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Narrative of the Ninth I. P. E.

By D. A. Webb, Dublin

Preliminaries

At the beginning of 1948 the permanent committee, feeling that recovery from the effects of the war had proceeded far enough, at least in some countries, to make it possible to attempt to resume once more the series of Excursions, wrote, through its secretary, Dr. Lüdi, to Professor Doyle of University College, Dublin, enquiring whether there was any possibility of an Excursion being held in Ireland in 1949. Ireland was selected as a country which, on the one hand, possesses many peculiar features of phytogeographical interest, and, on the other hand, had the material advantage of having escaped devastation or occupation during the war. Professor Doyle brought the request in the first instance before the Flora and Fauna Committee of the Royal Irish Academy, which gave its general approval to the project, and asked Professor Doyle to summon a committee of Dublin botanists to discuss its practicability. After two meetings of this committee, it was decided to make plans for an Excursion in July, 1949, and Dr. Webb, of Trinity College, Dublin, agreed to act as secretary to the committee and general organizer of the Excursion. It was realized that fourteen months was not adequate for preparations to be made on the scale on which they had been made for previous Excursions; but on account of the International Botanical Congress at Stockholm arranged for 1950, postponement would have meant postