waterfall in a river not far from the Astragalus cliff)
Armeria maritima (alpine form)
Veronica alpina
Juncus castaneus
Carex aquatilis
" capillaris
Alopecurus alpinus
Phleum alpinum
Asplenium viride
Polypodium alpestre (in various states)

Friday, 4th August 1865.

At 8 a.m. the party started for Canlochan, carrying with them knapsacks and some provisions, with the intention of remaining at Canlochan during the night. They were compelled to do this on account of not being able to procure a man at Clova to take baggage and provisions over to Canlochan. The day being warm and sunny the progress of the party was much impeded by the load which they had to carry.

The party first went by cart to Acharn, thence they went to the *Malaxis* station and gathered the plant; next they went to Glen Fee, and picked *Oxytropis campestris*, *Arctostaphylos Uva-ursi*, *Galium pusillum*, and many alpine plants.

Went to the upper end of Glen Fee, and thus crossed by the table-land to Canness. Descended into the glen, and reached the sheiling at the foot of Canlochan. There was no one in it. The party deposited their baggage, along with tea, sugar, and butter, and then proceeded to botanise in Canlochan Glen. Went round the glen and examined specially the rocks at the upper part marked by the streaks of quartz. Among the plants gathered were *Carex vaginata*, *Juncus castaneus*, and *Mulgedium alpinum* in two places; in one there were seventy-seven specimens in full flower; in the other only one in flower.

Among other plants seen may be noticed :—

Dryas octopetala	Gentiana campestris (alpine form)
Potentilla alpestris	Veronica humifusa
Sibbaldia procumbens	„ alpina
Saxifraga nivalis	„ saxatilis
Erigeron alpinus	Juncus triglumis
Gentiana nivalis	Carex atrata

Returned to the sheiling about 8 p.m. Lighted a camp fire and cooked our evening meal. The night was cold, and the fire had to be kept up all night.

Saturday, 5th August 1865.

Rose at 5, made breakfast, and at 7 started for the rock of Canness. Several alpine plants were gathered, such as

Veronica alpina, *Poa alpina*, and *Polypodium alpestre* (in various forms). On reaching top of Canness, the party went by Little Gilrannoch to the head of Glen Dole, gathering *Lychnis alpina* and *Carex rariflora* near it, as well as at the head of Glen Dole. Mr. Stuart and Mr. Watson visited the Astragalus cliff, but failed to get the plant. All then proceeded by Glen Dole to Acharn, where they met the dogcart, which, however, broke down near Braedownie, and a cart was substituted. Reached Clova about 5 p.m. to dinner.

Monday, 7th August 1865.

About 9 a.m. party went to climb hill opposite the hotel, gathering *Tofieldia palustris*, *Lycopodium annotinum*, *Azalea procumbens*, and walked along top of the mountain towards Glen Fee, but did not find *Arctostaphylos alpina*.

Mist and rain came on. The weather was changeable—fair and sunny at one time and raining at another. Visited corrie at entrance of Glen Fee, also large corrie further up, and gathered *Carex vaginata*, *C. Vahlii*, *Salix Lapponum*, *Azalea procumbens*.

Failed to get *Carex Grahami*. Saw *Polypodium alpestre* and many alpine plants. Returned to Clova by cart from Acharn about 7.

Tuesday, 8th August 1865.

This morning at 9, Dr. Balfour, Messrs. Naylor, Stuart, and Duncanson left in a cart for Bachnagairn with the view of visiting Lochnagar. Mr. M'Nab and Mr. Watson went to Loch Brandy and gathered *Isoëtes lacustris*, *Subularia aquatica*, *Lobelia Dortmanna*, *Sparganium natans*, *Juncus supinus*, *var.*

The Lochnagar party visited the beautiful waterfall at Bachnagairn, and then walked across the hills to Glen Muick. Passing between Loch Muick and Dhu Loch, they ascended the hill and walked towards Lochnagar. Reached the top of the mountain before 3. Found a party there along with a game-keeper. Descended the ravine near the summit and botanised at the foot of the cliffs, and were rewarded with specimens of *Cerastium latifolium*, *Saxifraga rivularis*, *Aira alpina* (*vivi-*

parous), *Poa alpina*, *Cryptogramme crispa*, *Polypodium alpestre* (in various forms).

Rain descended heavily and continued to do so all the afternoon; the mist also was so thick that the party had to use a compass for their guidance. Ascended the mountain and proceeded along the road made lately for the Royal visitors to the Dhu Loch.

The walk back to Loch Muick was wet and dreary, then the party ascended the hill and reached the glen of the Esk about one mile above Bachnagairn, and had to proceed through wet woods beside the swollen and roaring Esk with its waterfalls. At the shooting-lodge of Mr. Donald Ogilvy they got some bread and cheese, and returned by the cart, amidst rain and mist, thoroughly drenched, to Clova, which was reached about 10 p.m. The journey was a long and fatiguing one. The view from Lochnagar was very fine; the party enjoyed it before the mist and rain came on.

Wednesday, 9th August 1865.

This morning, about 7, Mr. Naylor and Mr. Stuart went to Loch Brandy, bathed in it, and gathered the usual plants. All breakfasted together at 10 a.m. Day was dull, but no rain. All went to the cave near Braedownie, which was visited with lighted candles. A photograph was taken of the cave and the rocks around it. Dr. Balfour, Messrs. Stuart, Duncanson, and Watson crossed the Esk at Braedownie and visited Isabella Mackenzie, the woman without hands and feet. Gathered *Sparganium simplex* and *Gymnadenia albida.*

Returned to the inn at 5.30 p.m. for dinner. Arranged plants and packed up roots for Botanic Garden. The evening cleared and the moonlight was beautiful.

Thursday, 10*th August* 1865.

Breakfasted about 8 a.m., and Messrs. Naylor, Stuart, M'Nab, Watson, and Duncanson left in two dogcarts at 9 a.m. for Kirriemuir on their way to Edinburgh, whilst Dr. Balfour remained at Clova.

Wednesday, 16*th August* 1865.

Dr. Balfour and A. F. Balfour left the inn at Clova in order to visit the head of Glen Prosen. They walked up Glen Clova as far as the gamekeeper's house, and then ascended the mountain called Driesch, whence they walked by the head of Glen Fee to rocks at the head of Prosen. At the top of the glen there are two divisions, one to the east, nearest Glen Fee, and the other to the west. The latter seems to be the proper head of the glen, although the stream in the former is larger and seems to be more properly Prosen Water. Both of the small glens were visited; in that on the east all the ordinary alpine plants were gathered :—

Sibbaldia procumbens	Saxifraga oppositifolia
Saxifraga aizoides	Gnaphalium supinum
„ stellaris	Juncus triglumis

Large specimens of *Angelica sylvestris* and of *Valeriana officinalis* were seen in flower. On rocks on west of the glen there was abundance of *Carex vaginata* and *Saussurea alpina.* Few ferns in the glen. In the glen to the west, and specially on the rocks on its western side, there was great profusion of *Polystichum Lonchitis*, *Lastrea dilatata* in all its forms, *Lastrea spinulosa* and *Polypodium alpestre* in various forms. Looked for *Polypodium flexile*, but could not see any distinct specimens, although some varieties seemed to approach it. This little glen seems to be worthy of careful examination; the time allowed was too short. Returned to Clova in a direct line over the hills; a fatiguing walk.

Friday 18*th August* 1865.

On Craig Bruich, the saddle-backed mountain above Acharn, I gathered to-day :—

Saxifraga oppositifolia	Carex vaginata
Gnaphalium supinum	Polypodium alpestre (in forms)
Azalea procumbens	
Tofieldia palustris	

and the ordinary alpine plants.

EXCURSIONS IN 1866.

Ratho, Kirkliston, and Dalmeny Park.

Saturday, 12*th May* 1866.

Party of 92 met at the North British Railway Station (Waverley Bridge) at 11.30 a.m. Proceeded to Ratho, walked to Kirkliston and Dalmeny Park. Returned from Dalmeny Station by train at 5.55 p.m. Return tickets, 1s.

The following were among the plants collected :—

Anemone nemorosa
Cheiranthus Cheiri
Draba verna
Alliaria officinalis
Brassica Rapa
Lunaria biennis
Viola odorata
Oxalis Acetosella
Acer platanoides
Prunus domestica
Pyrus Malus
Saxifraga granulata
Ribes nigrum
Myrrhis odorata
Asperula odorata
Valerianella olitoria
Doronicum plantagineum
Primula caulescens
Vinca minor
Anchusa sempervirens
Omphalodes verna
Linaria Cymbalaria
Lamium amplexicaule
„ incisum
Polygonum Bistorta
Daphne Laureola
Carpinus Betulus
Listera ovata
Orchis mascula
Allium vineale
Lilium Martagon
Luzula sylvatica
Arum maculatum
Ophioglossum vulgatum

Some of the party visited Cramond Bridge and collected :—

Asplenium Adiantum-nigrum
Asplenium Ruta-muraria
Scolopendrium vulgare
Cystopteris fragilis

Burntisland and Aberdour.

Saturday, 26*th May* 1866.

Party of 110 met at Scotland Street Station at 9.45 a.m. and proceeded to Burntisland, thence walked to Aberdour by the

shore. Returned by boat leaving Burntisland 3.3 p.m. Return tickets, 1s.

The following were among the plants collected :—

Ranunculus auricomus
Berberis vulgaris
Fumaria pallidiflora
Cheiranthus Cheiri
Barbarea vulgaris
Sisymbrium Thalianum
Alliaria officinalis
Brassica campestris
Lepidium Draba
Thlaspi arvense
Reseda Luteola
Helianthemum vulgare
Viola tricolor
Silene maritima
Cerastium trigynum
Arenaria trinervia
Geranium sanguineum
" dissectum
Ilex Aquifolium
Anthyllis Vulneraria
Astragalus hypoglottis
Vicia hirsuta
Geum rivale
Fragaria elatior
Pyrus Malus
Saxifraga granulata
Ribes rubrum
Adoxa Moschatellina
Leontodon lævigatus
Armeria maritima
Glaux maritima
Anchusa sempervirens
Myosotis collina
Echium vulgare
Antirrhinum majus
Plantago Coronopus
Rumex sanguineus
" viridis
Daphne Laureola
Parietaria diffusa
Blysmus rufus
Carex distans
Asplenium Adiantum-nigrum
Botrychium Lunaria
Equisetum palustre
Exidia Auricula-Judæ

Some of the party visited Dunearn hill and collected :—

Viola lutea
Scutellaria galericulata
Salix repens
Lycopodium clavatum

Gorebridge, Arniston, Dalhousie.

Saturday, 2nd June 1866.

Party of 35 met at the Waverley Station at 12.30 p.m. Proceeded to Gorebridge, thence walked to Arniston and Dalhousie. Returned from Dalhousie at 7.17 p.m. Return tickets, 1s.

The following were among the plants collected :—

Aquilegia vulgaris
Aconitum Napellus
Berberis vulgaris
Barbarea vulgaris
Brassica campestris
Reseda Luteola
Stellaria nemorum
„ Holostea
Arenaria trinervia
Geranium sylvaticum
Oxalis Acetosella
Ilex Aquifolium
Euonymus europæus
Acer campestre
Sarothamnus scoparius
Prunus Avium
„ Padus
Rubus Idæus
Geum urbanum
„ intermedium
Potentilla Tormentilla
Pyrus Aucuparia
„ Malus
Saxifraga umbrosa
Chrysosplenium alternifolium
Ribes alpinum
„ rubrum
Ribes nigrum
Sanicula europæa
Scandix Pecten-veneris
Hedera Helix
Asperula odorata
Valeriana pyrenaica
Petasites vulgaris
Doronicum plantagineum
Vaccinium Myrtillus
Lysimachia nemorum
Ligustrum vulgare
Vinca minor
Symphytum tuberosum
Anchusa sempervirens
Pulmonaria officinalis
Myosotis sylvatica
Verbascum Thapsus
Veronica montana
Lathræa Squamaria
Buxus sempervirens
Allium ursinum
Carex pendula
„ paludosa
Milium effusum
Taxus baccata
Scolopendrium vulgare
Equisetum maximum

East Linton, Tynningham, Whitberry Point, Ravensheugh, Binny Woods.

Saturday, 9th June 1866.

Party of 66 met at the Waverley Station at 7 a.m. Proceeded to East Linton, visited Tynningham garden and grounds,

Whitberry Point, Ravensheugh and Binny Woods, returning to East Linton by the Rhododendron Walk. The party was accompanied by Dr. Crombie and a guide from Tynningham. Left East Linton for Edinburgh by the train passing at 3.10 p.m. Return tickets, 1s. 6d.

The following were among the plants gathered :—

Berberis vulgaris
Papaver dubium
„ Argemone
Cardamine amara
Sinapis alba
Viola hirta
Cerastium glomeratum
„ arvense
Sagina maritima
Malva rotundifolia
Geranium sanguineum
Conium maculatum
Anthriscus vulgaris
Cornus sanguinea
Sambucus laciniata
Lonicera Periclymenum
Doronicum Pardalianches
Leontodon palustris
Arbutus Unedo
Glaux maritima
Vinca major
Erythræa Centaurium
Cynoglossum officinale
Symphytum officinale
Lycopsis arvensis
Hyoscyamus niger
Rhinanthus Crista-galli
Plantago maritima
Chenopodium Bonus-Henricus
Salicornia herbacea
Rumex obtusifolius
Euphorbia Helioscopia
Parietaria diffusa
Neottia Nidus-avis
Listera ovata
Orchis latifolia
Ruscus aculeatus
Blysmus rufus
Nardus stricta
Asplenium Adiantum-nigrum
Lastrea Oreopteris
„ spinulosa
Ophioglossum vulgatum
Botrychium Lunaria
Equisetum palustre

Grant's House, Renton, Pease Dene, Pease Bridge, Cockburnspath.

Saturday, 16*th June* 1866.

Party of 74 met at the Waverley Station (N.B. Rail.) at 7 a.m. Proceeded to Grant's House, visited Renton, thence walked by

Pease Dene and Bridge to Cockburnspath. Returned by train passing Cockburnspath at 2.33 p.m. Return tickets, 2s. 6d. The party was accompanied by Mr. Hardy (Grant's House) and Professor Liston, Edinburgh.

The following were among the plants collected :—

Berberis vulgaris
Cerastium glomeratum
Malva rotundifolia
Geranium sylvaticum
Astragalus hypoglottis
Vicia Orobus
„ sylvatica
Rubus saxatilis
Ribes alpinum
Sanicula europæa
Scandix Pecten-veneris
Œnanthe crocata
Asperula odorata
Armeria maritima
Trientalis europæa
Veronica montana
Plantago maritima
Empetrum nigrum
Orchis maculata
Iris Pseudacorus
Triglochin palustre
Asplenium Adiantumnigrum
Ceterach officinarum (wall at Renton)
Scolopendrium vulgare
Polystichum angulare
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Blechnum boreale

Kincardine, Culross, Crombie Point, Charlestown, Limekilns.

Saturday, 23rd June 1866.

Party of about 70 met at Granton Pier at 8.30 a.m. Proceeded by Stirling steamer to Kincardine. Thence walked to Culross, Crombie Point, Charlestown, and Limekilns. Returned by boat passing Limekilns at 5.30 p.m.

The party was accompanied by Professor Liston, and Mr. Giles Munby from Algiers. Return tickets, 1s. 6d. Pier dues, 5d.

The following were among the plants collected :—

Ranunculus sceleratus
Chelidonium majus
Corydalis claviculata
Reseda Luteola
Sagina maritima
Lepigonum marinum
Malva rotundifolia
Geranium phæum
Acer campestre
Trifolium hybridum
„ procumbens
Vicia sativa
Drosera rotundifolia
Myriophyllum spicatum
Hydrocotyle vulgare
Helosciadium inundatum
Œnanthe crocata
Viburnum Opulus
Galium palustre
Dipsacus sylvestris
Tanacetum vulgare
Senecio sylvaticus
Carduus acanthoides
„ arvensis
„ setosus
Vinca major
Anchusa sempervirens
Myosotis cæspitosa
Lithospermum officinale
Echium vulgare
Lycium barbarum
Atropa Belladonna
Rhinanthus Crista-galli
Mentha viridis
Plantago maritima
„ Coronopus
Littorella lacustris
Atriplex littoralis
„ Babingtonii
Rumex conglomeratus
„ sanguineus
Corallorrhiza innata
Alisma Plantago
Triglochin maritimum
Scirpus maritimus
Carex paniculata
„ remota
„ curta
„ pallescens
„ lævigata
„ ampullacea
Alopecurus geniculatus
Milium effusum
Glyceria aquatica
Festuca arundinacea
Nardus stricta
Osmunda regalis
Hypnum giganteum

Dolphinton.

Saturday, 30*th June* 1866.

Party of about 63 met at the Waverley Station at 8 a.m. Proceeded to Dolphinton. Returned by train leaving Dolphinton at 2.20 p.m. Mr. Mackenzie of Dolphinton provided the party with luncheon. The party was joined by Mr. Munby, Mr. Brand, Mr. M'Nab, and Professor Liston. Return tickets, 1s. 9d.

The following were among the plants collected :—

Meconopsis cambrica
Cochlearia alpina
Viola lutea
Linum catharticum
Comarum palustre
Saxifraga Hirculus
Parnassia palustris
Sedum villosum
Drosera rotundifolia
Galium palustre
Valeriana dioica
Senecio aquaticus
Vaccinium Oxycoccus
Erica Tetralix
Pyrola minor
Primula farinosa
Myosotis palustris
Veronica scutellata
Pedicularis sylvatica
Pinguicula vulgaris
Galeopsis Tetrahit
Rumex aquaticus
Empetrum nigrum
Orchis incarnata
Juncus supinus
Luzula congesta
Triglochin palustre
Scirpus setaceus
Eriophorum vaginatum
„ polystachyon
„ latifolium
Carex pulicaris
„ disticha
„ paniculata
„ muricata
„ stellulata
„ curta
„ ovalis
„ glauca
„ præcox
„ panicea
„ fulva
„ flava
„ Œderi
„ ampullacea
Alopecurus geniculatus
Glyceria fluitans
Botrychium Lunaria
Equisetum limosum
Chara vulgaris
Hypnum cordifolium
„ nitens
„ aduncum
„ lycopodioides

Forteviot, Invermay Woods and Grounds.

Saturday, 7th July 1866.

Party of about 40 met at the Waverley Station at 6.15 a.m. and proceeded to Forteviot. Breakfasted at Station Hotel (Mr. W. Wood). Visited Invermay woods and grounds. Party was joined by Dr. Laing and his son, Dr. Lauder Lindsay, Dr. Alex. Dickson, Dr. Traquair. Entertained to lunch at Invermay woods by Mr. and Mrs. Brown Douglas—the former accompanied the party during the day. Sheriff Jamieson also joined the

party at lunch. Returned by train passing Forteviot at 4.32 p.m. Return tickets, 4s. Breakfast, 1s. 6d. Some of the party visited Scone.

The following were among the plants collected :—

Ranunculus hirsutus
Papaver Argemone
Corydalis lutea (near Perth)
Hesperis matronalis
Iberis amara
Cerastium glomeratum
" arvense
Stellaria nemorum
Lepigonum rubrum
Hypericum hirsutum
Geranium sylvaticum
Trifolium medium
" strictum
" hybridum
Anthyllis Vulneraria
Astragalus hypoglottis
Vicia sylvatica
Rubus saxatilis
Potentilla reptans
Chrysosplenium alternifolium
Circæa lutetiana
Sanicula europæa
Viburnum Opulus
Lonicera Caprifolium
Galium Mollugo
Asperula odorata
Filago germanica
Senecio aquaticus
Carduus tenuiflorus
Pyrola minor
Moneses grandiflora (Scone woods)
Trientalis europæa (Scone woods)
Ligustrum vulgare
Vinca minor
Polemonium cæruleum
Myosotis palustris
Veronica montana
Melampyrum pratense
Stachys Betonica
Lamium amplexicaule
Polygonum Bistorta
Neottia Nidus-avis
Listera ovata
Iris Pseudacorus
Juncus glaucus
Koeleria cristata
Asplenium Adiantum-nigrum
Scolopendrium vulgare
Cystopteris fragilis
Polystichum angulare
Polypodium Dryopteris
Botrychium Lunaria
Equisetum umbrosum
Sticta pulmonaria

Beattock, Garpol Linn.

Saturday, 14*th July* 1866.

Party of 40 met at the Caledonian Railway Station at 7.40 a.m. Proceeded to Beattock. Breakfasted at Beattock Bridge Hotel

(Sinclair's). Visited Garpol Linn and hills beyond. The party was accompanied by Sir William and Miss Jardine, Miss Gould, Rev. Mr. Colvin, Kirkpatrick; Rev. Mr. Williamson, Moffat; Mr. William Carruthers (British Museum), Dr. Dickson, Dr. Traquair, Dr. Grainger-Stewart, Professor Liston. Returned by train leaving Beattock at 5.2 p.m. Return tickets, 4s. Breakfast, 1s. 6d.

The following were among the plants collected :—

Viola palustris
Lepigonum rubrum
Hypericum humifusum
" pulchrum
Geranium sylvaticum
Genista tinctoria
Trifolium arvense
Astragalus hypoglottis
Rubus saxatilis
Drosera rotundifolia
Epilobium palustre
Hydrocotyle vulgaris
Sanicula europæa
Antennaria dioica
Apargia autumnalis
Jasione montana
Vaccinium Oxycoccus
Pyrola minor
Myosotis repens
Verbascum Thapsus
Veronica montana
Pinguicula vulgaris
Myrica Gale
Empetrum nigrum
Listera cordata
Orchis maculata
Gymnadenia conopsea
Narthecium ossifragum
Juncus acutiflorus
Carex pulicaris
" lævigata
" binervis
Holcus mollis
Melica nutans
" uniflora
Cryptogramme crispa
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
" Phegopteris
Botrychium Lunaria
Lycopodium clavatum
" alpinum

Some of the party proceeded to Beattock on Friday afternoon and visited Beld Crag and the hills in Moffatdale, and collected:—

Saxifraga stellaris
Sedum Rhodiola
Pyrola secunda
Asplenium viride

Rothesay, Ascog, Mount Stuart.

Saturday, 21st July 1866.

Party of about 50 met at the Edinburgh and Glasgow Railway Station at 6.15 a.m. Proceeded to Rothesay, walked to Ascog

and Mount Stuart. Returned by boat passing Rothesay at 4.40 p.m., and reached Edinburgh about 10.15 p.m. Return tickets, 5s. Breakfast on board, 1s. 6d. Pier at Helensburgh, 1d.

Party accompanied by Dr. Dickson, Dr. Traquair, Professor Liston, Mr. Lowe, and several ladies.

The following plants were collected :—

Chelidonium majus
Sinapis alba
Sagina nodosa
Hypericum Androsæmum
" humifusum
" pulchrum
Linum usitatissimum
Rubus carpinifolius
Potentilla Tormentilla
" procumbens
Cotyledon Umbilicus
Sedum angulare
Lythrum Salicaria
Epilobium hirsutum
Helosciadium inundatum
Œnanthe Lachenalii
Pastinaca sativa
Torilis Anthriscus
Eupatorium cannabinum
Jasione montana
Lysimachia vulgaris
Erythræa Centaurium
Symphytum officinale
Pinguicula lusitanica
Stachys ambigua
Polygonum lapathifolium
Habenaria viridis
" chlorantha
Juncus Gerardi
" maritimus
" acutiflorus
Sparganium ramosum
Alisma Plantago
" ranunculoides
Blysmus rufus
Carex distans
" extensa
Asplenium Adiantumnigrum
Lastrea Oreopteris
" æmula (Fœnisecii)
Polypodium Phegopteris
Chara flexilis
Sticta scrobiculata
" pulmonaria
Parmelia perlata

Loch Lomond, Inverarnan, Ben Voirlich.

Friday, 27th July 1866.

Party, consisting of J. H. Balfour, John Archibald, W. H. Carruthers, Alex. Craig Christie, Rev. R. F. Colvin, William Craig, Walter Dixon, John K. Duncanson, James W. Edmond, Alexander Irvine, Alexander E. Keith, William John Kennedy, Professor D. Liston, James H. Lowe, J. R. Marrian, Wm.

Stephen Mitchell, F. Naylor, John Wilson Paton, V. R. Prankerd, Andrea Rabagliati, James Richardson, John Sadler, Wm. Stokes Shaw, Francis E. Smart, J. Stiell, James Watters, J. T. Wightman, met at the Waverley Station at 2 p.m. on Friday, 27th, and proceeded to head of Loch Lomond *viâ* Balloch, thence walked to Inverarnan Hotel, which was reached about 9 o'clock. Some of the party (Messrs. Sadler, Duncanson, Smart, Mitchell, Edmond, Dixon, and Craig), left the steamer in the evening at Tarbet, and walked to Inverarnan. Slept at the hotel. Return tickets, 5s. 5d. Hotel and other expenses, 10s. 6d.

Saturday, 28th July 1866.

Breakfasted at 6 a.m. and started for Ben Voirlich about 7. Returned to head of loch about 4 p.m. Left head of loch about 4.20, and reached Edinburgh about 10 p.m.

The following were among the plants collected :—

Thalictrum alpinum
Corydalis claviculata
Cochlearia alpina
Hypericum Androsæmum
Rubus saxatilis
Alchemilla alpina
Saxifraga oppositifolia
" stellaris
" aizoides
Sedum Rhodiola
Drosera anglica
Peplis Portula
Lythrum Salicaria
Epilobium alpinum
Carum verticillatum
Cornus suecica
Galium boreale
Solidago Virgaurea
Gnaphalium supinum
Carduus heterophyllus
Saussurea alpina
Hieracium Lawsoni
Lobelia Dortmanna
Vaccinium uliginosum
Euphrasia officinalis, var. alpina
Plantago maritima
Littorella lacustris
Oxyria reniformis
Myrica Gale
Salix venulosa
" herbacea
Empetrum nigrum
Malaxis paludosa
Listera cordata
Juncus trifidus
" triglumis
Luzula spicata
Rhynchospora alba
Carex rigida
" vaginata
Hymenophyllum tunbridgense
" Wilsoni
Cryptogramme crispa
Blechnum boreale

Asplenium viride
Cystopteris fragilis
Lastrea Oreopteris
„ æmula
Polypodium Dryopteris
„ Phegopteris
Osmunda regalis
Lycopodium Selago
„ annotinum
„ clavatum
„ alpinum
„ selaginoides

besides many alpine Musci and Lichens.

Braemar

Friday, 3rd August 1866.

Party, consisting of J. H. Balfour, Thomas Barclay, Robert P. Colvin, Alfred T. Coore, Walter Dixon, P. Neill Fraser, F. Naylor, Orlando R. Prankerd, Wm. Stokes Shaw, Francis G. Smart, and James Thomson, met at the Scotland Street Station of the N.B. Railway, and proceeded by train at 6.25 a.m. to Perth and Aberdeen—having return tickets to Aberdeen available for three weeks for 12s. 6d. Reached Aberdeen at 12.35 p.m., and met Professors Struthers and Dickie, who, after lunch, proceeded with us to see the town and Marischal College. Had a fine view from the tower of the College; the arrangements in the College are excellent. Saw the hall, library, examination room, and Anatomical and Natural History lecture rooms. Left by train at 2.40 for Aboyne. Return ticket, available for three weeks, 2s. Reached Aboyne at 4.49. Took up our quarters at the hotel (Cook's). The evening being fine, we visited the Suspension Bridge and the grounds about Aboyne Castle. Gathered *Campanula rapunculoides* on the roadside. It was in considerable quantity. Had tea-dinner on return.

Saturday, 4th August 1866.

After breakfast, left about 8 a.m. in an omnibus for Ballater. Gathered *Melampyrum sylvaticum* there, then went by hired omnibus to Balmoral and visited the grounds under the direction of Mr. Paterson, the gardener. Then proceeded to Braemar, and took up our quarters at the Fife Arms Hotel (Hunter).

Were all comfortably accommodated. Afternoon was very wet and windy, and we were prevented from walking. I ascertained one important fact to-day—that there was no smoking man in the party. The day became windy and wet.

Monday, 6th August 1866.

Breakfasted at 7 a.m., and about 8 left by drag for Glen Callater. Went to the gamekeeper's house (Michie), then examined the glen, beginning with rocks on the left side of the glen immediately at the south end of Loch Callater, and then walked round all the rocks in the glen and in Glen Kandor, returning to the gamekeeper's house about 5, where we met the drag and returned to inn about 6 p.m. The day was very wet, and we were all thoroughly drenched.

We gathered many good plants. Among others :—

Silene acaulis
Rubus saxatilis
„ Chamæmorus
Sibbaldia procumbens
Saxifraga oppositifolia
„ hypnoides
Epilobium angustifolium
„ alsinifolium
„ alpinum
Gnaphalium supinum
Saussurea alpina
Azalea procumbens
Pyrola media
Veronica humifusa
„ alpina
Salix arbutifolia
Salix Lapponum
„ Myrsinites
„ herbacea
„ reticulata
Habenaria viridis
Tofieldia palustris
Juncus trifidus
„ triglumis
Carex rupestris
„ rigida
„ vaginata
„ capillaris
Cryptogramme crispa
Asplenium viride
Polypodium alpestre
Polystichum Lonchitis

Mr. Banley joined the party to-day. He arrived by coach from Ballater.

Tuesday, 7th August 1866.

The day was very wet and unpromising. Party, consisting of Dr. Balfour and Messrs. Fraser, Coore and Dixon, proceeded to the Falls of Corriemulzie and to the Linn of Dee, and returned by Mr. Gray Clark's Allanagavit, crossing the Dee in his boat.

At Corriemulzie they gathered :—

Arabis petræa (in the gravelly bed of the stream near Allanagavit)
Epilobium angustifolium
Carduus heterophyllus
Melica nutans
Poa nemoralis
Triticum caninum (near Allanagavit)

Wednesday, 8th August 1866.

Rev. Mr. Shaw left this morning for England. The morning was fine and sunny. Party numbering eight left at 7.45 a.m., and crossed in Angus Macintosh's boat, as the ferry has been abolished by Colonel Farquharson. Macintosh is head-keeper to Lord Holmesdale, who has the Ben Avon shootings. From the point where we crossed the river we walked to Little Craigendal, taking two turns to the right on the Ben-na-Bourd road. Found abundance of *Astragalus alpinus* low down on the west side of the hill. Plenty of it in flower. Examined the hill fully, and then descended on the Ben Avon side. Went up to the natural cairns of Ben Avon; on one we ascended there is a large rocking-stone. From Ben Avon walked to Ben-na-Bourd and descended into the glen, walked by the river to Angus Macintosh's, and reached the hotel about 6.30. Mr. Naylor and Mr. Prankerd reached Braemar to-day, thus making our party ten.

A letter was received from Dickie as to *Cystopteris montana*. He says that Croall found it on the south side of Glen Callater under large rocks below the cliffs. It was also found by Dr. Ogilvy on rocks at head of Canlochan below table-land leading to Glen Callater.

Among the plants collected to-day were the following :—

Cerastium alpinum
Astragalus alpinus
Epilobium alsinifolium
" alpinum
Meum athamanticum
Cornus suecica
Gnaphalium supinum
Saussurea alpina
Pyrola secunda
Armeria maritima
Armeria alpina
Trientalis europæa (in flower)
Tofieldia palustris
Aira cæspitosa (alpine form)
Polypodium alpestre (various forms)
Lycopodium annotinum
Equisetum umbrosum

Thursday, 9th August 1866.

This morning the party, with the exception of Mr. Barclay, proceeded at 8 a.m. by car to the back of Canlochan, ascended the hill, and spent all day in the glen.

The following plants were gathered :—

Cochlearia grœnlandica
Silene acaulis
Cerastium alpinum
Potentilla maculata
Sibbaldia procumbens
Saxifraga nivalis
„ hypnoides
Epilobium alsinifolium
„ alpinum
Erigeron alpinus
Mulgedium alpinum
Gentiana nivalis
Veronica humifusa
„ alpina
Veronica saxatilis (in flower)
Juncus castaneus
„ triglumis
Carex Persoonii
„ atrata
„ rariflora
„ vaginata
„ capillaris
Alopecurus alpinus
Phleum alpinum
Aira alpina
Poa alpina
„ Balfourii

The day was fine with the exception of about half an hour, when a severe storm, accompanied with mist, came on. The party returned by car, which met them at 5 p.m.

Friday, 10th August 1866.

The morning was rather promising. The party went to Lochnagar, leaving at 8 a.m. by car for Callater, and then walking. Had a fine view as they ascended, and saw the summit of the mountain clear, but before they reached it rain and mist came on and continued all day. Examined cliffs round the little loch to the west of Lochnagar. Abundance of snow seen, many feet deep, some patches several hundred feet in extent. Had a glissade of 100 feet on the snow. Went to top of the mountain. Descended by ravine so as to get *Saxifraga rivularis*. Went along part of the cliffs and ascended by a gravelly ravine, thence returned amidst mist, sleet, and wind to the lower cairns. From this the party (consisting at this time of Dr. Balfour, Coore, Prankerd, Dixon, and Thomson) descended to the keeper's lodge

at Callater to meet the car and get a change of clothes. Mr. Fraser spent the whole day at Glen Callater looking for *Cystopteris montana*, but was unsuccessful. Mr. Colvin, Mr. Barclay, and Mr. Stuart returned early. Mr. Naylor lost his way in the mist and did not reach the hotel till late, having walked by the Invercauld side of the mountain. Among the plants collected to-day were :—

Cerastium alpinum	Aira alpina vivipara
Saxifraga rivularis	Poa alpina vivipara
Alopecurus alpinus	Cryptogramme crispa
Phleum alpinum	Polypodium alpestre

Looked at the old station for *Mulgedium alpinum*, but could not see any specimens of the plant. The day was one of the wettest and coldest we had experienced during our trip. Thermometer on summit, 38°.

Saturday, 11*th August* 1866.

This morning was very fine. Mr. Colvin and Mr. Banley left for Edinburgh, by Blairgowrie, along with Dr. Burton of Walsall. The rest of the party (eight in number) left by drag for Linn of Dee, and proceeded beyond it as far as the twopenny bridge over the Dee. Thence walked to Cairn Toul. The day was warm and sunny and the walk was fatiguing. Owing to the swollen state of the streams we had to ford one of them which joins the Dee about two miles from Cairn Toul. Mr. Prankerd went to the top of Ben na Mac Dhu. The rest went to Cairn Toul. We did not return from Cairn Toul until 10 p.m., having walked some twenty-two miles and driven above twenty.

Among the plants gathered were :—

Arabis petræa	Luzula arcuata
Cochlearia grœnlandica	Carex pauciflora
Silene acaulis	„ lagopina
Cerastium alpinum	Aira alpina vivipara
„ trigynum	Poa alpina vivipara
Sibbaldia procumbens (in flower)	Cryptogramme crispa
Drosera anglica	Polypodium alpestre

Monday, 13*th August* 1866.

This day the party broke up. At 9 a.m. most of them left by conveyance for Blairgowrie and Coupar Angus, which they left at 3.5 p.m. for Perth, and then by train at 4.10 for Edinburgh, which was reached about 7 p.m. Mr. Fraser went with the party as far as Glen Callater road, and proceeded to the glen to endeavour to find *Cystopteris montana*.

EXCURSIONS IN 1867.

Roslin, Polton, and Hawthornden.

Saturday, 18*th May* 1867.

Party of 85 met at the North British Railway Station at 10.50 a.m. Proceeded to Roslin, thence walked to Hawthornden and Polton. Returned from Hawthornden at 3.17 p.m. Return tickets, 1s. 2d.

Among the plants collected were the following :—

Anemone nemorosa
Ranunculus auricomus
Caltha palustris
Cheiranthus Cheiri
Cardamine pratensis
Draba verna
Alliaria officinalis
Viola sylvatica
Cerastium glomeratum
" trigynum
Stellaria Holostea
Arenaria trinervia
Oxalis Acetosella
Lathyrus macrorrhizus
Prunus Padus
" Avium
Geum rivale
" intermedium
Fragaria vesca
Pyrus Malus
Saxifraga granulata
Chrysosplenium alternifolium
Ribes nigrum
Sanicula europæa
Myrrhis odorata
Adoxa Moschatellina
Asperula odorata
Petasites fragrans
Leontodon palustris
Myosotis sylvatica
Veronica montana
Nepeta Glechoma
Allium ursinum
Equisetum maximum
" hyemale

Burntisland and Kinghorn.

Saturday, 25*th May* 1867.

A party of 86 met at Scotland Street Station at 9.45 a.m. and proceeded to Kinghorn. Walked along the coast to Burntisland and returned to Edinburgh by boat leaving Burntisland at 3.3 p.m. Return tickets, 1s. 1d. Day fine.

The following were among the plants collected :—

Papaver Argemone
Cheiranthus Cheiri
Barbarea vulgaris
Arabis hirsuta
Alyssum calycinum
Draba verna
Cochlearia danica
Armoracia rusticana
Sisymbrium Thalianum
Sinapis alba
Lepidium Draba
Viola hirta
„ canina
Cerastium arvense
Vicia hirsuta
„ lathyroides
Fragaria elatior
Saxifraga umbrosa
Carum Carui
Haloscias scoticum
Centranthus ruber
Leontodon palustris
Veronica agrestis
Salvia Verbenaca
Lamium amplexicaule
„ incisum
Plantago maritima
„ Coronopus
Orchis mascula
Botrychium Lunaria

Gorebridge, Borthwick Castle, and Tynehead.

Saturday, 1*st June* 1867.

A party met at the Waverley Station at 12.30 p.m. and proceeded to Gorebridge, thence walked by Borthwick Castle to Tynehead. Returned from Tynehead by train passing at 6.55 p.m. Return tickets, 1s. 2d. Day fine, very hot.

The following were among the plants collected :—

Cardamine amara
Cerastium arvense
Montia fontana
Geranium phæum
„ sylvaticum
Linum catharticum
Genista anglica
Vicia sativa
Geum intermedium
Fragaria elatior
Saxifraga hypnoides
Ribes nigrum
Myrrhis odorata
Viburnum Lantana
Antennaria dioica
Pyrola minor
Vinca minor
Menyanthes trifoliata
Anchusa sempervirens
Veronica agrestis
Humulus Lupulus
Alnus glutinosa
Empetrum nigrum
Neottia Nidus-avis
Orchis mascula
Luzula sylvatica
„ multiflora
„ congesta
Arum maculatum
Eriophorum polystachyon
Juniperus communis
Scolopendrium vulgare
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Ophioglossum vulgatum
Equisetum palustre
„ limosum
Lycopodium clavatum

Midcalder, Meadowbank, Dalmahoy, and Currie.

Saturday, 8th June 1867.

A party of 75 met at the Caledonian Railway Station, Lothian Road, at 10.20 a.m. and proceeded to Midcalder, thence walked by Meadowbank and Dalmahoy to Currie. Returned by train passing Currie at 3.13 p.m. Return tickets, 1s.

During the day, which was wet, the following plants were collected :—

Aquilegia vulgaris
Aconitum Napellus
Cardamine pratensis (double)
Viola palustris
„ canina
„ lutea
Sagina subulata
Geranium columbinum
„ lucidum
Prunus Padus
Pyrus Malus
Saxifraga hypnoides

Myriophyllum spicatum
Cornus sanguinea
Galium Mollugo
Valeriana pyrenaica
Antennaria dioica
Leontodon lævigatus
Pyrola minor
Pedicularis sylvatica
Pinguicula vulgaris
Chenopodium Bonus-Henricus
Populus tremula
Empetrum nigrum
Anacharis Alsinastrum
Listera ovata
Lastrea spinulosa

Many good lichens were gathered on Dalmahoy Hill.

St. Andrews, Denbrae, and Tentsmuir.

Saturday, 15*th June* 1867.

Party of 81 met at Scotland Street Station at 6.25 a.m. and proceeded to St. Andrews. Breakfasted in Davidson's Royal Hotel there. After breakfast visited the old Castle and Pier, thence walked to Denbrae, where the party were served with luncheon by the proprietor, Dr. Watson Wemyss. Returned to St. Andrews by the Links. At breakfast we were joined by Mr. Jas. G. Black, who acted as guide during the day. Dr. Watson Wemyss, Professor Oswald Bell, Professor Fisher, Dr. William Traill and Mr. Traill, Mr. Howie (Largo), Rev. Mr. Astley (Edinburgh), Dr. White (Edinburgh). Return tickets, 3s. 3d. Breakfast, 1s. 9d.

The following were among the plants collected :—

Aquilegia vulgaris
Alyssum calycinum
Cerastium arvense
Geranium sanguineum
Astragalus hypoglottis
Saxifraga umbrosa
„ tridactylites
Glaux maritima
Scrophularia aquatica
Scleranthus annuus
Listera ovata
Convallaria majalis
Koeleria cristata
Elymus arenarius
Botrychium Lunaria

Some of the party visited Tentsmuir and collected :—

Mimulus luteus
Euphorbia Esula
Listera cordata
Carex incurva
Lycopodium inundatum
besides many interesting and rare Musci.

Others visited the rocks by the sea-shore east of the town and picked *Asplenium marinum*.

Perth, Kinnoul, Orchardneuk, Moncrieff, Bridge of Earn.

Saturday, 22nd June 1867.

Party of 70 left Scotland Street Station at 6.20 a.m. and proceeded to Perth. Breakfasted in the Station Refreshment Rooms (M'Donald's). Visited Kinnoul, ferried the Tay to Orchardneuk, visited Moncrieff, and walked to Bridge of Earn, which they left for Edinburgh by the train passing at 4.20, and arrived in Edinburgh about 7.15. At Perth the party were joined by Dr. Lauder Lindsay, Dr. Stirling, Dr. Bramwell, Mr. John Sim, Mr. Ramsay, Mr. M'Farlane, Mr. Stewart, and Mr. Dawson, who acted as guide, and who also furnished refreshments in the way of beer at Orchardneuk. Return tickets, 3s. 6d. Breakfast, 1s. 6d. Ferry, 2d.

The day was fine and many good plants were collected, including :—

Ranunculus hirsutus
Chelidonium majus
Cheiranthus Cheiri
Hesperis matronalis
Helianthemum vulgare
Viola canina
Silene maritima
Sagina subulata
Malva moschata
Geranium sanguineum
„ phæum
„ pyrenaicum
„ columbinum
Erodium cicutarium
Trifolium striatum
Anthyllis Vulneraria
Astragalus hypoglottis
Potentilla argentea
„ hirta
Poterium Sanguisorba
Rosa alpina
Sedum Telephium
„ reflexum
Hippuris vulgaris
Conium maculatum
Petroselinum sativum

Cornus sanguinea
Asperula odorata
Lactuca virosa
Cynoglossum officinale
Anchusa sempervirens
Myosotis cæspitosa
Echium vulgare
Antirrhinum majus
Veronica agrestis
Rhinanthus Crista-galli
Chenopodium Bonus-Henricus
Anacharis Alsinastrum
Listera ovata
Alisma Plantago
Koeleria cristata
Pinus sylvestris
Ceterach officinarum

Mr. Christie, who visited Scone Woods, picked :—

Moneses grandiflora
Trientalis europæa
Corallorrhiza innata
Listera cordata
Lastrea spinulosa

Burntisland, Kirkcaldy, Raith, Balmuto, Auchtertool.

Saturday, 29th June 1867.

Party of 63 left Scotland Street Station at 6.20 a.m. and proceeded to Kirkcaldy, where they were provided with breakfast in the Town Hall by Provost Swan. After breakfast, they botanised over the estate of Raith (the seat of Col. Ferguson). They returned by train passing Kirkcaldy at 2.46 p.m. Return tickets, 1s. 2d.

The following were among the plants collected :—

Ranunculus hederaceus
Aconitum Napellus
Berberis vulgaris
Nuphar luteum
Meconopsis cambrica (Auchtertool)
Potentilla fruticosa
Valeriana pyrenaica
Doronicum Pardalianches
Tragopogon porrifolius (Cupar)
Anchusa sempervirens
Rumex sanguineus
Daphne Laureola
Salix purpurea
Ruscus aculeatus
Typha latifolia
Lemna minor
Cystopteris fragilis

Some of the party proceeded to Balmuto and Auchtertool and collected :—

Meconopsis cambrica	Ophioglossum vulgatum
Gymnadenia conopsea	

Others visited Burntisland and collected :—

Lepidium Draba	Sedum anglicum
Thlaspi arvense	Carduus Marianus
Geranium sanguineum	Echium vulgare
Trifolium striatum	Sclerochloa loliacea

Mr. Barclay (Cupar), Dr. Stodart (Kirkcaldy), Mr. Douglas, and other gentlemen joined the party at breakfast.

Linlithgow, Hiltly, Cuckold le Roi, Kipps, Lochcote, the Avon, Woodcockdale.

Saturday, 6th July 1867.

Party of 45 left the Waverley Station at 9.45 a.m. for Linlithgow. They visited the Castle and then proceeded by Hiltly to the hill called Cuckold le Roi (Cockle Roy), thence to Kipps, Lochcote, the banks of the Avon, and Woodcockdale. The party returned by train leaving Linlithgow at 2.6 p.m. Return tickets, 1s. 3d.

The following plants were collected :—

Nasturtium palustre	Gymnadenia conopsea
Hieracium prenanthoides	Habenaria viridis
Pyrola minor	„ chlorantha
Lysimachia thyrsiflora	Allium Schœnoprasum
Veronica scutellata	Potamogeton perfoliatus
Anacharis Alsinastrum	„ pusillus
Epipactis latifolia	

Heriot, Borthwick Hall, Camp Hill, Moorfoot Hills, Green Neck, Gorebridge.

Saturday, 13*th July* 1867.

A party of 60 left Edinburgh at 6.40 a.m. for Heriot, thence they walked to Borthwick Hall, where they were met by Charles Lawson, Esq., and M. Vilmorin, from Paris. They were entertained to breakfast in a large tent on the lawn. After breakfast they visited the Camp Hill, &c., and returned to Borthwick Hall to lunch at one o'clock. Charles Lawson, sen., occupied the chair and gave the party a most hearty welcome. Lunch finished, they then proceeded across the Moorfoot Hills by the Green Neck to Gorebridge, which they left for Edinburgh by train at 7.8 p.m. Return tickets, 1s. 3d.

The day was fine, and a good many plants were collected, such as :—

Ranunculus hederaceus
Trollius europæus
Camelina fœtida
Viola lutea
Montia fontana
Tilia grandiflora
Parnassia palustris
Sedum villosum
Epilobium angustfolium
Listera cordata
Allosorus crispus

North Berwick, Dirleton, Gullan.

Saturday, 20*th July* 1867.

A party of about 40 left the Waverley Station for Dirleton at 10.30 a.m. They visited Dirleton Castle and Common, thence proceeded to North Berwick, where they were entertained to lunch by Mr. Stevenson, and left for Edinburgh by train at 6.40 p.m. The party was accompanied by Professor Liston, Professor Alex. Dickson, and Dr. Traquair.

The day was fine, and many good plants were collected, including :—

Thalictrum minus
Ranunculus floribundus
Fumaria micrantha
Alyssum calycinum
Reseda lutea
Dianthus deltoides
Silene noctiflora
Sagina nodosa
Geranium pusillum
Trifolium incarnatum
Astragalus hypoglottis
Saxifraga tridactylites
Parnassia palustris
Sedum album
Hydrocotyle vulgaris
Smyrnium Olusatrum
Helosciadium repens
Centranthus ruber
Scabiosa Columbaria
Filago germanica
„ minima
Carduus acanthoides
Centaurea Scabiosa
„ Cyanus
Thrincia hirta
Apargia autumnalis
Tragopogon minor
Anagallis tenella
Erythræa Centaurium
Gentiana campestris
Cynoglossum officinale
Lithospermum arvense
Echium vulgare
Solanum Dulcamara
Hyoscyamus niger
Antirrhinum majus
Veronica polita
„ Anagallis
Euphrasia Odontites
Calamintha Acinos
Stachys sylvatica
Galeopsis versicolor
Lamium intermedium
Ballota fœtida
Habenaria viridis
Apera interrupta (new to the flora, on the way to Dirleton Common in great profusion)
Psamma arenaria
Equisetum variegatum
Lycopodium selaginoides

Mr. Dickson and Mr. Christie visited Gullan, and picked :—

Silene anglica
Cerastium arvense
Malva rotundifolia
Samolus Valerandi
Littorella lacustris

Callander, Loch Lubnaig, Ben Ledi, Stank Burn.

Saturday, 27th July 1867.

Party of 45 left the Waverley Station at 6.15 a.m. and proceeded to Callander. Breakfasted there in the Dreadnought

Hotel, visited Loch Lubnaig and Ben Ledi by the Stank Burn, and returned to Callander about 6 p.m. Partook of tea in Macgregor's Hotel, and left Callander at 7.20 for Edinburgh, which they reached about 10 o'clock. The day was fine and a magnificent view was obtained from the top of Ben Ledi. The party was accompanied by Dr. Lauder Lindsay, Dr. Clay, the Rev. Mr. Colvin, &c.

The following plants were collected :—

Thalictrum alpinum
Nymphæa alba
Draba incana
Subularia aquatica
Silene acaulis
Hypericum Androsæmum
Vicia sylvatica
Rubus Chamæmorus
Saxifraga oppositifolia
" nivalis
" stellaris
" hypnoides
Sedum Rhodiola
" Telephium
" reflexum
Pimpinella magna
Cornus suecica
Gnaphalium supinum
Hieracium boreale
Lobelia Dortmanna
Vaccinium Oxycoccus
Littorella lacustris
(Loch Lubnaig)
Polygonum viviparum
Oxyria reniformis
Rumex alpinus
Salix herbacea
Malaxis paludosa
Listera cordata
Habenaria chlorantha
Juncus biglumis
" triglumis
Luzula spicata
Carex rigida
" irrigua
" vaginata
Hymenophyllum Wilsoni
Allosorus crispus
Asplenium viride
Lycopodium Selago
" alpinum
Isoëtes lacustris
Splachnum ampullaceum
" mnioides

Dalwhinnie.

Monday, 5th August 1867.

Party consisting of J. H. Balfour, Charles P. Astley, Alex. Craig Christie, Robert P. Colvin, Alfred Coore, Walter Dixon,

Jas. W. Edmond, P. Neill Fraser, Arthur Abbott Green, Thomas Jackson, W. John Kennedy, W. L. Lindsay, left Edinburgh on Monday, 5th August, at 9.45 for Perth and Dalwhinnie. Return tickets, available for fourteen days, 8s.

Reached Dalwhinnie between 3 and 4 p.m., where they met Dr. Lauder Lindsay. In the course of the evening the following plants were gathered near Dalwhinnie :—

Genista anglica
Pyrola secunda
Utricularia minor
Rumex aquaticus
Cryptogramme crispa

Tuesday, 6th August 1867.

Party started at 10.8 a.m. for Dalnaspidal by train, ascended the Sow of Athole and also visited the Boar of Badenoch. Among the plants collected were :—

Rubus Chamæmorus
Sibbaldia procumbens
Epilobium alpinum
Gnaphalium supinum
Hieracium alpinum
" Lawsoni
Vaccinium Vitis-Idæa
Arctostaphylos Uva-ursi
Phyllodoce cærulea (some large plants were seen)
Azalea procumbens
Listera cordata
Carex rigida
Cryptogramme crispa
Lycopodium Selago
" clavatum
" alpinum
" selaginoides

There was a fine view from the summit of the mountain.

The Boar of Badenoch was found to be much less productive than the Sow of Athole. In the evening there was some rain. The party walked back to the hotel by the road from Dalnaspidal.

Wednesday, 7th August 1867.

This morning the members of the party rose at 4 a.m., and after breakfast went in two boats on Loch Ericht with two boatmen, Donald Kennedy and Donald Wilson.

The morning was very fine, and the scenery on Loch Ericht was charming. We rowed first to Lord Henry Bentinck's shooting-lodge, and then on towards the head of the loch for about six or seven miles. In all we went about thirteen miles down the loch. The whole length of the loch is seventeen miles.

On landing about 10 a.m. we had lunch and then proceeded to ascend Ben Alder, about 3700 feet. Went to the top of the hill, visited various snow patches, some of them six feet thick. Saw fine herd of deer twice in the course of the day.

After reaching the summit we remained for some time at the cairn and had a splendid view of the following mountains, Schiehallion, Ben Nevis, Ben Lawers, Ben na Mac Dhu, and snowy summits of the hills at Loch Laggan. Mr. Astley, Mr. Coore, and myself descended from the summit into the large corrie. Saw abundance of snow, and gathered many alpine plants. Came down to the lake and joined the boats. Reached Dalwhinnie about 10 p.m. Had a good glissade in a snow wreath on the eastern side of the hill.

Among the plants gathered were the following :—

Trollius europæus
Cochlearia grœnlandica
Silene acaulis
Cerastium trigynum
Sibbaldia procumbens
Rubus Chamæmorus
Drosera anglica
Epilobium angustifolium
„ alpinum
Cornus suecica
Solidago cambrica
Gnaphalium supinum
Carduus heterophyllus
Saussurea alpina
Vaccinium uliginosum
Azalea procumbens
Gentiana campestris
Veronica humifusa
„ alpina
Salix Lapponum
„ herbacea
Tofieldia palustris
Juncus trifidus
„ triglumis
Luzula spicata
Carex vaginata
„ pulla
Cryptogramme crispa
Polypodium alpestre
„ flexile
„ vulgare
„ Dryopteris
„ Phegopteris

In Loch Ericht :—

Subularia aquatica
Isoëtes lacustris

The best part of Ben Alder is the great corrie or tarn above Loch Alder. The way to go to it is to land a few miles above the shooting-lodge and then walk up by the side of Ben Alder; the rocks near the snow should also be examined. This station on Ben Alder is the best now known for *Polypodium flexile*.

Lord Henry Bentinck is very particular about the deer-forest. We had permission from him. His forester, Mr. Clark, was very obliging, and gave us assistance in our work. This was a very fatiguing day, eighteen or nineteen hours being occupied.

Thursday, 8th August 1867.

The weather was not very promising to-day, alternate showers and sunshine. The party did not breakfast till 9, and spent some time putting their plants in order. They then divided into groups and went to different places. Fraser and Christie went to the rocks on the side of Loch Ericht, Astley and myself walked to Cat Lodge to see Mr. and Mrs. Armitstead, but they had gone fishing to Loch Laggan. We took lunch at Cat Lodge and then returned, thus walking twelve miles. Mr. Coore examined a corrie two or three miles from Dalwhinnie on the right hand of the road going to Dalnaspidal, and it seems to be worthy of further examination. He found :—

Silene acaulis	Pyrola media
Dryas octopetala (in flower)	Salix arbutifolia
Sibbaldia procumbens	„ herbacea
Saxifraga oppositifolia	Habenaria viridis
„ hypnoides	Tofieldia palustris
Hieracium alpinum	Juncus trifidus
„ Lawsoni	Luzula spicata

Messrs. Fraser and Christie visited the rocks on the left side of Loch Ericht going over, called Black Rock, and found *Polystichum Lonchitis*, *Botrychium Lunaria*, *Littorella lacustris*, *Asplenium viride*, *Carex vaginata*.

Dr. Lauder Lindsay left for Perth at 1 o'clock, and Mr. Astley for Edinburgh at 4.30.

Mr. Kennedy and Mr. W. Dixon went to Killiecrankie and Pitlochry by train and returned in the evening.

Friday, 9th August 1867.

This day the party divided into two. Mr. Fraser and Mr. Edmond again visited the great corrie of Ben Alder along with Donald Kennedy; they rowed in a boat to the shooting-lodge and met Mr. Clark, who accompanied them during the day, and then walked seven or eight miles by the west side of Loch Alder to the corrie. They gathered in the loch *Littorella lacustris*, *Subularia aquatica*, *Isoëtes lacustris* (very fine). In the corrie they collected abundance of *Polypodium flexile*, *Cryptogramme crispa*, *Carex pulla*, as well as *Polypodium alpestre*, *Veronica alpina*, and returned about 8.30 p.m. The remainder of the party, now numbering eight, proceeded at 7 a.m. by a drag, calling at Cat Lodge on the way and meeting Mr. and Mrs. Armitstead, passed the inn at Loch Laggan, and went about $3\frac{1}{2}$ miles along the side of the loch. They then proceeded under the guidance of Donald Fraser, keeper to Captain Edwards, to Corryarder, a high hill, probably 3600 feet, the summit being distant about seven or eight miles by the road taken by the party. The party went by the side of the Spean to the foot of the steep cliffs covered with snow. Patches were several hundred feet in length, one of these patches arched so as to form a vaulted passage about two hundred or more feet long. The height of the arch was about seven feet throughout, and the snow very hard. Under the arch the party took shelter from a severe shower. The rocks are in great part inaccessible on account of their steepness: they were promising, but they did not seem to be so productive as was expected.

The party went along the foot of the cliffs to the large gap called "the window of Corryarder," and intended to visit other corries on the opposite side, but too much time was occupied on the first cliffs, and a severe shower of hail and rain arrested their progress. To examine the rest of the mountain fully would require several days. It is an excursion worthy of attention.

Among the plants collected were the following :—

Cochlearia grœnlandica
Cerastium alpinum
„ trigynum
(in fine patches at the "window of Corry-arder")
Rubus Chamæmorus
(in fruit)
Sibbaldia procumbens
Saxifraga oppositifolia
„ stellaris
„ hypnoides
(in large patches, and with very large flowers)
Epilobium alpinum
Cornus suecica
Gnaphalium supinum
Saussurea alpina
(not in flower)
Hieracium alpinum
Vaccinium uliginosum
Armeria maritima
Veronica humifusa
„ alpina
Gymnadenia albida
Juncus trifidus
„ triglumis
Carex pauciflora
„ atrata
„ vaginata
Aira alpina vivipara
Poa Balfourii (two states)
Cryptogramme crispa
Blechnum boreale
Cystopteris fragilis
Polystichum Lonchitis
Lastrea Filix-mas, vars.
„ dilatata, vars.
Polypodium alpestre, vars.
„ Dryopteris
„ Phegopteris

The characteristics of the mountain may be said to be the ferns mentioned and *Cerastium alpinum* and *trigynum*.

The party returned about 6 p.m. to the Inn of Loch Laggan, where they had tea. They found that Sir W. Elliot and Dr. Skae and party were located at the inn. From the inn they returned by the drag to Dalwhinnie, reaching that place after 9 p.m. very wet and fatigued. There seem to be many mountains on both sides of Loch Laggan worthy of careful examination. A party might take up their residence at Loch Laggan Inn and thus be near the scene of their labours. Another station for a party might be Kingussie, where Cairngorm and Ben na Mac Dhu might be visited.

Saturday, 10*th August* 1867.

The party left Dalwhinnie at 10.8 a.m. by train. Mr. Coore went to Aberfeldy with the view of visiting Ben Lawers.

Messrs. Fraser, Christie, and Edmond went to Dunkeld in order to examine Stenton Crag for *Asplenium germanicum*. The rest of the party, six in number, proceeded to Edinburgh, which was reached about 4.10 p.m.

EXCURSIONS IN 1868.

Gorebridge, Arniston, Kirkhill, Dalhousie.

Saturday, 16th May 1868.

Party of 96 met at the North British Railway Station at 12.30 p.m. and proceeded to Gorebridge, thence walked to Arniston, and along the banks of the Esk to Kirkhill. Reached Dalhousie about 7 p.m. and returned to Edinburgh at 8 p.m. Return tickets, 1s.

Plants collected :—

Anemone nemorosa
Ranunculus auricomus
Aconitum Napellus
Berberis vulgaris
Viola palustris
Stellaria media
Rhamnus catharticus
Prunus Avium
„ Padus
Cratægus coccinea
Saxifraga umbrosa
Chrysosplenium alternifolium
Ribes nigrum
Philadelphus coronarius
Viburnum Lantana
Doronicum Pardalianches
Anchusa sempervirens
Veronica montana
Lathræa Squamaria
Listera ovata
Orchis mascula
Allium paradoxum
Milium effusum
Scolopendrium vulgare
Ophioglossum vulgatum
Equisetum maximum
Bryum capillare
„ cæspiticium
Dicranum majus
„ squarrosum
Hypnum denticulatum
„ cupressiforme
„ Schreberi
„ undulatum
„ squarrosum
Neckera complanata
Hookeria lucens
Marchantia polymorpha
Uredo Alchemillæ
Polyporus squamosus
Ramalina farinacea

Burntisland, Aberdour.

Saturday, 23rd May 1868.

Party of 80 met at Scotland Street Station at 9.30 a.m. and proceeded to Burntisland, thence walked to Aberdour. Returned by boat leaving Burntisland at 6.3 p.m. Return tickets, 1s.

The following were among the plants collected :—

Thalictrum flexuosum
Berberis vulgaris
Cheiranthus Cheiri
Cochlearia danica
Lepidium Draba
Viola odorata
„ hirta
„ canina
Cerastium tetrandrum
Sagina maritima
Geranium sanguineum
„ phæum
„ pyrenaicum
Rhamnus catharticus
Astragalus hypoglottis
Fragaria elatior
Anthriscus vulgaris
Centranthus ruber
Hieracium Pilosella
Anchusa sempervirens
Solanum Dulcamara
Salvia Verbenaca
Plantago maritima
Hippophaë rhamnoides
Urtica urens
Parietaria diffusa
Ruscus aculeatus
Triglochin maritimum
Blysmus rufus
Sclerochloa loliacea
Scolopendrium vulgare
Botrychium Lunaria
Ophioglossum vulgatum
Bryum cæspiticium
Anomodon viticulosus
Didymodon rubellus
Ceratodon purpureus
Orthotrichum anomalum
Jungermannia dilatata
Ramalina scopulorum
Parmelia aquila
Fucus serratus
„ nodosus
„ vesiculosus
„ canaliculatus
Chondrus crispus
Odonthalia pinnata
Delesseria sanguinea
Ptilota plumosa
Polysiphonia fastigata
Corallina officinalis

Prestonpans, Cockenzie, Longniddry.

Saturday, 30th May 1868.

Party of 84 met at the North British Railway Station at 10.30 a.m. and proceeded to Prestonpans, thence walked by

Cockenzie to Longniddry. Returned by train passing Longniddry at 3.36 p.m. Return tickets, 1s.

The following plants were collected :—

Ranunculus hederaceus
Berberis vulgaris
Chelidonium majus
Viola canina
Cerastium arvense
Stellaria graminea
Honckenya peploides
Geranium sanguineum
„ dissectum
Medicago sativa
Astragalus hypoglottis
Vicia sativa
„ lathyroides
Potentilla vèrna
Saxifraga tridactylites
Sempervivum tectorum
Helosciadium repens
Œnanthe crocata
Carduus nutans
Leontodon lævigatus
Cynoglossum officinale
Orchis incarnata
Triglochin maritimum
Lemna minor
Scirpus maritimus
Blysmus rufus
Sclerochloa rigida
Botrychium Lunaria
Tortula muralis
Hypnum albicans
„ dendroides

East Linton, Prestonkirk, Tynningham, Whitbery Point, the Tyne.

Saturday, 6th June 1868.

Party of 40 met at the North British Railway Station at 7 a.m. Proceeded to East Linton, thence walked by Prestonkirk to Tynningham, where they were met by a gardener, who acted as guide. Visited the garden along with Mr. Lees, saw some fine Orchids. Thence proceeded through the woods to Whitbery Point, where a fine view was had of the Isle of May, Bass Rock, Berwick Law, Trapraine Law, Lammermuir Hills, Dunbar, &c. Thence by the north of the Tyne, visiting the salt-marshes. Returned by train from East Linton at 3.10 p.m.

The following were among the plants collected :—

Thalictrum minus
Sinapis alba
Lepigonum marinum
Malva rotundifolia
Geranium sanguineum
Trifolium medium
Astragalus hypoglottis
Sempervivum tectorum
Lonicera Caprifolium
Valeriana officinalis
Tanacetum vulgare
Artemisia maritima
" gallica
Leontodon lævigatus
Glaux maritima
Erythræa Centaurium
Cynoglossum officinale
Symphytum tuberosum
Hyoscyamus niger
(large quantity)
Antirrhinum majus
Plantago maritima
Salicornia herbacea
Neottia Nidus-avis
Ruscus aculeatus
Triglochin maritimum
Scirpus maritimus
Botrychium Lunaria
Ophioglossum vulgatum
Polytrichum juniperinum

Winchburgh, Niddry Castle, Ecclesmachan, Binny Crag, Uphall.

Saturday, 13*th June* 1868.

Party of 41 met at the North British Railway Station at 11.30 a.m. and proceeded to Winchburgh, thence walked to Niddry Castle, Ecclesmachan, Binny Crag, and Uphall. Returned from Uphall by train at 5.51 p.m. Return tickets, 1s.

The following plants were collected :—

Aconitum Napellus
Fumaria pallidiflora
Viola lutea
Geranium pratense
" dissectum
" nodosum
Saxifraga granulata
Æthusa Cynapium
Asperula odorata
Carduus acanthoides
Anchusa sempervirens
Myosotis cæspitosa
Convolvulus sepium
Rhinanthus Crista-galli
Mentha velutina
Lamium lævigatum
Habenaria chlorantha
Convallaria majalis
Allium paradoxum

Several garden plants were found in the wood, including :—

Spiræa rubella
Symphoricarpus racemosus
Lysimachia tomentosa
Omphalodes verna
Nepeta longiflora

Jedburgh, Arlarly Well, the Jed, Ferniehurst Castle.

Saturday, 20*th June* 1868.

Party of 74 met at the North British Railway Station at 6.40 a.m. Proceeded to Jedburgh. Met Mr. E. Jardin at St. Boswells, who accompanied the party and acted as guide during the day. Breakfasted at the Spread Eagle Hotel (Scate). Met the Rev. George Ritchie, minister of the parish, who breakfasted with the party, also Sheriff Rutherford Russel and Mr. Adam Waterson. After breakfast, visited the Abbey, under the direction of Rev. Mr. Ritchie. Walked past Arlarly Well and along the banks of the Jed to Ferniehurst Castle, the old seat of the Lothians. A little beyond the Castle crossed the Jed and returned by the other side of the river to Jedburgh. Left Jedburgh at 4.40 p.m. Return tickets, 4s. 6d. Breakfast, 1s. 6d.

The following were among the plants collected :—

Chelidonium majus
Cardamine amara
Sinapis alba
Geranium sylvaticum
Trifolium hybridum
Vicia sativa
Geum intermedium
Sanicula europæa
Galium palustre
Carduus heterophyllus
Campanula latifolia
Lysimachia nemorum
Veronica montana
Melampyrum pratense
Plantago media
Salix aquatica
Listera ovata
Paris quadrifolia
Juncus acutiflorus
Carex paniculata
" stellulata
Carex remota
" ovalis
" vulgaris
" pallescens
" panicea
" sylvatica
" flava
" hirta
" paludosa
Aira cæspitosa
Holcus mollis
Melica uniflora
Blechnum boreale
Cystopteris fragilis
Lastrea Oreopteris
" spinulosa
Polypodium Dryopteris
Neckera complanata
Calicium turturaceum
Sticta pulmonaria

Selkirk, Haining, Haining Lochs, the Ettrick, Philiphaugh, the Yarrow, Newark Castle, Bowhill.

Saturday, 27th June 1868.

Party of 50 met at the North British Railway Station at 6.40 a.m. and proceeded to Selkirk. Breakfasted there in the County Hotel. At breakfast they were joined by Sir Walter Elliot, Rev. James Ferguson, and Rev. Mr. Brown (Episcopalian minister) from Edinburgh. Dr. Henry Anderson and Dr. John S. Muir were prevented accompanying the party by medical engagements. Rev. Mr. Ferguson acted as guide. The Rev. Mr. Davidson, United Presbyterian minister, and Mr. Scott, farmer, Philiphaugh, also accompanied the party. After breakfast they proceeded to Haining, the grounds of which they were allowed to visit through the kindness of Mrs. Pringle Douglas, whose gardener (Mr. Scott) assisted the party in their search for plants. The party visited Haining Lochs, in one of which the white and yellow water-lilies were abundant, and in the neighbouring pastures *Botrychium Lunaria* and *Ophioglossum vulgatum*. From Haining the party proceeded by the banks of the Ettrick to Philiphaugh, the grounds of which they were permitted to visit by Sir John N. Murray, the proprietor, and Mr. Pierie, the tenant, and visited the scene of the battle of Philiphaugh, thence proceeded by the banks of the Yarrow to Newark Castle, walked over the hills to Bowhill, which, through the kindness of His Grace the Duke of Buccleuch, they also visited, under the guidance of Mr. Matheson, the gardener's son. Afterwards some of the party ascended the hill above Philiphaugh for *Listera cordata*. All met at Selkirk about 7.30 and returned by express train at 7.45 to Edinburgh. Return tickets, 3s. 3d. Breakfast, 1s. 6d.

The following plants were collected:—

Ranunculus Lingua
Nuphar luteum (Haining)
Nymphæa alba (Haining)
Cardamine amara (Philiphaugh)
Arabis hirsuta (Ettrick banks)
Iberis amara (Philiphaugh)
Reseda lutea
Viola lutea (Philiphaugh)
Stellaria nemorum (Philiphaugh)
Geranium pratense (Philiphaugh)

Astragalus Glyciphyllos
Trifolium arvense
(Ettrick banks)
Potentilla reptans
(Philiphaugh)
„ fruticosa
Saxifraga umbrosa
„ hypnoides
Sedum Rhodiola
„ Telephium
„ villosum
(Philiphaugh)
Drosera rotundifolia
(Philiphaugh)
Myriophyllum spicatum
Peplis Portula
(near Newark)
Epilobium angustifolium
(Bowhill)
„ hirsutum
(Bowhill)
Circæa lutetiana (Bowhill)
Hydrocotyle vulgaris
(near Newark)
Sanicula europæa (Bowhill)
Adoxa Moschatellina
(Bowhill)
Lonicera Periclymenum
Asperula odorata (Bowhill)
Valeriana dioica (Haining)
„ pyrenaica
Solidago Virgaurea
Doronicum Pardalianches
(Bowhill)
Carduus heterophyllus
(Bowhill)
Hieracium aurantiacum
(by the side of the loch
at Bowhill)
„ collinum
(in quantity by the
Ettrick)
Campanula latifolia
(Bowhill)
Vaccinium Vitis-Idæa
(Philiphaugh)
Erica Tetralix
Pyrola minor (Bowhill)
Lysimachia Nummularia
(Ettrick banks)
Trientalis europæa
(Bowhill)
Symphytum tuberosum
(Philiphaugh)
Lithospermum officinale
Veronica scutellata
(near Newark)
Melampyrum pratense
(Bowhill)
Calamintha Clinopodium
Scutellaria galericulata
(Philiphaugh)
Populus alba
„ nigra
Empetrum nigrum
(Philiphaugh)
Neottia Nidus-avis
(Bowhill)
Listera cordata
(Philiphaugh)
„ ovata (Haining)
Gymnadenia conopsea
(Philiphaugh)
Habenaria viridis (Haining)
„ bifolia (Haining)
„ chlorantha
Iris Pseudacorus
Allium ursinum (Bowhill)
Lilium Martagon
Typha angustifolia
Alisma Plantago
Potamogeton prælongus
„ pectinatus

Carex pulicaris
(Philiphaugh)
„ intermedia (Haining)
„ teretiuscula(Haining)
„ paniculata (Haining)
„ remota (Ettrick banks)
„ curta (Ettrick banks)
„ pallescens (near Newark)
„ panicea (Philiphaugh)
„ sylvatica (Bowhill)
„ fulva (Philiphaugh)
„ flava (Philiphaugh)
„ hirta (Philiphaugh)
„ ampullacea
Phalaris arundinacea
Holcus mollis
Avena pratensis (Bowhill)
Melica uniflora (Bowhill)
Asplenium Trichomanes
(Selkirk Bridge)
„ Ruta-muraria
(Selkirk Bridge)
Aspidium lobatum (Bowhill)
Lastrea Oreopteris
(Bowhill)
Polypodium Dryopteris
(Bowhill)
„ Phegopteris
(Philiphaugh)
Ophioglossum vulgatum
(Haining)
Botrychium Lunaria
(Haining)
Lycopodium Selago
(Philiphaugh)

Perth, Muirward Wood, Scone, Kinnoul Quarry.

Saturday, 4th July 1868.

A small party proceeded to Perth by 9.45 a.m. train, visited Muirward Wood, Scone, and Kinnoul Quarry, accompanied by Mr. Macfarlane, Perth.

In Muirward Wood were seen :—

Linnæa borealis (in considerable quantity)
Moneses grandiflora
Trientalis europæa
Listera cordata (abundantly)
Lastrea spinulosa

In Quarry Mill Den :—

Rubus nitidus
Rosa arvensis
Sedum reflexum
Pyrola minor
Lysimachia Nummularia
Alisma Plantago

In Kinnoul Quarry :—

Malva moschata
Trifolium striatum
Potentilla hirta
„ argentea
Poterium Sanguisorba
Rosa systyla
Antirrhinum majus

Montrose, Usan Mains, Buddon, Rock of St. Skeoch, Dunninald Den.

Saturday, 11*th July* 1868.

Party of 34 met at the North British Railway Station at 6.25 a.m. and proceeded by Burntisland and Perth to Dubton Station near Montrose, which they reached about 11.30 a.m. At the station they were met by Drs. Howden and Simpson and conveyed in omnibuses to the Royal Asylum, where breakfast had been prepared for the party by Dr. Howden. After breakfast the party, accompanied by Drs. Howden and Simpson, proceeded in omnibuses to Montrose, thence along the coast as far as Usan Mains, then walked along the shore to Buddon, the Rock of St. Skeoch, and Dunninald Den. Returned from Montrose, which they left at 5.15 p.m., and reached Edinburgh about 10 p.m. Return tickets, 6s. 6d. Omnibuses, 1s. 6d.

The following plants were collected :—

Sagina maritima
Lepigonum marinum
Astragalus Glyciphyllos
Vicia sylvatica
Linnæa borealis
Matricaria maritima
Carlina vulgaris
Campanula glomerata
Pyrola secunda
Trientalis europæa
Mertensia maritima
Atriplex Babingtonii
Goodyera repens
Habenaria viridis
Juncus Gerardi
„ glaucus
Scirpus sylvaticus
Carex distans
Triticum pungens
Asplenium marinum

Dumfries, Den Mill, Rutton Loch, Cargen.

Saturday, 18*th July* 1868.

Party of 60, besides 12 under the charge of Professor Laycock, met at the Caledonian Railway Station at 7.40 a.m. and proceeded to Dumfries, which they reached about 11.30 a.m. The party were conveyed from the station to the Royal Crichton Institution, where they were provided with breakfast. At breakfast they were joined by Dr. Gilchrist, Dr. M'Nab, Dr. Grierson, Dr.

Chalmers, &c., &c. Breakfast over, Professor Balfour thanked Dr. Gilchrist for the handsome way he had treated the party The botanical party then left in omnibuses and visited Den Mill, Rutton Loch, and Cargen (Dudgen's), and returned to Dumfries in time for train at 6.10 p.m. for Edinburgh. Return tickets, 5s.

The following plants were collected :—

Lepidium Smithii
Sagina nodosa
Geranium sanguineum
Genista tinctoria
Vicia sylvatica
Sedum reflexum
Lythrum Salicaria
Carum verticillatum
Meum athamanticum
Galium palustre
Achillea Ptarmica
Lobelia Dortmanna
Jasione montana
Melampyrum pratense
Stachys Betonica
Littorella lacustris
Gymnadenia albida
Sparganium simplex
Alisma ranunculoides
Potamogeton heterophyllus
„ lucens
„ prælongus
Scolopendrium vulgare
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Chara flexilis
„ vulgaris
Neckera crispa
„ complanata
Fontinalis antipyretica
Aulacomnion palustre
Sticta fuliginosa

Aberfeldy, Ben Lawers, Farrichar Quarry, Moness Falls.

Thursday, 23rd July 1868.

Party consisting of J. H. Balfour, A. P. Aitken, John Archibald, Rev. Charles T. Astley, George Bowman, John Storrs Brookfield, W. H. Brown, A. Craig Christie, Henry M. Church, J. Clelland Clarke, R. F. Colvin, William Craig, Louis Conrad Jockel, John Leitch, Robert Lindsay (gardener), William Logie, Thomas Wm. Mawson, Hugh Miller, P. Miller, Alexander Morrison, F. Naylor, David Page, John Sadler, John A. Simpson, R. Sivewright, Dr. R. H. Traquair, George Twentyman, Dr. Arthur Abney Walker, E. A. Walker, J. Watters, Dr. H. A. Weddell (Switzerland), Miss Weddell (Switzerland), left Edinburgh per Edinburgh, Perth, and Dundee Railway at 1.10 p.m. and proceeded to Aberfeldy. They stayed at M'Kenzie's Breadal-

bane Arms Hotel. Next morning the party breakfasted at half-past 5, and at 6.15 started in three drags for Ben Lawers, which they reached between 9 and 10 o'clock. They ascended Ben Lawers and returned to Lawers Inn about 6 o'clock, arriving in Aberfeldy about 9 p.m. Next day Farrichar Quarry and the Moness Falls were visited. The party left Aberfeldy at 1.30 and arrived in Edinburgh about 7 p.m.

The following plants were collected on Ben Lawers :—

Thalictrum alpinum
Draba incana
„ rupestris
Cochlearia alpina
Silene acaulis
Cerastium alpinum
Stellaria nemorum
Alsine rubella
Cherleria sedoides
Sagina saxatilis
„ nivalis
Rubus Chamæmorus
Potentilla maculata
Sibbaldia procumbens
Alchemilla alpina
Saxifraga nivalis
„ cernua
Epilobium alsinifolium
„ alpinum
Cornus suecica
Erigeron alpinus
Gnaphalium supinum
Saussurea alpina
Hieracium holosericeum
Gentiana nivalis
Myosotis alpestris
Veronica saxatilis
Salix herbacea
„ reticulata
Tofieldia palustris
Juncus biglumis
„ triglumis
Luzula spicata
Carex atrata
Sesleria cærulea
Poa alpina
„ Balfourii
Botrychium Lunaria
Sphagnum obtusifolium
„ acutifolium
„ squarrosum
Conostomum boreale
Encalypta ciliata
Trichostomum patens
„ lanuginosum
Polytrichum hercynicum
„ alpinum
Bryum Zierii
„ crudum
Timmia megapolitana
Bartramia pomiformis
„ ithyphylla
„ Halleriana
Neckera crispa
„ complanata
Hypnum rugosum
Blindia acuta
Alectoria jubata
Cetraria glauca
„ islandica
Solorina crocea
Sticta sylvatica
Lecanora Hookeri
„ tartarea

At Farrichar and Moness :—

Carduus heterophyllus
Hieracium Lawsoni
Campanula latifolia
Trientalis europæa
Melampyrum sylvaticum
Calamintha Clinopodium
Asplenium viride
Polypodium calcareum

Some went to Killiecrankie and collected :—

Lathyrus niger

Some visited Methven Bog and collected :—

Genista anglica
Vaccinium Oxycoccus
Scheuchzeria palustris
Carex irrigua
„ limosa
Lastrea spinulosa

Gatehouse and Kirkcudbright.

Tuesday, 4*th August* 1868.

Party consisting of J. H. Balfour, A. P. Aitken, Charles T. Astley (Kent), A. Craig Christie, H. M. Church, R. P. Colvin, A. T. Coore, D. Liston, G. Twentyman, left Edinburgh by the Caledonian Railway Station at 1.10 p.m. for Gatehouse, travelling by Dumfries, and then by the Glasgow and South-Western Railway for Tarff Station, which was reached about 7 p.m. Professor Liston joined the party at Beattock, Rev. R. P. Colvin at Lochmaben, and Mr. Coore at Dumfries.

Tarff Station is eight miles from Gatehouse. There is another Gatehouse station called Drumore, on the Caledonian and Portpatrick line, distant about seven miles from Gatehouse. The line from Dumfries to Gatehouse by the Caledonian Railway is longer than that by the Glasgow and South-Western. From Tarff the party was conveyed by omnibus to Mr. M'Michael's inn called the Murray Arms, where all were comfortably accommodated, arrangements having been previously made with the hotel-keeper. The party had their usual tea-dinner. Afterwards Dr. Balfour, with Mr. Astley and Mr. Coore, walked to Ardwell (distant two miles) to call on Mr. Walter Macculloch and to get

from him information as to the country. Mr. Macculloch had been a pupil at the High School of Edinburgh under Dr. Carson along with Dr. Balfour.

Wednesday, 5*th August* 1868.

Breakfasted at 7 and started at 8 by omnibus for Glen Farn, passing Ardwell, where Mr. Macculloch joined the party in his two-horse drag, and accompanied them. Anwoth was passed, the parish of Rutherford. There is a monument on the top of a hill to the old divine who, after being minister of this parish, was promoted to St. Andrews.

From Glen Farn ascended the hill called Cairn Hanna (?), 1497 feet above the level of the sea. Very few plants were gathered, none of an alpine character :—

Ranunculus Flammula, var.
Polygala vulgaris
„ oxyptera
Parnassia palustris
Drosera rotundifolia
Hippuris vulgaris
Carum verticillatum
Centaurea nigra
(radiate form)
Vaccinium Oxycoccus
Anagallis tenella
Menyanthes trifoliata
Empetrum nigrum
Lastrea dilatata, var. montana

The dry weather had withered the grass, and there was little vegetation on the upper portion of the hill. On the top there were some deep mud ponds, in one of which four sheep were found immersed. From the top of the hill the party descended to the Shean, which passes through a wooded ravine to Kirkdale as far as the shore of Wigton Bay.

In the glen *Polystichum angulare* was gathered, and on rocks not far from Ravenshall *Crithmum maritimum*. In Kirkdale Glen there was abundance of ordinary ferns, also *Hypericum Androsæmum*, *H. maculatum*, a variety of *H. dubium*, *Viburnum Opulus*, *Stachys Betonica*.

Walked by the shore by Dirk Hatteraick's Cave and Ravenshall Point, near which the party bathed. We proceeded to Kirkclaugh, the residence of Mr. Alex. Macculloch, where we lunched. Thence we proceeded, accompanied by Mr. Walter Macculloch, along the shore to Ardwell.

The plants gathered on the shore were :—

Cakile maritima
Silene maritima
Lepigonum marinum
Lathyrus sylvestris
Œnanthe Lachenalii
„ crocata
Carduus lanceolatus, var.
Statice Limonium
„ bahusiensis
Statice spathulata
(small forms like)
Armeria maritima
Scutellaria galericulata
Plantago maritima
Juncus maritimus
Schœnus nigricans
Asplenium marinum

Reached Ardwell about 6 p.m. and dined with Mr. Macculloch, who was most kind and hospitable. About 9.30 returned by omnibus to Gatehouse, and were employed for some time putting plants in paper.

Thursday, 6th August 1868.

Breakfasted at 7 a.m. Started at 8 by omnibus for Kirkcudbright, visited St. Mary's Isle, walked on both sides of it, returned to Kirkcudbright, walked to the bridge over the Dee at Tongueland. Returned to Kirkcudbright to lunch at the Commercial Hotel.

Among the plants gathered on the isle were :—

Cochlearia officinalis
Lepigonum marinum
Acer campestre
Spiræa salicifolia
Sedum Telephium
Circæa lutetiana
Epilobium angustifolium
Aster Tripolium
Statice Limonium
Statice bahusiensis
Salicornia herbacea
Suæda maritima (very large)
Listera ovata
Epipactis latifolia
Convallaria multiflora
Potamogeton polygonifolius
Festuca gigantea
Ophioglossum vulgatum

Near Kirkcudbright we found *Lepidium Smithii*, and near Tongueland *Serratula tinctoria.*

Returned to Commercial Inn at Kirkcudbright to lunch, and then proceeded by omnibus to Borgue. On the way gathered :—

Helleborus viridis
Inula Helenium
Senecio saracenicus
Convolvulus sepium
Verbascum Thapsus

From Borgue village went to the shore at Kirkandrew, visited the rocks on the shore, and collected :—

Silene maritima	Haloscias scoticum
Lepigonum marinum	Aster Tripolium
Sedum anglicum	Artemisia maritima
Crithmum maritimum	Carlina vulgaris

Omnibus met the party at Kirkandrew, and they proceeded by Margay to Gatehouse.

Friday, 7th August 1868.

Breakfasted at 7 a.m., and at 8 proceeded by omnibus to Drumore Station. Near the station heavy rain came on, and some of the party thought it better not to visit the mountain. There was a division, therefore, of the party. One ascended the hill called Cannismore, 2600 feet above the level of the sea. This mountain is one of the highest in the county. It is difficult to ascend on the western side, and produces no plants of interest.

Ascended to the top of the hill, and had a fine view from the cairn. Saw the mountains of Kirkcudbright, the Isle of Man, Cumberland hills, Ailsa Craig, Arran.

The rocks facing the east were more crumbling and productive, and on them were gathered :—

Saxifraga stellaris	Cryptogramme crispa
„ hypnoides	Lycopodium Selago
Salix herbacea	„ clavatum
Rhynchospora alba (near Drumore)	„ alpinum
	„ selaginoides

Upon the whole, the mountain was very poor as regards alpine species.

The other division of the party proceeded by train to Creetown, and examined the shore between it and Gatehouse.

They collected :—

Glaucium luteum	Vicia sylvatica
Crambe maritima	Lathyrus sylvestris
Hypericum Androsæmum	Prunus spinosa
„ dubium	Rubus discolor
„ quadrangulum	Pyrus Malus

Sedum rupestre
Epilobium hirsutum
Crithmum maritimum
Haloscias scoticum
Hieracium boreale
" umbellatum
Solanum Dulcamara
Beta maritima
Salix Smithiana
Juncus maritimus
Scirpus maritimus
Asplenium marinum
Scolopendrium vulgare
Polystichum angulare

Saturday, 8th August 1868.

This morning Mr. Coore left at 8 a.m. for England. The rest of the party were occupied with drying plants. Some visited the marsh near Gatehouse, and gathered *Vicia angustifolia*, *Œnanthe crocata*, and *Veronica Anagallis*.

Under the direction of Mr. Moule, factor of Mr. Murray Stewart, party visited the grounds and gardens at Cally House. The garden is well kept by Mr. Miller, the gardener. On the shore of the loch in the grounds gathered :—

Nasturtium palustre
Callitriche autumnalis
Peplis Portula
Gnaphalium uliginosum
Lysimachia Nummularia
Littorella lacustris
Polygonum Hydropiper

Visited the Horticultural Show ; competition chiefly among the working classes, very creditable. After lunch left at 1.30 p.m. for Tarff Station and proceeded to Dumfries.

At Tarff Station gathered *Genista tinctoria*, *Rosa spinosissima*, and *Alisma Plantago*.

On reaching Dumfries there was a delay of an hour and a half. After tea some visited the banks of the Nith near the old bridge, and collected *Medicago denticulata*, *M. maculata*, *Xanthium spinosum*, and *Phalaris canariensis*.

From Dumfries proceeded at 6.10 to Lockerbie, where *Symphytum officinale* was gathered, then proceeded by quick train to Edinburgh, which was reached about 10 p.m.

EXCURSIONS IN 1869.

Clova.

Thursday, 22nd April 1869.

A party, consisting of J. H. Balfour, I. B. Balfour, and William Bell, proceeded at 6.30 a.m. for Kirriemuir, by Scottish Central Railway. From Kirriemuir they went by dogcart to the Ogilvy Arms, Clova, kept by Mr. James Alexander, which was reached about 2.15 p.m. At Kirriemuir they parted with Messrs. Stormonth Darling, J. Hunt, and G. Brown, who went to Lednaltrie.

After dinner, party went to Loch Brandy and examined the rocks in the vicinity, gathering on the way *Eriophorum vaginatum*, *Luzula campestris*, *Tussilago Farfara*, *Lycopodia*, and many good mosses.

Friday, 23rd April 1869.

Visited Robert Welsh at Acharn, and then went to Glen Fee, passing round the top of the glen to its eastern side. Among the plants gathered were :—

Caltha minor
Oxytropis campestris
Saxifraga oppositifolia
Tussilago Farfara
Arctostaphylos Uva-ursi
Pyrola media
Eriophorum vaginatum
„ polystachyon
Woodsia hyperborea
Bryum Duvalii (barren)
Encalypta rhabdocarpa
Fontinalis squarrosa
(in fruit)
Hypnum molle
„ fluitans
(many varieties)
„ revolvens
„ aduncum
Mnium subglobosum
(fine fruit)
„ cinclidioides
(barren)
Splachnum sphæricum
Trichostomum glaucum

Saturday, 24th April 1869.

Visited Loch Wharral, Loch Brandy, and the corrie near it. The rocks at Loch Wharral dry and not disintegrating. Few plants found. Abundance of *Saxifraga oppositifolia* in fine flower. *Azalea procumbens* on tops of mountains. Visited landslip at Loch Brandy. There is a large rent at the summit

of the hill, and ere long there must be an avalanche of rocks into the loch. The rent has been increasing for many years. Many mosses and lichens, among them *Oligotrichum hercynicum*.

Monday, 26th April 1869.

Visited Bachnagairn, a shooting-lodge in Glen Esk. Examined the hills in neighbourhood, which were covered with large patches of snow. Many good mosses found, among them :—

Bryum alpinum (in fruit)
„ intermedium
„ torquescens
Cylindrothecium Montagnei
Fissidens osmundioides
Grimmia canescens
Hypnum elegans
„ flagellare

Tuesday, 27th April 1869.

Dr. Balfour and William Bell returned to Edinburgh, which was reached about 6.20 p.m. I. B. Balfour remained at Clova for fishing.

Penicuik, Auchendinny, Roslin.

Saturday, 15*th May* 1869.

A party of 114 met at the North British Railway Station at 7.45 a.m. and proceeded to Penicuik. Visited Penicuik Glen, walked by banks of Esk to Auchendinny and Roslin, returning from Roslin at 3.12 p.m. Return tickets, 1s.

Among the plants collected were:—

Anemone nemorosa
Ranunculus auricomus
„ Ficaria
Cardamine amara
Stellaria nemorum
Prunus Avium
„ Padus
Pyrus Aucuparia
„ Malus
Chrysosplenium alternifolium
Ribes alpinum
Adoxa Moschatellina
Valeriana pyrenaica
Doronicum Pardalianches
Vinca minor
Veronica montana
Salix alba
„ Caprea
„ aquatica
Neottia Nidus-avis
Lilium Martagon
Polypodium Dryopteris
„ Phegopteris
Equisetum maximum
„ umbrosum
Orthotrichum affine
Morchella esculenta

Burntisland, Kinghorn, Pettycur.

Saturday, 22nd May 1869.

Party of 86 met at the Waverley Station (Granton Branch) at 9.45 a.m. and proceeded to Kinghorn, thence walked to Burntisland along the coast by Pettycur. Returned from Burntisland at 3.3 p.m. Fare, 1s.

The following plants were collected :—

Papaver Argemone
Fumaria pallidiflora
Alyssum calycinum
Brassica campestris
Lepidium Draba
Thlaspi arvense
Viola canina
Cerastium arvense
Geranium sanguineum
Astragalus hypoglottis
" Glyciphyllos
Anthriscus vulgaris
Senecio viscosus
Leontodon lævigatus
Borago officinalis
Lycium barbarum
Veronica Buxbaumii
Salvia Verbenaca

Lamium incisum
Hippophaë rhamnoides
Botrychium Lunaria
Grimmia orbicularis
(new to Fifeshire)
" leucophæa
Trichostomum crispulum
(new to Fifeshire)
Schistidium maritimum
Weissia controversa
Parmelia parietina
Ramalina scopulorum
Fucus canaliculatus
" serratus
" nodosus
" vesiculosus
Laminaria digitata
Polysiphonia fastigiata

South Queensferry, North Queensferry, Inverkeithing.

Saturday, 29th May 1869.

Party of 100 met at the Waverley Station at 9.15 a.m. and proceeded to South Queensferry, thence by steamboat to North Queensferry, and botanised as far as Inverkeithing. Returned from North Queensferry at 4.45 p.m. and by train leaving South Queensferry at 5.50 p.m. Return tickets, 1s.

The Rev. Mr. Colvin and Rev. Mr. Ferguson, Glen Prosen, accompanied the party.

The following plants were collected :—

Thalictrum flexuosum
Berberis vulgaris
Cheiranthus Cheiri
Viola hirta
„ canina
Sagina maritima
Lepigonum marinum
Montia fontana
Geranium sanguineum
Astragalus Glyciphyllos
Sedum villosum
Œnanthe crocata
Asperula odorata
Echium vulgare
Allium ursinum
Botrychium Lunaria
Rhodymenia palmata
Delesseria sanguinea
„ laciniata
Ulva latissima

Dirleton, Dirleton Castle, North Berwick.

Saturday, 5*th June* 1869.

Party of 40 met at 7.10 a.m. at the Waverley Station and proceeded to Dirleton, visited Dirleton Castle and Common, walked to North Berwick, visited North Berwick Law. Returned from North Berwick by train reaching Edinburgh about 4.15 p.m. Return tickets, 1s. 10d.

The following plants were collected :—

Cheiranthus Cheiri
Alyssum calycinum
Saxifraga tridactylites
Smyrnium Olusatrum
Centranthus ruber
Senecio sylvaticus
Carduus tenuiflorus
Leontodon lævigatus
Chenopodium Bonus-Henricus
Euphorbia Peplus
Parietaria diffusa
Equisetum palustre
„ variegatum

Manuel, Manuel Mill, Woodcockdale, Carriber Glen, Buden Hill, Cockle Roy, Linlithgow.

Saturday, 12*th June* 1869.

Party of 86 met at the Waverley Station at 11.30 a.m. and proceeded to Manuel, thence walked to Manuel Mill, Woodcock-

dale, Carriber Glen and Castle, Buden Hill, Cockle Roy, and Linlithgow. Returned by train passing Linlithgow at 6.45 p.m. Return tickets, 1s. 6d.

The following plants were collected :—

Trollius europæus
Aquilegia vulgaris
Berberis vulgaris
Chelidonium majus
Fumaria pallidiflora
Viola odorata
„ lutea
Geranium sanguineum
„ nodosum
„ sylvaticum
„ lucidum
Geum intermedium
Rosa alpina
(Carriber Castle)
Saxifraga umbrosa
Sedum villosum
Sanicula europæa
Adoxa Moschatellina
Viburnum Opulus
Polemonium cæruleum
Symphytum officinale
Myosotis cæspitosa
Calamintha Clinopodium
Lysimachia thyrsiflora
Neottia Nidus-avis
Epipactis latifolia
Habenaria chlorantha
Allium Schœnoprasum
Ophioglossum vulgatum
Botrychium Lunaria
Equisetum umbrosum

Denny, Banks of Carron Water, Hermitage.

Saturday, 19th June 1869.

Party of 60 met at the Waverley Station at 9.15 a.m. Proceeded to Denny, thence walked under Dr. Peter White's guidance up the banks of Carron Water as far as the Hermitage, and returned to Denny, which was left at 5.5 p.m. Return tickets, 2s. 7½d.

The following plants were gathered :—

Trollius europæus
Meconopsis cambrica
Viola canina
„ lutea
Cardamine amara
Geranium sylvaticum
Rubus saxatilis
Fragaria elatior

Sedum villosum
„ anglicum
Sempervivum tectorum
Carum Carui
Carduus heterophyllus
Menyanthes trifoliata
Mimulus luteus
Listera ovata
Orchis latifolia
„ maculata
Gymnadenia conopsea
„ albida
Habenaria bifolia
„ chlorantha
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Botrychium Lunaria
Cornicularia aculeata
Cladonia rangiferina
Parmelia saxatilis
Urceolaria scruposa
Lecanora parella

Cleghorn, Banks of the Mouse, Cartland Crags, Stonebyres, Lanark.

Saturday, 26th June 1869.

Party of 94 met at the Caledonian Railway Station (Lothian Road) at 10.10 a.m. Proceeded to Cleghorn, thence walked along the banks of the Mouse to Cartland Crags, then by Stonebyres to Lanark, which was left at 5.5 p.m. At Cleghorn the party were met by Professor Dickson, Glasgow, and fifteen of his students. Return tickets, 2s. 8d.

The following plants were collected :—

Trollius europæus
Aquilegia vulgaris
Hesperis matronalis
Geranium sylvaticum
„ lucidum
Trifolium medium
„ striatum
Vicia Orobus
Rubus saxatilis
Geum intermedium
Fragaria elatior
Carum Carui
Viburnum Opulus
Carduus heterophyllus
Jasione montana
Vinca minor
Polemonium cæruleum
Populus tremula
Gymnadenia conopsea
Habenaria chlorantha
Equisetum hyemale
Tortula Mülleri

Dollar, Castle Campbell Glen, the Ochils.

Saturday, 3rd July 1869.

Party of 50 met at the Waverley Station at 6.30 a.m. Proceeded *viâ* Stirling to Dollar, breakfasted there in Henderson's Castle Campbell Hotel, thence walked through Castle Campbell Glen to the Castle and the Ochils, returning to Dollar by King's Seat. The party was joined at breakfast by Dr. Strachan, Mr. Westwood, and Dr. Strachan's son acted as guide to the party. Return tickets, 3s. Breakfast, 1s. 6d.

The following plants were collected :—

Stellaria nemorum
Geranium sylvaticum
Ornithopus perpusillus
Epilobium alsinifolium
Saxifraga stellaris
„ hypnoides
Smyrnium Olusatrum
Solidago Virgaurea
Vaccinium Vitis-Idæa
Myosotis palustris
Gymnadenia conopsea
„ albida
Habenaria chlorantha
Eriophorum latifolium
Carex rigida
Hymenophyllum Wilsoni
Scolopendrium vulgare
Equisetum umbrosum

Kelso, Twizel, Milnegraden, The Tweed, Ladykirk, Paxton, Norham, Berwick.

Saturday, 10*th July* 1869.

Party of about 50 met at the Waverley Station at 6.35 a.m. and proceeded to Kelso, breakfasted there, thence went by train to Twizel, where they crossed the Tweed to Milnegraden, conducted by the gardener through the grounds, thence walked by banks of the Tweed to Ladykirk, the residence of Mr. Robertson, M.P. Mr. Scott, the gardener, conducted the party through the garden, houses, and stable. At 1.15 the party, at the invitation of Mr. Robertson, sat down to luncheon in Ladykirk House. The party then proceeded to Paxton, visiting by the way the parish

church of Norham and the old Castle. At Paxton, Mr. Milne Home supplied the party with refreshments. From there the party proceeded direct to Berwick, which they left by the London express train at 7 p.m., reaching Edinburgh about 8.30. Dr. Douglas (Kelso), Mr. Boyd (Ormiston), and Dr. Paxton (Norham), joined the party.

The following plants were collected :—

Thalictrum flexuosum
Ranunculus arvensis
Nasturtium sylvestre
„ palustre
Cerastium arvense
Medicago denticulata
„ maculata
Œnanthe crocata
Scabiosa Columbaria
Silybum Marianum
Echium vulgare
Mentha viridis
Epipactis latifolia
Serrafalcus racemosus

Perth, Dunkeld, Birnam Glen, Rumbling Bridge, Strath Braan.

Saturday, 17*th July* 1869.

Party of 34 met at the Waverley Bridge—Edinburgh, Perth, and Dundee Station—at 6.20 a.m. and proceeded to Perth. Breakfasted in Railway Refreshment Rooms (Mr. M'Donald). At breakfast the party were joined by Dr. Lauder Lindsay, Dr. Bramwell, Rev. Mr. Lowe, and Mr. Dawson. After breakfast the party crossed the Tay by the Railway Bridge to Barnhill Toll, examined the north bank for a short distance, and returned to Perth by the Witch Quarry and Bridge End. The party left Perth by train for Dunkeld at 12.45. On arriving at Dunkeld the party proceeded up Birnam Glen for about a couple of miles and then struck across the country to the Rumbling Bridge, returning to Dunkeld by Strath Braan. The party left Dunkeld at 6.15 and reached Edinburgh about 10.30 p.m. Return tickets, 5s. 2d. Breakfast, 1s. 9d.

The following plants were collected :—

Chelidonium majus
Armoracia rusticana
Hesperis matronalis
Lepidium Smithii
Iberis amara
Saponaria officinalis
Cerastium arvense
Hypericum humifusum
Malva moschata
Radiola Millegrana
Geranium pyrenaicum
Genista anglica
Trifolium scabrum
Spiræa salicifolia
Potentilla hirta
„ argentea
Sanguisorba canadensis
Poterium Sanguisorba
Saxifraga aizoides
Sedum album
Astrantia major
Cicuta virosa
Œnanthe crocata
Daucus Carota
Galium boreale
Campanula rapunculoides
Vaccinium Oxycoccus
Linaria repens
Mimulus luteus
Galeopsis versicolor
Lamium maculatum
Polygonum viviparum
Listera cordata
Scheuchzeria palustris

Clova.

Thursday, 22nd July 1869.

Party consisting of J. H. Balfour, Andrew P. Aitken, James C. Allman, W. Bell, John Brown, Alexander Craig Christie, Henry M. Church, Robert F. Colvin, E. C. Craig, J. C. Cruaux, Alfred C. E. Harris, Charles Norton Hayman, G. Forbes Irvine, John Leitch, Thos. Wm. Mawson, Alexander Morrison, John Sadler, Thomas R. Scott, John A. Simpson, J. L. Stewart, M.D., James Tait, James Watters, Fredk. W. Wright, and Holmes Young, met at the Waverley Station at 1.5 p.m. and proceeded by rail, *viâ* Fife, Perth, and Forfar, to Kirriemuir, thence to Clova Ogilvy Arms in two drags and a dogcart, supplied by Christison of the Airlie Arms Hotel, Kirriemuir. Clova was reached about 10 p.m.

Friday, 23rd July 1869.

This day the party proceeded to Acharn in the drags, and thence walked to Glen Dole and examined the rocks on the left

side, then crossed to Glen Fee, returned to Acharn and drove to Clova Hotel, which was reached about 7 o'clock in the evening. Four of the party who had started at 3 a.m. for Little Gilrannoch joined the main body in Glen Dole.

Saturday, 24th July 1869.

After breakfast visited Loch Brandy and the rocks on its left, and returned to the hotel about 12 o'clock noon. After luncheon the party drove to Kirriemuir, which was reached about 4 o'clock. They left Kirriemuir at 5.5 and reached Edinburgh about 11 p.m., the train being fully an hour late. Hotel bill at Clova, 11s. 6d. each. Conveyances, 7s. Railway return tickets, 7s. 6d. Total, £1 6s.

In Glen Dole collected :—

Thalictrum alpinum
Astragalus alpinus
Dryas octopetala
Saxifraga hypnoides
" platypetala
Linnæa borealis
Erigeron alpinus
Saussurea alpina
Sonchus alpinus
Pyrola rotundifolia
" media
" secunda
Malaxis paludosa
(near Acharn)
Tofieldia palustris
Polypodium alpestre

In Glen Fee were collected :—

Oxytropis campestris | Woodsia hyperborea

At Loch Brandy :—

Subularia aquatica
Potentilla maculata
Azalea procumbens
Salix herbacea
Sparganium natans
Allosorus crispus
Botrychium Lunaria
Isoëtes lacustris

The party who visited Little Gilrannoch collected :—

Lychnis alpina | Armeria alpina

Eriophorum alpinum was planted in Glen Dole by J. Sadler.

Arran.

Wednesday, 4th August 1869.

Party consisting of J. H. Balfour, Alexander Dickson, Andrew P. Aitken, Isaac B. Balfour, J. H. Balfour, jun., John M. Bramock, Henry M. Church, Robert Colvin, James B. Davies, J. B. Duncan, R. W. Forrest, William Forrest, M. Jameson, John Sadler, and James Watters, left Edinburgh at 6.20 a.m. and proceeded to Glasgow, which was reached at 7.45. Thence went by the steamboat "Hero," leaving the Broomielaw at 8 a.m. for Arran. On the way they touched at Greenock, Dunoon, and Rothesay. They reached Arran about 2 p.m. and took up their quarters at Bannatyne's Inn, Lamlash. In the evening the party went to dredge in Lamlash Bay, and some visited Holy Island.

The following plants were collected :—

Hypericum Androsæmum
" humifusum
Cotyledon Umbilicus
Apium graveolens
Arctostaphylos Uva-ursi
Scutellaria galericulata
Zostera marina
" nana

Thursday, 5th August 1869.

This morning the party left Lamlash at 8 a.m. and walked to Brodick and Corrie, returning from Corrie by the boat at 1 p.m. In the evening dredging and fishing were carried on.

The plants gathered in the course of the day were :—

Sinapis arvensis
Sagina maritima
Lathyrus latifolius
Œnanthe Lachenalii
" crocata
Aster Tripolium
Matricaria maritima
Anagallis arvensis
" tenella
Samolus Valerandi
Erythræa latifolia
Pinguicula lusitanica
Lycopus europæus
Salicornia herbacea
Suæda maritima
Triticum acutum
" junceum
Hymenophyllum tunbridgense
" Wilsoni
Lastrea æmula
Osmunda regalis

Friday, 6th August 1869.

This morning at 6.45 a.m. the party went by the steamboat "Lady May" to Invercloy. We breakfasted at Macdonald's near Invercloy, and then walked to the top of Goatfell. Returned about 4 p.m. to Lamlash. Very few plants were collected, among them *Alchemilla alpina* and *Salix herbacea.* Some of the party came by boats from Invercloy to Lamlash.

Saturday, 7th August 1869.

The day was very wet and stormy, and it was found impossible to take a botanical trip. There was some boating and fishing in the evening, when the weather cleared slightly.

Monday, 9th August 1869.

At 9.30 this morning went by drag to Lag, then walked round Bennan Head to Kilmorie, Kildonan, Whiting Bay, and Lamlash. Had lunch at Wm. Samson's at Kildonan. Day stormy, with occasional showers.

Among the plants gathered were :—

Hypericum Androsæmum
„ dubium
Lathyrus sylvestris
Carlina vulgaris
Convolvulus sepium
Pinguicula lusitanica
Atriplex arenaria
Scirpus maritimus
Asplenium marinum
Scolopendrium vulgare
Polystichum angulare

Tuesday, 10*th August* 1869.

This morning at 9 the party went by drag to Corrie, expecting to meet Mr. Wunsch, who had arranged to visit the bed of fossil plants near the Fallen Rocks. He did not appear. Party went to Loch Ranza and then went up the stream to the station for *Pyrus fennica,* which was gathered, as also *Drosera anglica, Rhynchospora alba,* and *Carex pauciflora.*

Remained at Corrie (Wm. Morrison's inn) all night.

Thursday, 12*th August* 1869.

Party with the exception of Aitken (who went to Whiting Bay) proceeded by drag to Blackwaterfoot, Drumodune, and King's Caves. Spent the whole day there. Fine day; view very extensive. Porphyrite basaltic rocks at Drumodune about eighty feet high covered with *Ramalina scopulorum*, quite grey with short lichen. Ivy spreading on them.

On the sands gathered *Sinapis monensis*, *Viola sylvatica* (with big roots), *Convolvulus Soldanella*, *Scutellaria galericulata*, *Triticum junceum*; and in King's Caves, *Asplenium marinum*, *Scolopendrium vulgare*, *Osmunda regalis*.

Rain in the evening about 8.

Friday, 13*th August* 1869.

This day party broke up, Dr. Dickson and Mr. Aitken returning to Glasgow, Dr. Balfour remaining in Arran. Plants of *Zostera marina* in fine flower were gathered, and some were taken up in a rooting condition in salt water to Glasgow by Dr. Dickson.

EXCURSIONS IN 1870.

Midcalder, Meadowbank, Dalmahoy, Currie.

Saturday, 14*th May* 1870.

Party of about 100 left the Caledonian Railway Station at 10.20 a.m. and proceeded to Midcalder, thence walked by Meadowbank and Dalmahoy to Currie, which they left by train passing at 4.5 p.m. Return ticket, 1s.

The following plants were collected :—

Caltha palustris	Viola canina
Anemone nemorosa	„ lutea
Viola palustris	Lychnis diurna

Stellaria Holostea
Montia fontana
Prunus spinosa
„ Avium
Geum intermedium
Chrysosplenium oppositifolium
Myriophyllum spicatum
Adoxa Moschatellina
Myosotis collina
Scrophularia vernalis
Mercurialis perennis
Anacharis Alsinastrum
Typha angustifolia
Blechnum boreale
Lastrea dilatata
Equisetum limosum

Besides Musci, Lichens, Hepaticae, Alga, and Fungi.

Burntisland, Aberdour Woods.

Saturday, 21*st May* 1870.

Party of 130 (including 25 ladies) met at the Waverley Station at 9.45 a.m. and proceeded to Burntisland, thence walked to Aberdour Woods. Returned from Burntisland by boat leaving at 3 p.m. Return ticket, 1s.

The following plants were collected :—

Erysimum cheiranthoides
Camelina sativa
Lepidium Draba
Viola hirta
Sagina maritima
Malva sylvestris
Erodium cicutarium
Vicia sativa
Saxifraga granulata
Myrrhis odorata
Echium vulgare
Primula elatior
Glaux maritima
Salvia Verbenaca
Plantago Coronopus
Parietaria diffusa
Listera ovata
Orchis mascula
Endymion nutans
Blysmus rufus
Asplenium Adiantum-nigrum
Ophioglossum vulgatum

Also species of Marine Algæ, Mosses, and Lichens.

Canal, Slateford, Colinton.

Saturday, 4th June 1870.

A party of 55 met at the Canal Basin, Port Hopetoun, at 11 a.m. Walked by banks of Canal to Slateford, thence walked by Colinton to Edinburgh, which was reached about 5 p.m.

The following plants were collected :—

Corydalis lutea
Cardamine amara
Geranium phæum
" sylvaticum
Geum intermedium
Fragaria elatior
Saxifraga umbrosa
" hypnoides
Sanicula europæa
Asperula odorata
Valeriana pyrenaica
Doronicum Pardalianches
Vinca minor
Symphytum officinale
Anacharis Alsinastrum
Potamogeton perfoliatus
" pectinatus
Polypodium Dryopteris

Penicuik.

Saturday, 11th June 1870.

A party of 66 met at North British Railway Station at 7.45 a.m. and proceeded to Penicuik.

Walked through Penicuik Glen (Sir James Clark's) under the guidance of Mr. Evans. Returned by train passing Penicuik at 2.49 p.m. Fare, 1s.

Plants collected :—

Trollius europæus
Montia fontana
Sanicula europæa
Viburnum Opulus
Asperula odorata
Valeriana pyrenaica
Apargia hispida
Campanula latifolia
Vaccinium Myrtillus
Pyrola minor
Myosotis cæspitosa
" palustris
Veronica Buxbaumii
Rhinanthus Crista-galli
Melampyrum pratense
Lathræa Squamaria
Littorella lacustris
Neottia Nidus-avis
Orchis latifolia
Habenaria chlorantha
Iris Pseudacorus
Allium ursinum
Luzula sylvatica
Juniperus communis
Polypodium Phegopteris
Botrychium Lunaria

Alloa, Menstrie Glen, Stirling.

Saturday, 18*th June* 1870.

Party of 35 met at the Waverley Bridge at 8.45 a.m. and proceeded to Alloa. Met Drs. Brotherston and Duncanson, who accompanied us during the day. Visited Menstrie Glen, walked to Stirling, which we left for Edinburgh at 3 p.m. Fare, 3s.

The following plants were collected :—

Fumaria pallidiflora
Lychnis vespertina
" Viscaria
Geranium sylvaticum
" lucidum
Sedum Telephium
" album
" anglicum
Sanicula europæa
Conium maculatum
Pyrola minor
Chenopodium Bonus-Henricus
Corallorrhiza innata
Orchis latifolia
Habenaria chlorantha
Iris Pseudacorus
Potamogeton lucens
Hymenophyllum Wilsoni
Lastrea spinulosa

Kirkcaldy, Raith.

Saturday, 25*th June* 1870.

Party of 83 met at the Waverley Bridge at 6.20 a.m. and proceeded to Kirkcaldy, where they were entertained to breakfast in Scott's Hotel by Provost Swan. After breakfast visited ponds and woods of Raith, and also the shore near the town. At 2 o'clock the party returned to Provost Swan's house for lunch and left by train passing Kirkcaldy at 2.25 p.m. Return ticket, 1s.

The following plants were collected :—

Thalictrum minus
Papaver somniferum
Reseda lutea
Malva moschata
Geranium sanguineum
Trifolium striatum
Astragalus hypoglottis
Geum intermedium
Potentilla fruticosa
Epilobium angustifolium
Ribes alpinum
Valeriana pyrenaica
Doronicum Pardalianches
Vinca minor
Echium vulgare
Mimulus luteus
Rhinanthus Crista-galli
Calamintha Clinopodium
Listera ovata
Ruscus aculeatus
Typha angustifolia
Alisma Plantago

Perth, Almond Bank, Springfield, Methven Bog, Scone, Kinnoul.

Saturday, 2nd July 1870.

Party of 46 met at the Waverley Station at 6.20 a.m. and proceeded (*viâ* Fife) to Perth. Breakfasted at Refreshment Rooms, Perth Station, after which the party walked across the North Inch, along the banks of the Tay and Almond to Pitcairn Field, where Mr. Dawson had provided beer for the party, which was very acceptable, the day being exceedingly warm. From Springfield walked to Methven Bog, and left Almond Bank Station for Perth by train at 4.10 p.m. Some went to Scone and Kinnoul Hill. Return ticket, 4s. Breakfast, 1s. 9d. Railway ticket from Almond Bank to Perth, 3½d.

The following plants were collected :—

Thalictrum flexuosum
Nasturtium palustre
Hesperis matronalis
Iberis amara
Silene maritima
Stellaria nemorum
Hypericum maculatum
Malva moschata
Geranium sanguineum
Genista anglica
Astragalus Glyciphyllos
Alchemilla alpina
Poterium Sanguisorba
Sedum reflexum
Helosciadium inundatum
Linnæa borealis
Asperula taurina
Valeriana pyrenaica
Carduus heterophyllus
Apargia autumnalis
Lactuca virosa
Vaccinium Oxycoccus
Moneses grandiflora
Armeria maritima
Trientalis europæa
Linaria repens
Plantago maritima
Littorella lacustris
Polygonum viviparum
Epipactis latifolia
„ ensifolia
Habenaria chlorantha
Alisma Plantago
Scheuchzeria palustris
Carex limosa
Ceterach officinarum
Lastrea spinulosa

Drem, Gullan, Aberlady.

Saturday, 9th July 1870.

Party of 26 met at the Waverley Station at 7 a.m. and proceeded to Drem; walked to Gullan and Aberlady. Returned

by train passing Longniddry at 3.50 p.m. Return tickets, 1s. 6d.

The following plants were collected :—

Papaver somniferum
Senebiera Coronopus
Silene noctiflora
Sagina nodosa
Lepigonum marinum
Malva moschata
Geranium pusillum
Trifolium medium
Sedum album
„ reflexum
Smyrnium Olusatrum
Pulicaria dysenterica
Carduus nutans
Campanula glomerata
Anagallis tenella
Erythræa Centaurium
Echium vulgare
Hyoscyamus niger
Limosella aquatica
Utricularia vulgaris
Lamium amplexicaule
Ballota fœtida
Hippophaë rhamnoides
Alisma Plantago
Carex teretiuscula

Callander, Loch Lubnaig, Ben Ledi.

Saturday, 16*th July* 1870.

Party of 65 met at the Waverley Station at 6.50 a.m., proceeded to Callander, breakfasted there in M'Gregor's Hotel. Professor Dickson with five pupils from Glasgow joined the party. Thereafter walked by Pass of Leny and Loch Lubnaig to Ben Ledi, which was ascended by way of the Stank. Summit reached about 4 p.m. Callander was reached about 6.15 p.m. Left Callander at 7.30. Return ticket, 4s. 4d. Breakfast, 1s. 9d.

The following plants were collected :—

Thalictrum alpinum
Nymphæa alba
Draba incana
Silene acaulis
Alchemilla alpina
Saxifraga oppositifolia
„ nivalis
„ stellaris
Epilobium alpinum
Pimpinella magna
Œnanthe pimpinelloides
(on the side of the approach leading to Leny House. The first time this plant has been collected in Scotland)

Galium boreale
Gnaphalium sylvaticum
" supinum
Crepis paludosa
Vaccinium Oxycoccus
Menyanthes trifoliata
Polygonum viviparum
Malaxis paludosa
Gymnadenia albida
Alisma Plantago
Cryptogramme crispa
Asplenium viride
Polystichum Lonchitis
Botrychium Lunaria
Lycopodium alpinum

Loch Lomond, Ben Voirlich.

Friday, 22nd July 1870.

Party of 26 met at the Waverley Station at 2 p.m. and proceeded by Glasgow and Balloch to the head of Loch Lomond. At Glasgow the party was joined by Professor Dickson and two pupils. The party then consisted of J. H. Balfour, Alexander Dickson, Tom Anderson, I. B. Balfour, John R. Blandshard, James H. Bogle, J. H. Balfour Browne, Henry M. Church, F. S. Fraser, J. S. T. Gow, S. Grunnell, R. M. Gunn, J. Leitch, David B. Logie, Alex. Loughton, Edward M'Callum, E. D. M'Kellar, Richd. Raimes, junr., A. Clunies Ross, Frederick J. C. Ross, John Sadler, Robert Scott, J. S. Shaw, J. E. Sinclair, George W. Smellie, E. W. F. Steven, John R. Warren, Wm. G. T. Watt, J. Watters.

Remained at Inverarnan Hotel for the night.

Saturday, 23rd July 1870.

After an early breakfast they left the hotel about 7.30 a.m. and proceeded to Ben Voirlich, the summit of which was reached about 12.30 p.m. The party returned to Ardlui in time to catch the 4.10 p.m. boat for Balloch. Messrs. Leitch, Ross, and Sadler went to Tarbet and collected *Hymenophyllum tunbridgense.* Edinburgh was reached about 11.15 p.m. The day was excessively hot. Return tickets, 6s. 2d. Hotel expenses, 7s. 6d. Other expenses, 4s. 6d.

The following plants were collected :—

Thalictrum alpinum
Cochlearia alpina
Silene acaulis
Rubus saxatilis
Sibbaldia procumbens
Saxifraga stellaris
„ aizoides
Sedum Rhodiola
Peplis Portula
Lythrum Salicaria
Epilobium alpinum
Saussurea alpina
Hieracium alpinum
Vaccinium uliginosum
Armeria maritima
Lysimachia vulgaris
Melampyrum montanum
Stachys ambigua
Polygonum Hydropiper
„ viviparum
Oxyria reniformis
Salix herbacea
Malaxis paludosa
Habenaria chlorantha
(some specimens measuring twenty-three inches long, near Inverarnan)
Luzula spicata
Carex rigida
Poa Balfourii
Hymenophyllum tunbridgense
„ Wilsoni
Allosorus crispus
Asplenium viride
Athyrium Filix-fœmina
(fifty-one inches high)
Polystichum Lonchitis
Lastrea spinulosa
Polypodium alpestre
Lycopodium inundatum

Planted *Scheuchzeria palustris* near inn and on hill.

Killin.

Thursday, 4*th August* 1870.

Party, consisting of J. H. Balfour, Aitken, G. G. Balfour, Isaac Balfour, Alexander Dickson, Sadler, Shaw, left Edinburgh by train at 4.10 for Callander, where they were joined by Dr. Walker, from Glasgow. They proceeded to Killin Station by train. The station is about 4 miles from Killin, and the party were conveyed to Killin in coaches. They reached Lochay Bridge Inn between 8 and 9, and were all accommodated by John Cameron and his wife, who were very attentive. Duncan Mackay was employed as a guide.

Friday, 5th August 1870.

This morning at 8.30, after breakfast, the party went to Craig Chailliach. They were joined by Mr. John Cameron and his brother, sons of the parish schoolmaster of Killin. The former had been a pupil of Professor Dickson's in Glasgow. We visited the rocks, and gathered :—

Thalictrum alpinum
Cochlearia officinalis
Silene maritima
„ acaulis
Cerastium alpinum
Sagina saxatilis
„ nivalis
(a new station for it)
Rubus saxatilis
„ Chamæmorus
Dryas octopetala
Potentilla maculata
Sibbaldia procumbens
Saxifraga nivalis
„ stellaris
„ aizoides
Adoxa Moschatellina
(very large, and near top of mountain)
Gnaphalium supinum
Saussurea alpina
Armeria maritima
Veronica humifusa
Polygonum viviparum
Salix arbutifolia
„ herbacea
„ reticulata
Tofieldia palustris
Juncus trifidus
„ triglumis
Carex atrata
„ rigida
„ pilulifera
„ capillaris
Sesleria cærulea
Asplenium viride
Polystichum Lonchitis
Botrychium Lunaria
Conostomum boreale
Andreæa alpina
Solorina crocea
Sticta scrobiculata

Saturday, 6th August 1870.

This morning, at 8 o'clock, party of 10 started in two cars for a farmhouse about 7 or 8 miles up the Lochay. We then ascended Corrach Uachdar. We gathered all the ordinary alpine plants. Among others :—

Rubus Chamæmorus
(in fruit)
Dryas octopetala
Saxifraga nivalis
Saussurea alpina
(in fine flower)
Vaccinium uliginosum
Arctostaphylos Uva-ursi
Asplenium viride
Polystichum Lonchitis
Bryum julaceum
„ alpinum
Encalypta ciliata
Solorina saccata
Peltidea aphthosa

Returned to the inn about 4.30 p.m. The day was charming and the scenery beautiful. On our return we had tea-dinner, and then went at 7 p.m. to the church at Killin to hear a popular lecture on Botany by Mr. Sadler. The lecture was listened to by a large and attentive audience. The Rev. R. F. Colvin arrived this evening by train, and thus made our party up to twelve.

In the grounds at Finlarig Castle ruins there are some very large chestnut-trees. One was measured sixteen feet nine inches in circumference, and another seventeen feet in circumference at about three feet from the ground.

Monday, 8th August 1870.

This day we were joined by a young lad called Thomson, from Edinburgh (son of R. D. Thomson). Drove to Lawers Inn in two conveyances. Met Miss Sophia Jex-Blake and her sister, Caroline Ann Jex-Blake, who accompanied us up Ben Lawers. In the course of the forenoon thick mist came on, and the ladies returned after reaching the part of the mountain where Lochnagar was visible. Mr. Colvin had previously returned, as well as George. We went along the side of the corrie where *Sagina nivalis* grows, and gathered plants of it. We saw also many specimens of *Cherleria sedoides*, and *Juncus triglumis*. The mist became very thick, and we found our way towards Lochan-a-Chait, there examined the rocks, also the loch. We reached this with difficulty on account of the mist. Found *Myosotis alpestris*. Mr. Cameron and Mr. Shaw went to the rocks, and called loudly to each other in the mist with the view of knowing where each of them was. The sound of their voices was responded to by a call from some one high up on the rocks. Mr. Cameron answered the call and ascended the rocks, and to his astonishment found that it was the Misses Jex-Blake, who had lost their way and had wandered in the mist into the dangerous position in which they were now placed. We conducted them down the rocks, and after some difficulty got them brought home thoroughly tired and drenched. We returned late in the evening to Killin.

Among the plants gathered were:—

Draba incana
Cochlearia officinalis
Arenaria maritima
Erigeron alpinus
Veronica saxatilis
Utricularia minor
Sparganium natans
Carex dioica
Carex Persoonii
„ atrata
„ pilulifera
Poa alpina
„ Balfourii
Asplenium viride
Polystichum Lonchitis
Polypodium alpestre

Tuesday, 9th August 1870.

This morning we were joined by Mr. Archibald Gibson and Mr. J. J. Thomson. We had three conveyances, which started at 8.30 a.m. for the pass over to Glen Lyon. We visited Larig-an-lochan and the rocks above it where *Woodsia hyperborea* was said to exist still. It used to abound in that locality, but we looked in vain for the plant to-day.

We then ascended the hill to the east and pass to Ben Lawers; walked round on its northern side to Ben Lawers.

We saw *Alsine rubella*, *Erigeron alpinus*, *Gentiana nivalis* (some quantity), *Myosotis alpestris*, and many other alpine plants.

We then ascended to the top of Ben Lawers, and had a glorious view, the day being clear and warm. On the summit we gathered *Draba rupestris*, *Saxifraga cernua*, *Polypodium alpestre*, and other alpine species.

Descended to Carnic about 6.30 p.m., and returned to Killin.

Wednesday, 10th August 1870.

This morning at 8 o'clock the party proceeded in two conveyances to Cherai, at the foot of Meall Ghaordie. The party ascended to the summit of Meall Ghaordie, gathering a few ordinary alpine plants on the way. The day was very hot and oppressive, and water was deficient. A quantity of tea was taken up the hill, which proved very refreshing. On reaching the summit the party descended on the side of the mountain next to Glen Lyon and a farmhouse called Stoneriach. They gathered *Cystopteris montana*, *Bartsia alpina*, and many good alpine species. They

returned to the foot of the hill about 5.30 p.m., and then proceeded in a conveyance to Killin.

The adventures of the last three days (8th, 9th, and 10th August) led to the formation of the Scottish Naturalists' Alpine Club, to consist of naturalists who are in the habit of visiting alpine districts in Scotland for the sake of natural science. No one to be admitted who had not ascended on foot at least three Scottish mountains of not less than 3300 feet above the level of the sea. Each person, before admission, must give a list of the mountains he has ascended.

The following were declared to be the original members of the Club, all of them having proved their qualification :—Professor Dickson, Rev. R. F. Colvin, Dr. Walker, Mr. Church, Mr. Aitken, Mr. Shaw, Mr. Sadler, Mr. Gibson, and Mr. I. B. Balfour.

A meeting of the members to be afterwards held at Edinburgh to arrange the rules and plan of procedure of the Club.

Thursday, 11*th August* 1870.

Another fine and dry day. This day the party broke up. Among the plants collected during the excursion were the following :—

Corydalis claviculata
Draba incana
„ rupestris
Cochlearia alpina
Silene acaulis
Cerastium alpinum
Alsine rubella
Cherleria sedoides
Sagina saxatilis
„ nivalis
Rubus suberectus
Dryas octopetala
Potentilla maculata
Alchemilla alpina
Saxifraga oppositifolia
Saxifraga nivalis
„ stellaris
„ aizoides
„ cernua
„ hypnoides
Sedum villosum
Epilobium alsinifolium
„ alpinum
Meum athamanticum
Erigeron alpinus
Gnaphalium supinum
Saussurea alpina
Hieracium alpinum
„ Lawsoni
„ corymbosum

Vaccinium uliginosum
Arctostaphylos Uva-ursi
Armeria maritima
Gentiana nivalis
Myosotis alpestris
Veronica humifusa
„ saxatilis
Bartsia alpina
Utricularia minor
Plantago maritima
Salix venulosa
„ arbutifolia
„ herbacea
„ reticulata
Gymnadenia albida
Habenaria viridis
Juncus biglumis
„ triglumis
Luzula spicata
Sparganium natans
Carex dioica
„ atrata
„ stictocarpa
„ capillaris
„ pulla
Sesleria cærulea
Poa alpina
„ Balfourii
Cryptogramme crispa
Asplenium viride
Cystopteris montana
Polystichum Lonchitis
Polypodium alpestre
Botrychium Lunaria
Sphagnum molluscum
Andreæa alpina
„ rupestris
Gymnostomum curvirostrum
Blindia acuta
Campylopus longipilus
Distichium capillaceum
Tortula tortuosa
Encalypta ciliata
Grimmia torta
Zygodon Mougeotii
Pogonatum alpinum
Bryum elongatum
„ pseudotriquetrum
„ alpinum
„ julaceum
„ Zierii
Amblyodon dealbatum
Bartramia Oederi
„ Halleriana
Conostomum boreale
Anœctangium compactum
Leskea rufescens
Hypnum trifarium
„ rugosum
„ aduncum
Fontinalis antipyretica
Sticta scrobiculata
„ sylvatica
„ pulmonaria
Cetraria islandica
„ glauca
Peltidea aphthosa
„ venosa
Solorina crocea
„ saccata
Umbilicaria proboscidea
Cornicularia tristis
Thamnolia vermicularis
Sphærophoron coralloides
„ compressum
Stereocaulon paschale
Cladonia bellidiflora
„ uncialis
Usnea barbata
Alectoria jubata
„ bicolor

EXCURSIONS IN 1871.

Kinghorn, Burntisland.

Saturday, 13*th May* 1871.

Party of 120 met at the Waverley Station at 9.10 a.m. and proceeded to Kinghorn. Botanised along the shore to Burntisland, and returned to Edinburgh by boat leaving Burntisland at 2.59 p.m. Return ticket, 1s.

The following plants were collected :—

Fumaria pallidiflora
Cheiranthus Cheiri
Alyssum calycinum
Brassica campestris
Lepidium Smithii
" Draba
Thlaspi arvense
Viola canina
Cerastium arvense
Honckenya peploides
Erodium cicutarium
Vicia lathyroides
Saxifraga granulata
Myrrhis odorata
Scandix Pecten-Veneris
Dipsacus sylvestris
Linaria Cymbalaria
Salvia Verbenaca
Lamium amplexicaule
" incisum
Atriplex Babingtonii
Rumex Acetosa
Hippophaë rhamnoides
Carex arenaria
Asplenium marinum
Ophioglossum vulgatum
Botrychium Lunaria

Penicuik, Roslin.

Saturday, 20*th May* 1871.

Party of 92 met at the Waverley Station at 7.45 a.m. and proceeded to Penicuik. Botanised by the Esk to Roslin. Returned by train passing Roslin at 2.59 p.m. Return ticket, 1s.

The following plants were collected :—

Anemone nemorosa
Ranunculus auricomus
Cardamine amara
Brassica campestris
Viola canina
Stellaria Holostea
Geranium sylvaticum
Oxalis Acetosella

Prunus Padus
Saxifraga granulata
Sanicula europæa
Adoxa Moschatellina
Asperula odorata
Valeriana pyrenaica
Doronicum Pardalianches
Pyrola *minor*
Symphytum officinale
Neottia Nidus-avis
Allium ursinum
Melica uniflora
Polypodium Dryopteris
„ Phegopteris
Blechnum boreale
Ophioglossum vulgatum
Equisetum maximum
„ umbrosum

Currie, Colinton, Slateford, Canal.

Saturday, 27th May 1871.

Party of 60 left the Caledonian Station at 10.20 a.m. and proceeded to Currie. Returned to Edinburgh by the banks of the Water of Leith, Colinton, Slateford, and the Canal. Single ticket to Currie, 5d.

The following plants were collected :—

Ranunculus auricomus
Berberis vulgaris
Papaver Argemone
Cardamine amara
Viola odorata
Geranium sylvaticum
„ lucidum
Geum intermedium
Fragaria elatior
Saxifraga umbrosa
„ hypnoides
Sanicula europæa
Carum Carui
Asperula odorata
Valeriana pyrenaica
Doronicum Pardalianches
Lysimachia thyrsiflora
Polemonium cæruleum
Anacharis Alsinastrum
Ruscus aculeatus
Allium Schœnoprasum
„ ursinum
Potamogeton crispus
„ pectinatus
Melica uniflora

Longniddry, Prestonpans.

Saturday, 3rd June 1871.

Party of 108 met at the Waverley Station at 10.30 a.m. and proceeded to Longniddry, thence walked by the shore to

Prestonpans, from which they returned to Edinburgh by train at 3.20 p.m. Return ticket, 1s. 1d.

The following plants were collected :—

Thalictrum minus
Berberis vulgaris
Alliaria officinalis
Astragalus hypoglottis
Vicia lathyroides
Potentilla verna
Saxifraga tridactylites
Senecio viscosus
Carduus nutans
Thrincia hirta
Leontodon lævigatus
Glaux maritima
Cynoglossum officinale
Anchusa sempervirens
Lycium barbarum
Hyoscyamus niger
Rhinanthus Crista-galli
Lamium amplexicaule
Ballota fœtida
Plantago maritima
Hippophaë rhamnoides
Orchis incarnata
Blysmus rufus
Sclerochloa rigida
Asplenium Adiantum-nigrum
Equisetum palustre
Uredo Rosæ

South Queensferry, North Queensferry.

Saturday, 10*th June* 1871.

Party of 80 left the Waverley Station at 11.45 a.m. and proceeded to South Queensferry, thence crossed in ferryboat to North Queensferry. Returned to South Queensferry, and thence by train at 7.30 p.m. to Edinburgh. Return railway ticket, 1s. 1d.; return boat ticket, 6d.

The following plants were collected :—

Ranunculus sceleratus
Aquilegia vulgaris
Viola canina
Sagina maritima
Trifolium striatum
Astragalus Glyciphyllos
Vicia lutea
Sedum villosum
Œnanthe crocata
Valerianella dentata
Senecio viscosus
Veronica scutellata
Salicornia herbacea
Allium Schœnoprasum
Asplenium Adiantum-nigrum
Ophioglossum vulgatum

Melrose, Eildon Hills.

Saturday, 17*th June* 1871.

Party of 90 left the Waverley Station at 10.5 a.m. and proceeded to Melrose, visited Eildon Hills, &c., and returned by train passing Melrose at 6.53 p.m. Return ticket, 3s.

The following plants were collected :—

Berberis vulgaris
Camelina fœtida
Raphanus Raphanistrum
Viola lutea, var. cærulea
Cerastium glomeratum
„ arvense
Stellaria glauca
Geranium sylvaticum
Trifolium hybridum
Vicia sativa
Geum intermedium
Torilis Anthriscus
Valeriana dioica
Anthemis arvensis
Vaccinium Vitis-Idæa
Pedicularis sylvatica
Rhinanthus Crista-galli
Rumex viridis
Empetrum nigrum
Listera ovata
Orchis latifolia
„ maculata
Carex panicea
Alopecurus geniculatus
Allosorus crispus

Cupar, Loch Malong, Logie, Forret, Leuchars.

Saturday, 24*th June* 1871.

Party of 52 left the Waverley Station (Edinburgh, Perth, and Dundee section) for Cupar by train at 6.45 a.m. At Cupar they were entertained to breakfast by Mr. Thomas Barclay, Sheriff-Clerk, in the Royal Hotel. At breakfast they were joined by several gentlemen belonging to the neighbourhood. After breakfast they walked by Loch Malong, Logie, and Forret to Leuchars, from which they returned by train at 5.39 p.m. Return ticket, 3s.

The following plants were collected :—

Chelidonium majus
Hesperis matronalis
Lepidium Smithii
Teesdalia nudicaulis
(about half-way between Forret and Leuchars)

Cerastium arvense
Sagina subulata
Malva moschata
Geranium phæum
Medicago sativa
Trifolium medium
Saxifraga umbrosa
Sedum reflexum
Œnanthe crocata
Anthemis Cotula
Doronicum Pardalianches
Senecio viscosus
Carduus Marianus
Centaurea Scabiosa
Pyrola minor
Trientalis europæa
Vinca minor
Polemonium cæruleum
Scrophularia vernalis
Rhinanthus major
(about half-way between Forret and Leuchars)
Littorella lacustris
Salix repens
Listera cordata
Gymnadenia conopsea
Lastrea spinulosa
Botrychium Lunaria
Lycopodium Selago
„ clavatum
„ alpinum

East Linton, Tynningham, Drem.

Saturday, 1*st July* 1871.

Party of 54 left the Waverley Station at 10.30 a.m. for East Linton, visited Tynningham, and returned by luggage train to Drem from East Fortune, and thence by passenger train to Edinburgh, which was reached at 8.15 p.m. Return tickets, 2s.

The following plants were collected :—

Chelidonium majus
Hesperis matronalis
Lepidium Smithii
Teesdalia nudicaulis
Viola lutea
Cerastium arvense
Sagina subulata
Malva moschata
Geranium phæum

Bridge of Allan, The Allan, Foal Bridge, Wharry Burn, Westerton, Stirling.

Saturday, 8*th July* 1871.

Party of 64 left the Waverley Station at 7.10 a.m. and proceeded to Bridge of Allan, where they breakfasted in Philp's Royal

Hotel. At breakfast they were joined by Rev. Dr. Ross and Dr. Paterson ; the latter accompanied the party during the day. Dr. Hunter, Linlithgow, also accompanied the party. They botanised by Westerton, along the banks of the Allan as far as the Foal Bridge, thence up the Auld Wharry Burn, and returned by the public road to Bridge of Allan, which was reached about 2.30 p.m. After visiting the Macfarlane Museum they proceeded to Stirling, where they examined particularly the Castle Rock. They returned to Edinburgh by train leaving Stirling at 6.15 p.m. Return ticket, 3s. 3d. Breakfast, 2s.

The following plants were collected during the first part of the excursion :—

Stellaria nemorum
Geranium sylvaticum
Trifolium medium
Vicia sylvatica
Agrimonia Eupatoria
Saxifraga hypnoides
Sedum anglicum
Viburnum Opulus
Senecio aquaticus
Calamintha Clinopodium
Parietaria diffusa
Paris quadrifolia
Neottia Nidus-avis
(in quantity)
Listera ovata

On the Castle Rock were collected :—

Aquilegia vulgaris
Brassica campestris
Sedum album
" reflexum
Conium maculatum
Petroselinum sativum
Silybum Marianum
Lactuca virosa
Echium vulgare
Atropa Belladona
Verbascum Lychnitis

Rumbling Bridge, Banks of Devon, Dollar.

Saturday, 15*th July* 1871.

Party of 62 left the Waverley Station at 7.10 a.m. and proceeded to Rumbling Bridge *viâ* Stirling, breakfasted in a marquee at

Rumbling Bridge Hotel, thence proceeded down the banks of the Devon to Dollar. Some of the party took the left hand while others took the right. They left Dollar by train at 4.30 p.m. The day was very wet. The party was joined by Rev. Mr. Moncrieffe and Mr. Westwood. Return ticket, 3s. 9½d. Breakfast, 1s. 9d.

The following plants were collected :—

Trifolium medium
Vicia sylvatica
Spiræa salicifolia
Rubus saxatilis
Saxifraga umbrosa
Ribes nigrum
Sedum Telephium
Viburnum Opulus
Eupatorium cannabinum
Carduus heterophyllus
Pyrola minor
Trientalis europæa
Symphytum officinale
Lathræa Squamaria
Mentha velutina
Melittis Melissophyllum
Polygonum Bistorta
Rumex alpinus
Neottia Nidus-avis
Habenaria viridis
„ chlorantha
Convallaria majalis
Paris quadrifolia
Carex remota
„ ovalis
Melica uniflora
Cystopteris fragilis
Lastrea Oreopteris
Polypodium Dryopteris
„ Phegopteris
Equisetum umbrosum

EXCURSIONS IN 1872.

Roslin, Polton.

Saturday, 11*th May* 1872.

Party of 127 met at North British Railway Station at 10.30 a.m. and proceeded to Roslin. Walked through Roslin Woods to Polton and returned to Edinburgh by train leaving Polton at 3.30 p.m. Return ticket, 1s.

The following plants were collected :—

Anemone nemorosa
Ranunculus auricomus
„ Ficaria
Caltha palustris
Cardamine pratensis
„ hirsuta
Draba verna
Alliaria officinalis
Viola odorata
„ sylvatica
Stellaria nemorum
„ Holostea
Arenaria trinervia
Geranium sylvaticum
Oxalis Acetosella
Vicia sylvatica
„ sepium
Lathyrus macrorrhizus
Prunus communis
„ domestica
Prunus Padus
Geum rivale
„ intermedium
Pyrus communis
Cratægus Oxyacantha
Ribes alpinum
„ rubrum
Adoxa Moschatellina
Asperula odorata
Vaccinium Myrtillus
Vinca minor
Symphytum tuberosum
Myosotis sylvatica
Veronica montana
Lathræa Squamaria
Polygonum Bistorta
Daphne Laureola
Carex pendula
Melica nutans
„ uniflora

Gorebridge, Arniston, Dalhousie.

Saturday, 18th May 1872.

Party of 109 met at the Waverley Station at 1.5 p.m. and proceeded to Gorebridge, thence walked through Arniston Woods going to Dalhousie Station, which was left at 7.20 p.m. Return ticket, 1s.

Plants collected :—

Aquilegia vulgaris
Aconitum Napellus
Viola palustris
Geranium sylvaticum
Acer platanoides
Prunus Padus
Saxifraga Geum
„ umbrosa
Chrysosplenium alternifolium
Ribes rubrum
„ nigrum
Viburnum Lantana
Asperula odorata
Doronicum Pardalianches
Leontodon lævigatus
Pyrola minor
Primula caulescens
Vinca minor
Pulmonaria officinalis

Myosotis sylvatica
Veronica Buxbaumii
" montana
Lathræa Squamaria
Orchis mascula
Galanthus nivalis
Allium paradoxum
Lilium Martagon
Arum maculatum
Triglochin palustre
Carex paludosa
Polypodium Dryopteris
" Phegopteris
Equisetum maximum
Philonotis strobilina

South Queensferry, North Queensferry, Inverkeithing.

Saturday, 25*th May* 1872.

Party of 88 met at the Waverley Station at 9.10 a.m. and proceeded by train to South Queensferry, thence by boat to North Queensferry, walked by the shore to Inverkeithing, and returned to North Queensferry by Ferry Hills in time for boat at 2.30 p.m. Reached Edinburgh about 4 p.m. Return railway ticket, 1s. 1d. Return boat ticket, 6d.

Some went to St. Davids and Donibristle and collected *Tulipa sylvestris* and *Ornithogalum umbellatum.*

The following plants were collected :—

Thalictrum flexuosum
Ranunculus auricomus
Cheiranthus Cheiri
Hesperis matronalis
Thlaspi arvense
Helianthemum vulgare
Viola hirta
" canina
Sagina maritima
Lepigonum marinum
Montia fontana
Geranium lucidum
Trifolium striatum
Anthyllis Vulneraria
Astragalus Glyciphyllos
Vicia lutea
Fragaria elatior
Saxifraga umbrosa
" granulata
Carum Carui
Anthriscus vulgaris
Œnanthe crocata
Lonicera Xylosteum (South Queensferry)
Asperula odorata
Filago germanica
Doronicum plantagineum
Senecio sylvaticus
Leontodon palustris
Armeria maritima
Primula caulescens
Anagallis arvensis
Myosotis versicolor
Plantago Coronopus

Scleranthus annuus
Hippophaë rhamnoides
Ulmus montana
Listera ovata
Orchis mascula
Narcissus poeticus
Allium Schœnoprasum
„ ursinum
Endymion nutans
Lemna minor
Triglochin maritimum
Carex alpina
„ glauca
Asplenium Adiantum-nigrum

Sea-weeds demonstrated on shore.

Kilconquhar, Elie.

Saturday, 1st June 1872.

Party of 58 met at the Waverley Station at 9.45 a.m. and proceeded to Kilconquhar, botanised Earlsferry coast and Kilconquhar Loch, &c. Returned from Elie at 4.42 p.m. Return ticket, 2s. 8d. The party were guided by Mr. Charles Howie of Largo.

The following plants were collected :—

Malcolmia maritima
Diplotaxis muralis
„ tenuifolia
Alyssum calycinum
(Kilconquhar Station)
Cochlearia danica
Armoracia rusticana
Viola canina
Lepigonum rubrum
Lavatera arborea
Saxifraga tridactylites
Hydrocotyle vulgaris
Symphytum officinale
Lycium barbarum
Beta maritima
Orchis incarnata
Carex aquatilis

Broomlee, West Linton, Dolphinton.

Saturday, 8th June 1872.

Party of 67 met at the Waverley Station at 8 a.m. and proceeded to Broomlee. Visited marshes and woods between West Linton and Dolphinton. Returned from Broomlee at 2.15 p.m. Return ticket, 1s. 6d.

The following plants were collected :—

Viola palustris
„ lutea
Cerastium glomeratum
Genista anglica
Rubus Chamæmorus
(abundantly on the summit of a hill called Mendick, immediately above the *Primula* marsh)
Sedum villosum
Valeriana dioica
Antennaria dioica
Doronicum Pardalianches
Primula farinosa
Pedicularis sylvatica
Pinguicula vulgaris
Salix repens
Potamogeton plantagineus
Eriophorum polystachyon,
var. minor
„ var. elatius
Carex dioica
„ paniculata
„ curta
Botrychium Lunaria

Linlithgow, Cockle Roy, Lochcote, Muiravonside.

Saturday, 15*th June* 1872.

Party of 62 left the Waverley Station at 8.35 a.m. and proceeded to Linlithgow. Under the guidance of Dr. Hunter visited the Palace, thence walked to Cockle Roy, Lochcote, and Muiravonside. Returned by train from Linlithgow at 6.47 p.m. Return ticket, 1s. 6d.

The following plants were collected :—

Trollius europæus
Chelidonium majus
Lepidium Smithii
Viola lutea
Geranium phæum
„ sylvaticum
Fragaria elatior
Saxifraga Geum
„ umbrosa
Ribes alpinum
Sedum villosum
Antennaria dioica
Doronicum Pardalianches
Erythræa Centaurium
Lysimachia thyrsiflora
Symphytum officinale
Myosotis palustris
Scrophularia vernalis
Rhinanthus Crista-galli
Melampyrum pratense
Neottia Nidus-avis
Epipactis latifolia
Habenaria chlorantha
Scirpus sylvaticus
Milium effusum
Melica nutans
Scolopendrium vulgare
Ophioglossum vulgatum

Drem, Gullan, Aberlady, Longniddry.

Saturday, 22nd June 1872.

Party of 30 left the Waverley Station at 10.15 a.m. and proceeded to Drem, thence walked by Gullan and Aberlady to Longniddry. Returned by train passing Longniddry at 7.15 p.m. Return ticket, 1s. 6d.

The following plants were collected :—

Fumaria pallidiflora
Cerastium arvense
Malva moschata
„ rotundifolia
Geranium sanguineum
Trifolium incarnatum
„ striatum
„ fragiferum
Potentilla reptans
Saxifraga tridactylites
Parnassia palustris
Sempervivum tectorum
Hippuris vulgaris
Helosciadium inundatum
Sium angustifolium
Valerianella dentata
Anthemis arvensis
Carduus nutans
Centaurea Scabiosa
Thrincia hirta
Campanula glomerata
Specularia hybrida
Echium vulgare
Hyoscyamus niger
Utricularia vulgaris
Marrubium vulgare
Salicornia herbacea
Orchis incarnata
Habenaria viridis
Blysmus rufus
Carex distans
Lepturus incurvatus, var. *β*. filiformis
Botrychium Lunaria
Equisetum variegatum

Selkirk, Ettrick, Yarrow, Philiphaugh, Bowhill, Newark Castle.

Saturday, 29th June 1872.

Party of 48 met at the Waverley Station at 6.30 a.m. and proceeded to Selkirk. Breakfasted in Drydon's County Hotel, thereafter, under the direction of Rev. Mr. Farquharson, walked to the manse, along to the junction of Ettrick and Yarrow, thence to Philiphaugh, Bowhill, and Newark Castle. Returned to Selkirk and left by special train at 5.45 p.m. The party was

joined by Dr. Gloag, Mr. Douglas, and other members of the Galashiels Naturalists' Field Club. Return ticket, 3s. 3½d. Breakfast, 2s.

The following plants were collected :—

Ranunculus floribundus
Aquilegia vulgaris
Berberis vulgaris
Arabis hirsuta
Teesdalia nudicaulis
Cerastium arvense
Hypericum hirsutum
Geranium sylvaticum
" pratense
Trifolium medium
Vicia sativa, var. β. angustifolia
Rubus rhamnifolius
Poterium Sanguisorba
Saxifraga umbrosa
Sedum villosum
Astrantia major
Sanicula europæa
Pimpinella Saxifraga
Œnanthe crocata
Cornus sanguinea
Viburnum Opulus
Valeriana dioica
Solidago Virgaurea
Anthemis arvensis
Doronicum Pardalianches
Carduus heterophyllus
Crepis virens
Hieracium aurantiacum
" collinum
Campanula latifolia
Lysimachia Nummularia
Trientalis europæa
Symphytum officinale
Anchusa sempervirens
Myosotis cæspitosa
Mimulus luteus
Rhinanthus Crista-galli
Calamintha Clinopodium
Scutellaria galericulata
Plantago media
Gymnadenia conopsea
Habenaria chlorantha
Sparganium ramosum
Alisma Plantago
Potamogeton prælongus
Holcus mollis
Lastrea Oreopteris
Polypodium Dryopteris
Ophioglossum vulgatum
Botrychium Lunaria
Palmella sp.

Morningside, Capel Law, Swanston, Braid Hills, Blackford Hill.

Saturday, 6th July 1872.

Party of 30 met at Morningside Toll-bar at 10 a.m. and proceeded to Capel Law, Swanston, Braid Hills, and Blackford Hill. Returned to Edinburgh by Mayfield at 4.30 p.m.

Among the plants collected were :—

Dianthus deltoides
Lychnis Viscaria
Malva sylvestris
Trifolium medium
„ hybridum
Rosa rubiginosa
Sedum villosum
Epilobium parviflorum
Daucus Carota
Carduus palustris
Vaccinium Vitis-Idæa
Erica cinerea
Verbascum Thapsus
Linaria vulgaris
Stachys sylvatica
Ballota ruderalis
Rumex obtusifolius
Empetrum nigrum
Carex stellulata
„ binervis
Alopecurus geniculatus
Juniperus communis
Asplenium Adiantum-nigrum
Cornicularia aculeata

Leslie, West Lomond Hill, Bishop Hill, Carlan Crags, Loch Leven.

Saturday, 13*th July* 1872.

Party of 40 met at the Waverley Station at 6 a.m. and proceeded to Leslie by train, thence walked to the Waterworks, about two and a half miles from railway station. The party was entertained to breakfast in the open air by Provost Swan. After breakfast the party examined the different filtering ponds and reservoirs which supply the towns of Kirkcaldy and Dysart with water, thence walked to top of West Lomond Hill. Some of the party visited Bishop Hill, Carlan Crags, and Loch Leven. They returned to the place where they breakfasted in the morning and partook of lunch, also provided by Provost Swan. They left Leslie at 4.50 p.m. Return ticket, 2s. 1d.

Plants collected :—

Oxytropis Halleri
Saxifraga hypnoides
Sedum villosum
Epilobium alsinifolium
Galium boreale
Vaccinium Vitis-Idæa
Trientalis europæa
Myosotis palustris
Veronica scutellata
Littorella lacustris
Rumex aquaticus
Listera cordata
Gymnadenia conopsea
Habenaria chlorantha
Potamogeton polygonifolius
Hymenophyllum Wilsoni
Cryptogramme crispa
Asplenium viride
Lastrea Oreopteris
Lycopodium alpinum

Dunkeld, Rumbling Bridge, Murthly.

Saturday, 20th July 1872.

Party of 50 met at the Waverley Station at 6.45 a.m. and proceeded to Dunkeld. Breakfasted in Fisher's Hotel. Visited Rumbling Bridge, and walked to Murthly Asylum by the green-walk and Murthly Castle. Returned by train passing Murthly Station at 6.30 p.m. Return tickets, 5s. 2d. Breakfast, 2s.

Professor Laycock and several students accompanied the party to Murthly. Dr. MacIntosh entertained the party to lunch and tea at the asylum.

The following plants were collected :—

Thalictrum flexuosum
Corydalis claviculata
Hypericum humifusum
Geranium lucidum
Vicia sylvatica
Spiræa salicifolia
Rubus suberectus
„ cæsius
„ saxatilis
Alchemilla alpina
Saxifraga aizoides
Circæa alpina
Galium boreale
Valeriana sambucifolia
Solidago Virgaurea
Carduus heterophyllus
Hieracium boreale
Vaccinium Vitis-Idæa
Trientalis europæa
Calamintha Clinopodium
Stachys Betonica
Polygonum viviparum
Rumex aquaticus
Narthecium ossifragum
Sparganium ramosum
Asplenium viride

Mr. John Sim met the party at Perth and supplied them with specimens of the following plants collected in the neighbourhood :—

Malva moschata
Potentilla erecta
Sanguisorba canadensis
Mentha sylvestris
Plantago media

Clova

Friday, 2nd August 1872.

Party consisting of J. H. Balfour, Alexander Dickson, A. P. Aitken, I. B. Balfour, William Craig, Tom Drummond, John

Leitch, Robert Lindsay, John S. Mackay, John Sadler, W. A. Stevenson, and Wm. Stirling, left Edinburgh per North British Railway at 9.35 a.m. by train going *viâ* Fife. Great crowd of passengers, and did not reach Perth till 12.30 p.m., being one hour late, by which time the ordinary train for Forfar had left the station. Special train was despatched and the party reached Forfar Station at 2 p.m. From Forfar the party proceeded to Kirriemuir, which they reached a little after 3 p.m. After dining at the Airlie Arms Hotel the party proceeded by a two-horse drag to the Ogilvy Arms Hotel, Clova, their baggage being sent by a game-cart. They reached Clova about 7.30 p.m., having had rain during the greater part of the journey. They were comfortably accommodated by Mr. Alexander. A meeting of the Scottish Botanical Alpine Club was held in the evening. Dr. Leitch and Dr. Duncanson were elected members of the Club.

Saturday, 3rd August 1872.

After breakfast at 7.30 a.m. the members of the party left the hotel about 8.30 for Glen Dole. Three of the party had a dog-cart up to Acharn, thence they proceeded to the station for *Malaxis paludosa*, which was gathered by all the party. Then walked to the lochs on the western side of the glen, which were examined carefully as far as the lofty mountains called Craig Maid. The party returned to Acharn about 5.30, and were driven to their hotel in three dog-carts, one of them kindly furnished by the Rev. George Smith, minister of Clova, who has just been presented to the parish of Westray, in Orkney, with a stipend of £400 a year. After tea the plants were arranged and put on paper.

Among the plants collected were the following:—

Thalictrum alpinum	Rubus Chamæmorus
Draba incana	Dryas octopetala
Silene acaulis	Potentilla maculata
Astragalus alpinus	Saxifraga oppositifolia
Rubus saxatilis	„ stellaris

Saxifraga hypnoides
Sedum Rhodiola
Epilobium alsinifolium
„ alpinum
Linnæa borealis
Galium boreale
Solidago cambrica
Erigeron alpinus
Antennaria dioica, var. hyperborea
Gnaphalium supinum
Saussurea alpina
Hieracium alpinum
„ Lawsoni
„ murorum, vars. (one with florets semitubular)
Apargia autumnalis
Mulgedium alpinum
Campanula rotundifolia (two plants with flowers having seven petals, seven stamens and normal stigma)
Vaccinium uliginosum
Arctostaphylos Uva-ursi
Pyrola rotundifolia
„ media
„ secunda
Trientalis europæa
Digitalis purpurea (with two flowers in one)
Veronica humifusa
Veronica alpina
„ saxatilis
Polygonum viviparum
Salix repens
„ rupestris
„ venulosa
„ reticulata
Malaxis paludosa
Listera cordata
Orchis mascula (in full flower very high up on the rocks)
Habenaria viridis
Tofieldia palustris
Juncus trifidus
„ triglumis
Luzula spicata
Carex rupestris
„ atrata
„ rigida
„ pilulifera
„ capillaris
Avena pratensis
„ strigosa
Poa Balfourii
Asplenium viride
Botrychium Lunaria
Lycopodium Selago
„ annotinum
„ clavatum
„ alpinum
„ selaginoides

Monday, 5*th* ***August*** 1872.

Breakfast at 7.30 a.m. and proceeded to Acharn. Thence the party visited Glen Fee, botanising the rocks and returning to the hotel about 6 p.m.

Among the plants collected were the following :—

Cochleariá (varieties)
Oxytropis campestris
Sibbaldia procumbens
Saxifraga nivalis
„ hypnoides
„ platypetala
Epilobium alsinifolium
„ alpinum
Saussurea alpina
Hieracium alpinum and
form between alpinum
and Lawsoni
Azalea procumbens
Veronica humifusa
„ alpina
Salix lanata
„ Lapponum
Salix Myrsinites
„ arbutifolia
„ herbacea
„ reticulata
Tofieldia palustris
Eriophorum latifolium
Carex Vahlii
„ atrata
„ vaginata
„ capillaris
„ Grahami (in the old
station in abundance)
Alopecurus alpinus
Poa Balfourii
Hymenophyllum Wilsoni
Woodsia hyperborea

Tuesday, 6th August 1872.

Breakfast at 7.30 a.m. Drove to Acharn in three machines, thence walked through Glen Dole to Jock's Road. Ascended by Jock's Road to falls of White Water, thence by banks of White Water for about a mile, then turned to west by stream which led the party to Little Gilrannoch, a peculiar porphyritic hill remarkable for *Lychnis alpina*. This plant was gathered by the party in full flower.

Among the plants noticed during the excursion were:—

Cochlearia officinalis, var.
grœnlandica
Cerastium triviale, var.
Cherleria sedoides
Rubus Chamæmorus
(in fruit)
Cornus suecica (in fruit)
Vaccinium uliginosum
Azalea procumbens
Pyrola secunda
Armeria maritima, var.
alpina
Trientalis europæa
(very abundant)
Veronica alpina
Salix (several species)
Tofieldia palustris
Juncus castaneus
Luzula spicata
Carex pauciflora
„ aquatilis
„ rariflora
„ capillaris
Alopecurus alpinus

Phleum alpinum
Lycopodium Selago
" annotinum
(in fruit)
" selaginoides
(with macro- and micro-spores alternating on some spikes)
Splachnum mnioides
Splachnum sphæricum
" vasculosum
" (in fruit)
Trichostomum lanuginosum
(on the top of the moraine-mound forming a dense mat three feet thick, passing into peat)

Wednesday, 7th August 1872.

Breakfast at 7.30 a.m. Started at 8.30 for Glen Fee. Examined the corrie on the southern side, visited the station for *Carex Grahami.* The plant was found in fruit in large quantity. Went round the corrie and saw *Carex Vahlii* in abundance, also specimens of *Carex vaginata.* A number of willows were also seen. Examined the tops of several hills, and descended by a deep corrie at the upper part of the glen, where *Cochlearia officinalis, var. alpina,* was growing in large quantity. Day misty and wet in afternoon and unfavourable for botanising. Returned to hotel about 4.30 p.m.

Thursday, 8th August 1872.

Breakfast at 8 o'clock. Proceeded to Loch Brandy. The water being low the party collected in the little loch :—

Subularia aquatica
Callitriche autumnalis
Lobelia Dortmanna
Littorella lacustris
Sparganium natans
Isoëtes lacustris

Ascended to the top of the mountain called the Snubb, gathered on the way the ordinary alpine plants, and, in addition to those formerly collected :—*Cerastium alpinum, Potentilla maculata, Cryptogramme crispa,* and several alpine *Hieracia.*

On the summit of the hill saw abundance of *Azalea procumbens* and *Salix herbacea. Lycopodium alpinum* was also very abundant.

The day being clear the view was extensive. Cairngorm, Ben na Mac Dhu, hills at Loch Lee, Battoch hills in Perthshire,

Breadalbanes, Fife hills, Lomonds. Lochnagar had snow. The temperature was very low. From Loch Brandy the party proceeded to Loch Wharral, and examined the rocks above the loch and collected the ordinary alpines, also an alpine variety of *Cerastium triviale* and of *Solidago Virgaurea, var. cambrica.* Went to old station for *Alopecurus alpinus*, but no specimens were seen. *Isoëtes lacustris* was found in the loch. Returned to the inn about 4.30, having had fine clear weather during the whole day.

Friday, 9th August 1872.

Breakfast at 8 a.m. Left Clova about 9 in drag for Kirriemuir, which we reached about 11.45. Left by train at 12.50. Lunched at Forfar Station. Left Forfar at 2.48 p.m. and reached Edinburgh *viâ* Fife about 7.30 p.m.

The volume containing the continuation of records of Excursions to the end of the year 1878 is, I regret to say, not available for their transcription.—I. B. B.

Index of Names of Places.

Aar, 263.
Aar glaciers, 265.
Abbey Crag, 359.
Abbey St. Bathan's, 292.
Abbotsford, 84, 302, 303.
Abbotsford Ferry, 302.
Abbotsford House, 84, 302.
Abdie, 362.
Aberdeen, 46, 52, 61, 93, 94, 110, 111, 185, 191, 300, 348, 401.
Aberdeen Granite Works, 111.
Aberdeen Links, 111.
Aberdeen, Marischal College, 111, 401.
Aberdour, 35, 87, 89, 135, 136, 158, 159, 176, 177, 196, 218, 219, 251, 286, 316, 355, 390, 422.
Aberdour Castle, 177, 196, 197, 219, 251, 316.
Aberdour Woods, 136, 450.
Aberfeldy, 59, 211, 212, 310, 311, 312, 314, 373, 383, 384, 420, 430, 431.
Aberlady, 27, 33, 66, 85, 86, 126, 127, 181, 204, 305, 306, 332, 453, 473.
Abernethy, 289, 290.
Aboyne, 186, 401.
Aboyne Castle, 401.
Aboyne Suspension Bridge, 186, 401.
Acharn, 57, 100, 173, 298, 343, 344, 345, 385, 386, 387, 389, 437, 445, 446, 477, 478, 479.
Ailsa Craig, 77, 142, 247, 435.
Airthrey, 359.
Aletsch, 269.
Allan, 466, 467.
Allanagavit, 402, 403.
Alloa, 36, 37, 359, 452.
Almond, 157, 453.
Almond, banks of the, 233.
Almond Bank, 321, 322, 453.
Almond Bank Marsh, 240.
Almond Bridge, 124, 216, 379.
Alva, 36.
Alva House, 36.
Ambleside, 166, 168.
Andersonian Museum, Glasgow, 42, 139.
Annister, 70.
Anstruther, 365.
Anwoth, 433.
Aran Island, 153.
Arbroath, 69, 70.
Archerfield, 33.
Ardlui, 455.
Ardrossan, 44.
Ardvoirlich Cottage, 354.
Ardvoirlich House, 353.
Ardvoirlich Waterfall, 354.
Ardwell, 432, 433, 434.
Argyllshire, 249.
Arlarly Well, 415.
Arniston, 24, 63, 78, 79, 103, 104, 123, 129, 157, 193, 217, 254, 301, 354, 391, 421, 469.
Arniston Woods, 469.
Arran, 42, 116, 139, 223, 224, 244, 247, 435, 447, 449.
Arrochar, 370, 371.
Arthur's Seat, 27, 39, 92, 284, 285.
Ascog, 398.
Astragalus Cliff (Glen Dole), 114, 173, 343, 385, 387.
Athlone, 153.
Atlantic, 151, 154.
Auchendinny, 219, 220, 233, 250, 285, 300, 326, 438.
Auchendinny Woods, 335.
Auchtermuchty, 289.
Auchtertool, 411, 412.
Auld Wharry Burn, 467.

Avon, 190, 412.
Ayrshire, 246, 249.
Ayton, 206, 207.
Ayton Castle, 207.

BACHELOR's Well, 149.
Bachnagairn, 387, 388, 438.
Balcarres, 293, 294.
Balcarres House, 294.
Baldoyle, 143, 144.
Balerno, 178, 194, 221, 326.
Ballater, 46, 47, 94, 102, 186, 300, 401, 402.
Ballencrief, 27.
Ballidavid (tower), 151.
Ballina Lodge, 152.
Ballinahow, 151.
Ballinasloe, 153.
Ballinluig, 372.
Balloch, 60, 77, 128, 216, 242, 368, 400, 455.
Ballochbuie, 187.
Balmoral, 101, 186, 300, 401.
Balmoral Palace, 186.
Balmoral Suspension Bridge, 186.
Balmuto, 411, 412.
Balnaboth, 100.
Balo, 202.
Balquhidder, 349.
Balvaird Castle, 289, 290.
Banchory, 186.
Bandon, 145.
Bandon Water, 146.
Bank of Almond, 322.
Banks of Devon, 467.
Banks of Mouse, 198, 288, 442.
Banks of Tweed, 337.
Banmore, 152.
Bantry, 146.
Bantry Bay, 146.
Barnhill, 259.
Barnhill Toll, 304, 305, 444.
Barnton, 192, 233.
Basle, 263.
Bass Rock, 28, 45, 46, 89, 111, 138, 139, 163, 257, 340, 341, 375, 376, 423.
Bathgate, 177.
Beattock, 137, 229, 230, 293, 330, 331, 397, 398, 432.
Beef Tub, 230.
Beld Crag, 137, 293, 330, 398.
Belhaven, 238, 319.
Belhaven Links, 319.
Belhaven Sands, 179.
Bellsyde, 177.
Bemersyde, 134, 135.
Ben A'an, 349, 368, 370.
Ben Alder, 372, 417, 418, 419.
Ben Avon, 49, 95, 403.
Ben Cleuch, 36.
Ben Cruachan, 214.
Ben Driesh, 300.
Ben Dubh Chraige, 184.
Ben Gornic, 246.
Ben Ime, 368, 369, 370, 371.
Ben Laoigh, 183.
Ben Lawers, 51, 60, 63, 71, 72, 73, 74, 189, 208, 210, 211, 213, 214, 312, 313, 348, 368, 373, 383, 384, 417, 420, 430, 431, 458, 459.
Ben Ledi, 308, 309, 333, 346, 347, 366, 367, 368, 414, 415, 454.
Ben Lomond, 30, 128, 214, 244, 368.
Ben Lui, 368.
Ben More, 214, 368, 369, 370.
Ben More Farm, 369, 370.
Ben na Bourd, 49, 94, 187, 403.
Ben na Mac Dhu, 51, 52, 54, 63, 101, 102, 188, 189, 190, 201, 202, 214, 405, 417, 420, 480.
Ben Nevis, 51, 52, 101, 189, 214, 417.
Ben Oss, 183, 184, 368.
Ben Shean, 349.
Ben Venue, 368.
Ben Vorlich, 30, 60, 76.
Ben Voirlich, 184, 242, 352, 353, 368, 399, 400, 455.
Ben-y-Cruiach Ben, 210.
Ben-y-Gloe, 52.
Ben-y-Lassigh, 214.
Benarty, 205, 306, 307, 320.
Bennan, 121, 249.
Bennan Head, 121, 240, 448.
Berne, 263, 269, 273.
Berne, Botanic Garden, 263.
Bernese Alps, 263.
Berwick, 240, 241, 443, 444.
Berwick Law, 90, 164, 423.

Berwick, Piergate, 241.
Bex, 273.
Big Craigendal, 95.
Binning Wood, 28, 361.
Binns, 105, 127.
Binny Crag, 424.
Binny Woods, 238, 392, 393.
Birnam, 257, 373.
Birnam Glen, 444.
Birnam Hill, 258.
Birnam Station, 258.
Bishop Hill, 201, 202, 205, 206, 381, 475.
Black Devon, 68, 69, 132, 133, 205, 206.
Blackford Hill, 474.
Black Hill, 308.
Black Island, 353.
Black Loch, 331, 332.
Blackness, 127, 197, 317.
Blackness Castle, 26, 105, 316, 317.
Blackrock, 145, 418.
Black Springs, 31.
Black Water, 121.
Blackwaterfoot, 121, 122, 245, 247, 248, 249, 449.
Blair, 109, 191.
Blairgowrie, 102, 259, 405, 406.
Blairlogie, 359.
Blasquet Islands, 151.
Boar of Badenoch, 416.
Boghead, 177.
Boldside, 302.
Bonaly, 31, 90, 308.
Bo'ness, 26.
Bonnington, 162, 163, 235, 236.
Bonnington Falls, 67, 198, 288, 317.
Bonskeid, 373.
Borgue, 434.
Borrowdale, 167.
Borthwick, 193, 333.
Borthwick Castle, 41, 42, 106, 107, 175, 254, 407.
Borthwick Hall, 413.
Bowfell, 167.
Bowhill, 426, 427, 428, 473.
Bowling, 128, 183, 216.
Bracklinn Bridge, 208, 209.
Braedownie, 100, 173, 344, 387, 388.
Braemar, 46, 48, 49, 50, 51, 52, 53, 54, 55, 60, 61, 63, 93, 94, 95, 96, 97, 98, 99, 102, 174, 185, 187, 209, 346, 401, 403.
Braemar Hills, 189.
Braeriach, 53, 63, 98, 99.
Braes of Balquhidder, 349.
Braid Hills, 474.
Brandon Mountain, 151.
Bray, 144.
Breadalbanes, 481.
Bridge End, 321, 322.
Bridge of Allan, 102, 256, 324, 466, 467.
Bridge of Allan, Mr. Macfarlane's Museum, 324.
Bridge of Allan Wells, 256, 324.
Bridge of Cally, 102.
Bridge of Earn, 303, 329, 338, 410.
Bridge of Lochay, 347.
Bridge of Tilt, 58, 191.
Brienz, 265.
Brigue, 269.
Brodick, 43, 44, 118, 119, 120, 122, 123, 139, 140, 141, 225, 244, 246, 447.
Broomhall Woods, 69.
Broomielaw, 42, 116, 128, 139, 142, 224, 227.
Broomlee, 471.
Brougham Hall, 169.
Bruce's Castle, 382.
Bruce's Grave, Robert, 331.
Bruntsfield Links, 31.
Bruntsfield Links Toll, 90.
Buddon, 429.
Buden Hill, 440, 441.
Burntisland, 25, 34, 35, 65, 68, 79, 80, 87, 89, 103, 124, 135, 136, 158, 159, 175, 176, 196, 218, 219, 234, 235, 251, 286, 316, 327, 334, 355, 374, 390, 391, 407, 411, 412, 422, 429, 439, 450, 462.
Burntisland Pier, 197.
Busby, 295.
Butterdean, 291.

CAERLAVEROCK Castle, 364.
Cairngorm, 52, 63, 190, 420, 480.
Cairn Hanna (?), 433.
Cairn Toul, 51, 52, 54, 63, 98, 190, 405.
Caisteal Abhail, 244.

Calair Burn, 353.
Callander, 71, 208, 209, 308, 309, 333, 346, 350, 366, 367, 414, 415, 454, 456.
Callater, 48, 99, 404, 405.
Callater Bridge, 94.
Cally House, Gatehouse, 436.
Cameron, 260.
Camp Hill, 413.
Canal, 26, 37, 38, 123, 128, 129, 174, 249, 308, 315, 325. 451, 463.
Canal Basin, 66, 112, 123, 129, 174, 308, 315.
Canlochan, 55, 56, 97, 98, 172, 188, 344, 385, 386, 403.
Canlochan Glen, 98, 188, 189, 386.
Canness, 385 386, 387.
Cannismore, 435.
Canty Bay, 28, 45, 89, 138, 163, 257, 340, 375.
Cape Law, 474.
Capel Mount, 100.
Cargen, 429, 430.
Carlan Crags, 320, 321, 475.
Carlan Hill, 321.
Carlisle, 165, 169.
Carnack Loch, 331.
Carnethy Hill, 308.
Carnic, 459.
Carnoustie, 70.
Caroline Park, 192, 233.
Carran Tuohill, 148.
Carriber Castle, 441.
Carriber Glen, 440, 441.
Carriden, 197, 316, 317.
Carron Iron Works, 24, 64.
Carron Water, banks of, 441.
Carse, 289.
Carse of Gowrie, 82.
Carstairs, 169.
Cart, 295.
Cartland Crags, 67, 162, 163, 235, 236, 288, 317, 442.
Cassel, 262.
Castle Campbell Glen, 443.
Castlecary, 24, 64.
Castlecary Glen, 64.
Castle Law, 338.
Castle Loch, 382.
Castleton, 55, 56, 58, 61, 190.
Castleton of Braemar, 101, 186, 188, 189.
Cat Lodge, 418, 419.
Catacol Bay, 245.
Cathcart, 295.
Cathcart Castle, 295.
Cathcart Woods, 295.
Catyaheaman, 211.
Cauldfield Loch, 237.
Cauldron Linn, 341.
Cavers, 360.
Cean-Mohr (?), 56, 188.
Chalet of Handeck, 265.
Chamounix, 273.
Chapel, 228.
Chapel Gardens, 227.
Chapel Woods, 228.
Charleston, 68, 69, 109, 110, 125, 161, 162, 306, 394.
Cherai, 459.
Chief's Wood, 84.
Clachan Glen, 248.
Clachland Point, 44, 117, 224.
Clare County, 154.
Cleghorn, 198, 205, 236, 288, 442.
Cleghorn Junction, 235.
Clevage Hill, 291.
Clevage Loch, 291.
Clifden, 155, 156.
Clova, 46, 51, 57, 60, 63, 100, 113, 114, 115, 169, 170, 171, 173, 174, 296, 297, 298, 299, 300, 342, 343, 344, 346, 385, 386, 387, 388, 389, 437, 445, 446, 476, 477, 481.
Cluny, 48, 58, 99, 102.
Clyde, 141, 152, 165, 249, 288.
Coalston, 231.
Cobbler, 368, 370.
Cockburn Law, 291, 292.
Cockburnspath, 64, 65, 131, 132, 160, 178, 179, 211, 255, 329, 376, 393, 394.
Cockburnspath Town Dene, 255.
Cockenzie, 422.
Cockle Roy, 412, 440, 441, 472.
Col, 268.
Coldingham, 40, 41, 107.
Coldingham Loch, 108.
Coldstream, 240, 241.
Coldstream Manse, 240.

Colinton, 26, 31, 37, 66, 90, 112, 123, 129, 174, 217, 249, 308, 315, 325, 336, 451, 463.
Colinton Woods, 38, 129.
Cologne, 262.
Compensation Ponds, 308.
Connemara, 154.
Coniston, 167.
Connor Hill, 151, 152.
Cora Linn, 67, 162, 163, 198, 235, 236, 288, 289, 317, 318.
Cork, 144, 145.
Cork Exhibition, 144.
Cork, Queen's College, 144.
Cornhill, 240.
Corrach Uachdar, 212, 215, 457.
Corrib, Lough, 156.
Corrie, 43, 118, 122, 140, 225. 226, 227, 244, 447, 448.
Corriegills, 117, 224.
Corriemulzie, 403.
Corriemulzie Linn, 97.
Corryarder, 419.
Corstorphine, 32, 124, 216, 233.
Corstorphine Hill, 233.
Cortachy, 113, 170, 174, 296.
Cortello Bay, 153.
Coshieville, 314.
Coupar-Angus, 102, 406.
Cousland, 107, 287.
Cove (Pease Dene), 329.
Cowdenbeath, 306.
Craggiemore, 155.
Cragnagat, 60.
Crag na Lochan, 59.
Craig Bruich, 389.
Craig Chailliach, 72, 209, 210, 457.
Craigcrook, 23, 124, 157, 192.
Craigendal, 49, 50, 51, 94, 95.
Craigie, 259.
Craigleith, 192, 233.
Craigleith Quarry, 233.
Craig Maid, 101, 477.
Craigmillar, 92, 93.
Craigmillar Castle, 92.
Craig Rennett, 101, 170, 173.
Cramond, 31, 124, 157, 216, 233.
Cramond Bridge, 23, 32, 390.
Cramond Island, 157.
Cramond Woods, 192.
Creetown, 435.
Crianlarich, 215, 369.
Crianlarich Inn, 75.
Crichton, 42, 81, 287.
Crichton Castle, 41, 83, 106, 107, 175, 176, 254.
Crieff, 240.
Croachlach, 58, 98.
Crombie Point, 394.
Cuckold le Roi, 412.
Culbin, 52.
Culross, 109, 110, 161, 306, 394.
Cumberland hills, 230, 435.
Cumberland Lakes, 165.
Cupar, 201, 260, 289, 294, 299, 320, 321, 323, 336, 338, 381, 411, 412, 465.
Currie, 26, 31, 37, 38, 66, 77, 78, 90, 112, 129, 131, 159, 194, 220, 221, 252, 302, 308, 326, 336, 356, 408, 449, 463.

DALGUISE, 372. 373, 374.
Dalguise House, 371.
Dalhousie, 24, 41, 63, 78, 123, 129, 130, 157, 217, 254, 301, 354, 391, 421, 469.
Dalhousie Woods, 79.
Dalkeith, 32, 91, 106, 107, 217, 328.
Dalmahoy, 26, 77, 78, 112, 131, 159, 221, 302, 326, 336, 408, 449.
Dalmahoy Hill, 37, 38, 194, 220, 252, 253, 356, 409.
Dalmeny, 32, 379.
Dalmeny Park, 379, 390.
Dalnaspidal, 372, 416, 418.
Dalwhinnie, 372, 415, 416, 417, 418, 420.
Danskine, 232.
Danskine Loch, 231.
Dargle, 144.
Dead Water Fell, 339.
Dean Bridge, 233.
Dee, 46, 49, 50, 53, 54, 58, 61, 94, 96, 97, 98, 99, 186, 190, 402, 405, 434.
Den, the [Balcarres], 294.
Denbrae, 409.
Dene, 40.
Denholm, 360.
Denholm Dene, 360.
Den Mill, 429, 430
Denmiln, 362, 363, 364.

Denmore, 110.
Denmore Bog, 111.
Denning, 64.
Denny, 441.
Dennyloanhead, 24.
Derry, 102.
Devil's Mills, 341.
Devon, banks of the, 468.
Dhu Loch, 47, 100, 387, 388.
Dingle, 151.
Dinish Cottage, 150.
Dippen, 246, 247, 248.
Dippen Point, 121.
Dirk Hatteraick's Cave, 433.
Dirleton, 28, 33, 85, 87, 111, 126, 138, 163, 164, 181, 204, 257, 323, 450, 413, 440.
Dirleton Castle, 112, 126, 139, 204, 257, 413, 440.
Dirleton Common, 112, 126, 139 257, 413, 414, 440.
Dobb's Linn, 229, 230.
Dochart, 212, 215.
Dole, 299.
Dollar, 174, 443, 467, 468.
Dolphinton, 378, 395, 471.
Dolphinton House, 378.
Donibristle, 35, 68, 87, 88, 135, 136, 158, 176, 177, 196, 197, 251, 470.
Donibristle Woods, 159.
Doune, 71.
Dover, 274.
Dreghorn, 123, 124, 174.
Drem, 27, 28, 33, 45, 46, 66, 85, 87, 89, 90, 111, 112, 181, 182, 305, 323, 332, 357, 453, 466, 473.
Driesch, 389.
Drumodune, 245, 247, 248, 449.
Drumore, 432, 435.
Dryburgh, 85, 135, 199, 200, 201, 237, 377.
Dryburgh Abbey, 134, 199, 236, 337.
Dubh Loch, 47, 100, 387, 388.
Dublin, 142, 143, 144, 151, 153, 156, 157.
Dublin, College Botanic Garden, 143.
Dublin, Trinity College, 142.
Dublin, Zoological Gardens, 143.
Dubton, Royal Asylum, 429.
Dubton Station, 429.
Duddingston, 39, 92.
Duddingston Loch, 27, 92, 116, 284, 285.
Dugary, 245.
Dull, 311, 314.
Dumbarton, 30, 31, 60.
Dumfries, 364, 382, 429, 430, 432, 436.
Dumfries, Crichton Institute, 364, 429.
Dunaengus, 154.
Dunbar, 178, 179, 238, 319, 423.
Dunbar Castle, 238.
Dunblane, 260, 309, 325.
Duncrook, 347.
Dundee, 70, 93.
Dunearn Hill, 391.
Dunfermline, 68, 69, 132, 134, 205, 331, 332.
Dunglass, 160, 329.
Dunglass Dene, 64, 65, 131, 178, 179, 221, 255, 376.
Dunglass Pond, 255.
Dunglass Woods, 131.
Dunipace, 24, 64.
Dunkeld, 46, 58, 59, 191, 192, 257, 258, 371, 373, 421, 444, 476.
Dunkeld Road Station, 192.
Dunlow Farm, 207.
Dunmail Rise, 167.
Dunninald Den, 429.
Dunoon, 24, 447.
Dunsappie, 285.
Duntarvie Castle, 26.
Dykehead, 113, 115, 174, 296.
Dysart, 65, 130, 158, 196, 227, 475.
Dysart House, 34.
Dysart Woods, 34, 79, 80, 130.

EAGLESCARNIE, 231.
Eagle's Nest, 147.
Earl's Ferry, 336.
Earlsferry, 471.
Earn, 289.
East Fortune, 466.
East Kilbride, 295.
East Kilmorie, 246.
East Linton, 179, 238, 319, 361, 392, 393, 423, 466.
East Lomond Hill, 201, 202.
Easter Dalmahoy Hill, 39, 159.
Eastern Wemyss, 158, 227.

Ecclesmachan, 424.
Eden, banks of, 260.
Edinample, 352.
Edinburgh High School, 433.
Edin's Hold, 292.
Edmonston, 93.
Eildon, 237, 238.
Eildon Hills, 84, 134, 199, 236, 302, 303, 377, 465.
Elie, 293, 294, 336, 337, 365, 366, 380, 471.
Elie Harbour, 366.
Elphinston, 287.
Enniskerry, 144.
Esk, 32, 91, 115, 170, 172, 219, 250, 285, 296, 297, 299, 300, 301, 326, 328, 335, 343, 354, 388, 421, 438, 462.
Esk Mill, 250.
Esthwaite, 167.
Ettrick, 426, 473.
Ettrick banks, 427, 428.
Eye, 291.
Eyemouth, 206, 207, 208.

FALDONSIDE, 84.
Fale, 152.
Falkirk, 24, 64.
Falkland, 201, 320.
Falkland House, 202.
Falkland Palace, 201, 202, 203.
Falkland Road Station, 201, 202.
Falloch, 184.
Falls of Acharn, 59.
Falls of Clyde, 67, 236.
Falls of Corriemulzie, 402.
Falls of Leny, 350.
Falls of Moness, 383.
Falls of the Muick, 47.
Falls of the Teith, 71.
Falls of White Water, 172, 298.
Farrichar, 432.
Farrichar Quarry, 430, 431.
Faskally Grounds, 373.
Fast Castle, 40, 108, 207.
Fergan, 311.
Ferniehurst Castle, 425.
Ferry Hills, 35, 68, 125, 159, 253, 328, 379, 470.
Fife, 445.
Fife Hills, 481.
Finlarig Castle, 458.
Finlarig Woods, 209.
Firth of Forth, 233.
Flodden, 240.
Foal Bridge, 466, 467.
Foineven, 61.
Ford, 81, 83, 107.
Forfar, 110, 113, 115, 343, 346, 481, 445, 477.
Forret, 465, 466.
Forteviot, 239, 290, 291, 396, 397.
Fountainhall Woods, 81.
Frankfort, 262.
Furggen glacier, 271.
Fushiebridge, 24, 41, 104, 106, 175, 193, 254.

GALASHIELS, 84, 474.
Galerus (castle), 151.
Galt, 236.
Galtmede Moss, 237.
Galway, 153, 156.
Galway Bay, 153, 154.
Galway, Queen's College, 153, 156.
Gallowshall, 91, 106.
Gap of Dunloe, 147.
Garpol Linn, 137, 293, 330, 331, 397, 398.
Garrion Bridge, 165.
Garrion Burn, 164, 165.
Garth Castle, 314.
Gatehouse, 432, 434, 435, 436.
Gemmi Pass, 272.
Geneva, 263, 273.
Geneva, Botanic Garden, 274.
Geneva, Cour St. Pierre, 274.
Geneva, Rue de Rhone, 273.
Giessbach, 264, 265.
Gifford, 231.
Gilrannoch, 56.
Gladswood, 134, 199, 200.
Glammis, 170, 174.
Glanmire Burn, 145.
Glanmire Glen, 145.
Glasgow, 24, 30, 31, 42, 44, 60, 76, 77, 128, 129, 139, 141, 142, 183, 185, 216, 224, 226, 227, 246, 287, 295, 449, 454, 455, 456.
Glasgow, Andersonian Museum, 42, 139.

Glasgow Cathedral, 128.
Glasgow College, 30.
Glasgow, Hunterian Museum, 128.
Glasgow University, 128.
Glas Maol, 55, 56, 97, 189.
Glasmount Woods, 234.
Glasnevin, 143.
Glasnevin Garden, 142.
Glassalt Burn, 55.
Glena, 150.
Glencoe, 369.
Glenfarg, 289, 290, 338.
Glenfarg Woods, 289.
Glengariff, 146.
Glenvale, 201, 202.
Glen Ample, 352.
Glen Benlister, 248.
Glen Buckie, 353.
Glen Callater, 57, 101, 188, 402, 403, 405, 406.
Glen Candlich, 56, 188.
Glen Caorrunn, 183.
Glen Clova, 100, 297.
Glen Cloy, 246.
Glen Dee, 53, 54, 190.
Glen Derry, 189.
Glen Dole, 57, 101, 114, 170, 171, 172, 173, 296, 297, 298, 299, 343, 344, 385, 387, 445, 446, 477, 479.
Glen Esk, 100, 171, 438.
Glen Falloch, 60, 76, 128, 183, 368.
Glen Farn, 433.
Glen Fee, 57, 101, 114, 170, 171, 173, 297, 345, 386, 387, 389, 437, 446, 478, 480.
Glen Fiadh, 343.
Glen Gelder, 186.
Glen Isla, 51, 60, 63.
Glen Kandor, 402.
Glen Lochay, 214.
Glen Lui, 51, 101, 189.
Glen Lyon, 211, 347, 459.
Glen Lyon Road, 74.
Glen Muick, 300, 387.
Glen Prosen, 345, 389, 439.
Glen Rosa, 119, 120, 122.
Glen Sannox, 43, 118, 119, 140, 225, 244.
Glen of Tillicoultry, 37.
Glen Tilt, 46, 54, 58, 59, 191, 373.
Glen Vale, 320, 381.
Goatfell, 43, 119, 120, 122, 140, 225, 226, 244, 249, 448.
Gogar, 37.
Gorebridge, 63, 78, 103, 106, 123, 129, 157, 175, 193, 217, 301, 333, 354, 391, 407, 413, 421, 469.
Gorner Grat, 271.
Gosford, 33, 85, 86, 126, 127, 181, 204, 305, 306, 332.
Gothic Hall, 231.
Gowbarrow Park, 168, 169.
Grange Quarry, 196.
Granite Works, Aberdeen, 111.
Granton, 23, 31, 35, 36, 37, 87, 103, 109, 110, 111, 124, 125, 135, 157, 162, 180, 192, 216, 218, 233, 253, 306, 379.
Granton Pier, 25, 161, 192, 222, 301, 328, 394.
Granton Quarry, 192.
Granton Woods, 192.
Grant's House, 107, 291, 292, 393, 394.
Grasmere, 167, 168.
Great Glacier, 271.
Greenlaw Barracks, 335.
Green Neck, 413.
Greenock, 42, 142, 227, 447.
Grey Mare's Tail, 229, 230.
Grimsel, 265.
Grimsel Hospice, 266.
Guard Bridge, 182.
Gullan, 27, 33, 66, 85, 87, 111, 112, 126, 181, 182, 204, 305, 323, 324, 332, 357, 413, 414, 453, 473.
Gullan Links, 86, 204, 205.
Gullan Loch, 86, 126.
Guttannen, 265.

HABBIE'S HOWE, 31, 90, 308.
Haddington, 231.
Haining, 426, 427, 428.
Haining Lochs, 426.
Hartfell, 230.
Hassendean, 199, 236, 237, 360.
Hawick, 360.
Hawthornden, 406.
Heidelberg, 262.
Heidelberg Castle, 262.
Helensburgh, 399.

Helvellyn, 167, 168.
Henley, 324.
Heriot, 413.
Hermitage, 441.
Highfield Farm, 239.
Hillhead, 331.
Hiltly, 412.
Holy Island, 224, 226, 246, 447.
Holy Isle, 117.
Holyrood, 27, 39, 92, 116, 284, 285.
Honister Crag, 167.
Hopetoun, 26, 105, 106, 127, 197, 316, 317.
Hopetoun Woods, 26, 317.
Horse Glen, 149.
Hospice of the Grimsel, 265, 268.
Howth, 143.
Humbie Woods, 196.
Hunterian Museum, Glasgow, 128.
Hunter's Bog, 284.
Huntly Burn, 84.

IMACHAR, 245.
Inchcolm, 181.
Inchkeith, 181.
India, 272.
Innisfallen, 149.
Interlaken, 263, 264.
Inverarnan, 30, 60, 76, 77, 128, 183, 214, 215, 216, 242, 368, 370, 371, 399, 400.
Invercauld, 54, 96, 405.
Invercloy, 44, 118, 139, 246, 448.
Inveresk, 328.
Inverglas, 371.
Inverkeithing, 35, 68, 88, 125, 126, 135, 136, 158, 159, 222, 253, 301, 328, 379, 439, 470.
Inverkeithing Bay, 87.
Invermay, 290, 291, 396.
Invermay Woods, 239, 396.
Inverness, 348.
Inversnaid, 30.
Inveruglas, 77.
Ireland, 141, 244.
Isle of Man, 435.
Isle of May, 423.

JACK-A-BOYS Bay, 150.
Jed, 425.
Jedburgh, 425.
Jedburgh Abbey, 425.
Jock's Road, 101, 172, 298, 299, 344, 385, 479.
Jura, 244.

KAIMES Hill, 252, 326.
Keir, 256, 324.
Kelso, 240, 443, 444.
Kendal, 165, 166.
Kenmare, 146.
Kenmore, 59, 348, 373, 374.
Kerry, 152.
Kerry Head, 151.
Kethock, 295.
Kielder, 339.
Kielder Castle, 339.
Kilconquhar, 293, 336, 337, 471.
Kilconquhar Loch, 294, 336, 337, 471.
Kildonan, 246, 247, 448.
Kildonan Castle, 121.
Killaloe, 152.
Killarney, 149, 150.
Killiecrankie, 58, 192, 342, 373, 419, 432.
Killin, 46, 59, 60, 71, 72, 73, 74, 75, 210, 211, 212, 213, 214, 216, 347, 348, 369, 456, 457, 458, 459, 460.
Killin Station, 456.
Kilmorie, 117, 248, 448.
Kilronan, 154.
Kincardine, 109, 161, 180, 306, 394.
Kinfauns, 303, 329, 330.
Kinfauns Toll-bar, 259.
Kinghorn, 25, 34, 80, 103, 175, 234, 235, 251, 286, 327, 334, 335, 374, 407, 439, 462.
Kinghorn Loch, 175, 234, 286, 374.
King's Caves, 245, 247, 449.
King's College, 110.
King's Cross Point, 117.
King's Hill, 245.
King's House, 209, 349, 353.
King's Seat, 443.
Kingussie, 420.
Kinnoul, 321, 410, 453.
Kinnoul Church, 259.
Kinnoul Hill, 239, 259, 289, 303, 304, 305, 322, 329, 453.
Kinnoul Quarry, 428.

Kinross, 306.
Kinross House, 307.
Kinross-shire, 202.
Kippendavie, 324.
Kippenross, 256, 324.
Kipps, 177, 412.
Kirkandrew, 435.
Kirkcaldy, 34, 65, 79, 80, 103, 124, 196, 411, 412, 452, 475.
Kirkclaugh, 433.
Kirkcudbright, 432, 434.
Kirkcudbright, mountains of, 435.
Kirkdale, 433.
Kirkdale Glen, 433.
Kirkhill, 63, 79, 323, 421.
Kirkliston, 390.
Kirk Loch, 382.
Kirknewton, 77.
Kirkpatrick, 398.
Kirkpatrick Juxta, 137, 293.
Kirkton, 177.
Kirkton Clova, 100.
Kirkton of Largo, 380.
Kirriemuir, 100, 170, 174, 296, 299, 300, 343, 345, 346, 385, 388, 437, 445, 446, 477, 481.
Kleinensee, 265.
Knock, 133.
Knock Hill, 68, 69, 132, 133, 177, 205.
Knox's Pulpit, John, 202.
Kylemore, 156.
Kylemore Lough, 156.

LADYBANK, 289, 290, 321.
Ladykirk, 443.
Ladykirk House, 443.
Lag, 117, 118, 120, 121, 246, 247, 248, 249, 448.
Lag road, 245.
Lake of Brienz, 264.
Lake of Geneva, 269, 273.
Lamlash, 44, 116, 117, 118, 119, 120, 123, 224, 225, 226, 244, 245, 246, 248, 249, 447, 448.
Lamlash Bay, 120, 226, 447.
Lammermuir Hills, 423.
Lanark, 67, 162, 163, 198, 235, 236, 288, 317, 442.
Lancefield Spinning Co., Glasgow, 30.
Larbert, 24, 64.
Largo, 293, 294, 380, 409, 471.
Largo Links, 294.
Largs, 139, 141.
Larig-an-lochan, 459.
Lawhead, 28.
Lax, 269.
Lednaltrie, 437.
Leenane, 156.
Leith, 181, 260.
Lennoxlove, 231, 232.
Leny, 309.
Leny, Falls of, 350.
Leny House, 454.
Leny, Pass of, 71.
Leslie, 381, 475.
Leslie Waterworks, 475.
Leuchars, 125, 182, 260, 465, 466.
Leuk, 272.
Leven, 227, 294.
Leven Bridge, 227.
Leven railway banks, 228.
Limekilns, 68, 125, 126, 394.
Limerick, 151, 152.
Lindores Loch, 362, 364.
Linlithgow, 26, 105, 127, 177, 178, 197, 316, 412, 440, 441, 467, 472.
Linlithgow Loch, 105, 127, 178, 317.
Linlithgow Palace, 127, 197, 317, 472.
Linn of Dee, 51, 52, 54, 98, 101, 102, 189, 191, 402, 405.
Linton, 28, 45, 64, 178.
Listowel, 152.
Lithgow Bridge, 177.
Little Craigendal, 49, 50, 52, 94, 95, 187, 403.
Little Gilrannoch, 56, 172, 298, 344, 385, 387, 446, 479.
Little Loch, 84.
Loch Alder, 418, 419.
Loch Avon, 52, 101, 102, 190.
Lochay, 212, 213, 347, 369, 457.
Loch Brandy, 115, 173, 299, 300, 344, 387, 388, 437, 446, 480, 481.
Loch Callater, 48, 56, 58, 95, 96, 99, 188, 297, 402.
Loch Candlich, 48, 49.
Loch Carnack, 332.
Lochcote, 412, 472.

Loch Dochart, 215.
Loch Doyne, 349.
Loch Earn, 349.
Lochearnhead, 71, 72, 209.
Lochend, 27, 132.
Loch Ericht, 372, 416, 417, 418.
Loch Etchachan, 52, 101, 102, 189, 190.
Loch Evnach, 54.
Loch Fittie, 205, 331.
Loch Kander, 96.
Loch Katrine, 30.
Loch of Kinnaird, 314.
Loch Laggan, 417, 418, 419, 420.
Loch Lee, 480.
Lochgelly, 306, 307, 320, 321.
Loch Leven, 202, 205, 206, 306, 307, 320, 381, 475.
Loch Leven Castle, 307.
Loch Lomond, 30, 46, 60, 76, 77, 128, 183, 185, 216, 242, 243, 368, 371, 399, 400, 455.
Loch Long, 243.
Loch Lubnaig, 71, 209, 309, 310, 346, 349, 352, 366, 367, 414, 415, 454.
Lochmaben, 382, 432.
Loch Malong, 465.
Lochmill, 362, 363, 364.
Loch Muick, 47, 100, 387, 388.
Lochnagar, 47, 51, 52, 54, 63, 96, 99, 101, 187, 299, 300, 387, 388, 404, 458, 481.
Loch-na-gat (Lochan-a-Chait), 59, 211, 214, 348, 458.
Lochore, 306, 307.
Loch Ranza, 122, 226, 245, 448.
Loch Skene, 229, 230.
Loch Sloy, 77, 184.
Loch Tay, 72, 211, 212.
Loch Voil, 349, 353.
Loch Wharral, 437, 481.
Lockerbie, 436.
Logie, 465.
Lomonds, 189, 320, 321, 481.
London, 274.
Longniddry, 33, 66, 85, 127, 181, 204, 305, 306, 332, 357, 422, 423, 454, 463, 473.
Long Range, 147.
Lornshill Woods, 359.
Lough Corrib, 156.
Lough Derg, 152.
Lower Lake, 150.
Lucknow, 260.
Luffness, 27, 33, 85, 86, 127, 181, 182, 204, 305, 323, 332.
Lumsdaine, 40.
Lumsden Bay, 108.
Lunan, 69.

MACDUFF'S Castle, 227, 228, 363.
Macfarlane's Museum, Bridge of Allan, 467.
M'Gillicuddy's Reeks, 148.
Macnab Burying Ground, 212.

MAAM, 156.
Malahide, 144.
Mallow, 151.
Mangerton, 149.
Manuel, 440.
Manuel Mill, 440.
Mar Forest, 189.
Marble Quarry, 191.
Mare's Crag, 362, 363, 364.
Margay, 435.
Martigny, 272, 273.
Massa, 269.
Matterhorn, 271.
May, banks of, 291.
Mayfield, 474.
Meadowbank, 159, 194, 220, 221, 252, 302, 326, 356, 408, 449.
Meall Ghaordie, 212, 347, 459.
Meeting of the Waters, 150.
Meiringen, 265.
Melrose, 84, 85, 134, 135, 199, 236, 302, 337, 377, 465.
Melrose Abbey, 134, 200, 302, 337, 378.
Melville Hall, 287.
Mendick, 472.
Menstrie, 359, 360, 452.
Merchiston, 31, 325.
Methven, 239, 303, 305, 321, 322.
Methven Bog, 240, 259, 322, 432, 453.
Methven Woods, 240, 322.
Meuse, 261.
Midcalder, 131, 159, 194, 220, 252, 302, 326, 356, 408, 449.
Middle Eildon Hill, 200.

Middle Lake, 147, 150.
Middle Walk (Meadows), 325.
Milltown of Clova, 296.
Milnegraden, 240, 241, 443.
Minto Crags, 199, 236, 237, 360.
Moffat, 138, 228, 229, 230, 293, 330, 398.
Moffatdale, 398.
Moffat Hills, 293.
Moffat Well, 230, 293.
Moncrieff, 410.
Moncrieff Hill, 239, 289, 303, 304, 305, 329.
Moncrieff House, 304.
Moness, 310, 311, 432.
Moness Falls, 311, 430, 431.
Monkstown, 145.
Montrose, 69. 93, 429.
Moorfoot Hills, 413.
Moray Firth, 52.
Morayshire, coast of, 101.
Morecambe Bay, 167.
Morningside, 123, 124, 174, 474.
Moulinearn, 59.
Mount Stuart, 398, 399.
Mouse, 198, 288, 289, 442.
Muckersie Falls, 290, 291.
Muckross, 149.
Muckross Abbey, 150.
Muckross Demesne, 149.
Muick, 47.
Muiravonside, 472.
Muirward Wood, 239, 428.
Mull of Cantyre, 244.
Mull of Galloway, 244.
Münster, 269.
Murthly, 258, 373, 476.
Murthly Asylum, 476.
Murthly Castle, 476.
Musselburgh, 32, 91, 328.
Musselburgh Links, 92.

NAMELESS Rill, 244.
Navity, 306, 307.
Netherbyres, 207, 208.
Neuhaus, 263.
Newark, 427, 428.
Newark Castle, 426, 473.
Newburgh, 289, 362, 363.
Newhaven, 34, 79, 328.
New Scone, 240.
Newton, 199, 236, 360.
Newton Point, 122.
Newton Station, 199.
Newtown, 84, 85, 337.
Niddrie Castle, 26, 105, 127, 316, 317, 424.
Nith, 364, 436.
Norham, 240, 241, 443, 444.
Norham Castle, 240.
North Berwick, 29, 45, 89, 90, 111, 112, 126, 138, 163, 164, 204, 257, 323, 332, 340, 375, 413, 440.
North Berwick Law, 376, 440.
North Berwick Links, 112, 204, 257, 323, 340.
North Esk, 233.
North Ferry, 32.
North Queensferry, 35, 68, 87, 135, 136, 158, 222, 253, 301, 328, 379, 439, 464, 470.
Northumberland, 339.
Northumberland Hills, 167.

OBER-AAR Glacier, 266, 268.
Obere Hasli-Thal, 265.
Obergestelen, 269.
Oberland, 265.
Ochils, 189, 359, 362, 363, 443.
Ochil Hills, 338.
Ogilvy's House, 170.
Orchardneuk, 303, 304, 329, 330, 410.
Ore, 227.
Ormiston, 81, 444.
Ormiston Hall Woods, 81.
O'Sullivan's Waterfall, 150.
Oughterard, 156.
Overtown, 164.
Oxytropis Cliff, (Clova), 297, 298.

PANNANICH Wells, 186.
Paris, 262, 274, 413.
Parson's Green, 27.
Pass of Leny, 71, 209, 454.
Passage, 145.
Pathhead, 80.
Patterdale, 166, 168.
Paxton, 443, 444.
Pease Bridge, 376, 393, 394.

Pease Burn, 132.
Pease Dene, 64, 65, 132, 160, 178, 179, 221, 255, 329, 376, 393, 394.
Penicuik, 219, 220, 233, 250, 285, 300, 326, 335, 374, 438, 451, 462.
Penicuik Glen, 335, 438, 451.
Penicuik, Paper Mills, 326, 374.
Penicuik, Valleyfield, 233, 250.
Penmanshiel, 107, 131, 255, 291.
Penrith, 168, 169.
Penrith Castle, 169.
Pentlands, 31, 90, 123, 124, 174, 189, 308.
Perth, 93, 110, 113, 170, 174, 239, 240, 257, 258, 259, 290, 296, 300, 303, 304, 305, 321, 322, 329, 339, 343, 346, 397, 401, 406, 410, 416, 418, 428, 429, 444, 445, 453, 476, 477.
Perth Asylum, 303, 321.
Perth, North Inch, 453.
Perthshire Hills, 480.
Peterhead, 300.
Pettycur, 25, 34, 76, 80, 103, 175, 196, 234, 235, 286, 334, 439.
Philiphaugh, 426, 427, 428, 473.
Phœnix Park, 143.
Pitcairn Field, 453.
Pitkeathly, 239, 363.
Pitlochry, 342, 373, 419.
Pittencross, 331.
Pittenweem, 365.
Pladda, 246, 249.
Polmoodie, 229.
Polton, 406, 468.
Pooley Bridge, 168, 169.
Por Hopetoun, 37, 66, 129, 174, 308, 315, 451.
Portmarnock, 144.
Portobello, 91.
Powerscourt Waterfall, 144.
Prestonhall, 83, 106, 107, 287.
Prestonhall Woods, 81, 82.
Prestonholme, 79.
Prestonkirk, 179, 319, 423.
Prestonpans, 287, 422, 463, 464.
Prinlaws, 381.
Prosen, 389.
Prosen Water, 389.
Punch Bowl, 149.

QUARRY Mill Den, 428.
Queensferry, 32, 35, 68, 87, 88, 125, 136, 158, 222, 301, 328, 379.
Queensferry Road, 233.
Queenstown, 145.
Quixwood, 292.

RAITH, 34, 411, 452.
Ramsheugh, 338.
Ratho, 26, 112, 390.
Ravelrig, 26, 37, 38, 66, 77, 78, 112, 131, 159, 194, 220, 252, 302, 326, 336.
Ravelston, 23, 157.
Ravenscraig Castle, 34, 65, 66, 79, 103, 158.
Ravenscroft Castle, 124.
Ravenshall, 433.
Ravenshall Point, 433.
Ravensheugh, 392, 393.
Red Tarn, 167.
Reichenbach Waterfall, 265.
Renton, 393, 394.
Reston, 40, 41, 107, 109.
Retreat, the, 292.
Rhine, 262.
Rhone, 268, 269, 272.
Rhone Valley, 265.
Riffel, 272.
Riverstown, 145.
Rock and Spindle, 323.
Rock of St. Skeoch, 429.
Roman Camp, 41, 42.
Rosiin, 219, 233, 234. 250, 251, 285, 300, 326, 335, 406, 438, 462, 468.
Roslin Chapel, 233.
Roslin Powder Mill, 250.
Roslin Woods, 468.
Ross Castle, 149.
Ross Island, 149.
Rossie Castle, 69.
Rosyth, 126.
Rothesay, 398, 399, 447.
Rothiemurchus, 190.
Rotterdam, 261.
Roundstone, 155.
Round Table, 169.
Rowardennan, 30, 129.
Rumbling Bridge, 205, 206, 307, 341, 444, 467, 476.

Rutton Loch, 429, 430.
Rydal, 166, 167, 168.
Rydal Lake, 166, 167.
Rydal Mount, 166.
Rydal Waterfall, 166.
Rymer's Glen, 302.

SAAS, 270.
Saddleback, 167.
St. Abb's Head, 40, 107, 108, 206, 207.
St. Andrews, 125, 182, 259, 260, 323, 409, 433.
St. Andrews Castle, 323.
St. Andrews Harbour, 323.
St. Andrews Links, 182.
St. Andrews United College, 323.
St. Anthony's Chapel, 285.
St. Baldred's, 361.
St. Boswells, 134, 377, 425.
St. David's, 35, 87, 88, 125, 126, 135, 136, 159, 222, 223. 253, 301, 470.
St. Leonards, 32, 41.
St. Mary's Isle, 434.
St. Molio's Cave, 226.
St. Monans, 294, 365, 366.
St. Niklaus, 270, 272.
St. Rollox, 30, 128.
Saline, 205.
Saline Hills, 68, 132, 133, 205, 206.
Salisbury Crags, 27, 39, 92, 116.
Samson's Ribs, 27, 284.
Sands of Barry, 69, 70.
Sandy Bent, 319.
Sannox, 140, 244.
Scalp, 144.
Scawfell, 167.
Schiehallion, 214, 314, 417.
Scone, 259, 303, 305, 321, 330, 397, 428, 453.
Scone Woods, 322, 397, 411.
Seafield, 25, 65, 116, 117.
Seafield Tower, 80, 103.
Selkirk, 426, 473.
Selkirk Bridge, 428.
Seven Churches, 154, 155.
Shannon, 152, 153.
Shannon Bridge, 153.
Shean, 433.
Shedog, 248.
Shelter Stone, 101, 190.
Shetland 93.
Shisken Church, 248.
Siccars Point, 207.
Sidelhorn, 265, 267.
Sikkim, 158.
Sion, 272.
Sir W. Scott's tomb, 85.
Skellig Rocks, 151.
Skiddaw, 167.
Slateford, 26, 37, 38, 66, 112, 123, 129, 174, 249, 308, 315, 225, 451, 463.
Smerwick, 151.
Snubb, the, 480.
Solway, 167, 230.
Sommers Town, 145.
Southampton, 82.
South Esk Station, 24.
South Queensferry, 32, 379, 439, 464, 470.
Sow of Athole, 372, 416.
Spean, 419.
Spey, 52, 54, 101, 190.
Spital Bridge, 55.
Spital of Glenshee, 97, 102, 188, 189.
Springbank, 224, 225, 226, 244, 246.
Springfield, 453.
Springs of the Dee, 54.
Stalden, 270.
Stank, 454.
Stank Burn, 367, 414, 415.
Starly Burn, 25, 35, 136, 176, 218, 219.
Stenton Crag, 257, 258, 373, 421.
Stirling, 71, 93, 102, 174, 208, 211, 242, 256, 324, 325, 359, 368, 371, 443, 452, 466, 467.
Stirling Castle, 208, 242, 256, 325.
Stirling Castle Rock, 467.
Stock Gill, 166.
Stonebyres, 163, 235, 236, 288, 317, 442.
Stoneriach, 459.
Storsdale, 121, 122.
Stracy, 248.
Straight Leap, the, 292.
Strath Braan, 444.
Strathmiglo, 289, 290, 320.
Strathspey, 53.
Strathyre, 346, 347, 348, 349, 350, 352, 353.
Striding Edge, 168.
Stronvar, 353.

Stuc-a-Chroin, 352.
Suspension Bridge, 114.
Sutherlandshire, 61.
Swanston, 249, 474.
Swirrel Edge, 167.
Switzerland, 260.

TANNA river, 122.
Tantallon, 163, 164, 332.
Tantallon Castle, 28, 45, 89, 138, 257, 340, 375, 376.
Tarbert, 151, 152.
Tarbet, 184, 185, 242, 243, 370, 371, 400, 455.
Tarff, 432, 436.
Tay, 59, 289, 303, 329, 330, 410, 444, 453.
Tay, banks of, 259.
Taymouth, 312.
Taymouth Castle, 59.
Teith, 71.
Tentsmuir, 182, 260, 323, 409, 410.
Tête Noire, 273.
Thornhill, 382.
Thornton, 227, 228, 246, 306, 345.
Thornton Junction, 294.
Thun, 263, 264.
Till, 240.
Tillicoultry, 36.
Tillicoultry Glen, 37.
Tongueland, 434.
Torbane Hill, 177.
Torraline Water, 121.
Torry, 109.
Torryburn, 109, 134, 161, 162, 306.
Town Wood, 331.
Tralee, 150, 151, 152.
Tranent, 81, 207.
Trapraine Law, 423.
Trossachs, 30, 76, 309.
Tulliallan, 109, 161, 180.
Tummel, 59.
Turk Mountain, 147, 149.
Turk Waterfall, 146.
Tweed, 84, 134, 135, 199, 200, 236, 240, 377, 443.
Tweedbank, 237, 241.
Tweedmill, 240.
Twizel Castle, 240, 241, 443.
Tyne, 83, 179, 319, 361, 423.
Tynehead, 81, 83, 175, 193, 254, 287, 333, 407.
Tynningham, 45, 179, 238, 319, 361, 392, 393, 423, 466.

ULLESWATER, 168, 169.
Unter-Aar Glacier, 266.
Unterseen, 264.
Uphall, 424.
Upper Lake, 147.
Upper Largo, 380.
Usan Mains, 429.
Utrecht, 261, 262.
Utrecht Botanic Garden, 261.

VALAIS, 268, 269, 272, 273.
Valentia, 151.
Valleyfield Paper Mills, 233, 285.
Viesch, 269.
Villeneuve, 273.
Visp, 269, 270, 272.
Visp River, 270.
Vispach, 269.

WALES, 209.
Walsall, 405.
Water of Leith, 78, 194, 220, 252, 302, 315, 326, 327, 336, 356, 463.
Weem, 312, 314.
Weisshorn, 270.
Well Burn, 230.
Wells of Dee, 53, 190, 191.
Wemyss, 130, 158, 196, 197, 227, 228.
Wemyss Bay, 139, 141.
Wemyss Castle, 227, 228.
Wemyss Hill Farm, 165.
Western Dalmahoy Hill, 77, 159.
Western Wemyss, 158, 228.
Westerton, 466, 467.
West Linton, 471.
West Lomond Hill, 201, 202, 320, 321, 381, 475.
Wharrie Bridge, 324.
Wharrie Burn, 466.
Wharrie Glen, 256, 324.
Whitadder, 241, 292.
Whitbery Point, 319, 392, 393, 423.
White Coombe, 230.
Whitekirk, 28.

White Water, 57, 101, 172, 298, 344, 385, 479.
Whiting Bay, 120, 121, 244, 245, 246, 247, 248, 448, 449.
Whittingham, 107.
Wicklow Court, 143.
Wigton Bay, 433.
Winchburgh, 26, 32, 105, 127, 197, 316, 317, 424.
Windermere, 165, 166, 167.
Window of Corryarder, 419, 420.
Wine Cellars, 150.
Wishaw, 164.
Witch Quarry, 444.
Wolflee, 368.
Woodcockdale, 177, 412, 440.
Woodhall, 26, 37, 38, 66, 78, 112, 129 159, 194, 315.
Wordsworth's tomb, 167.
Wytheburn, 167.

YARROW, 426, 473.
Yester, 231, 232.
Yester House, 231.

Zermatt, 270, 271, 272.
Zmutt glacier, 271.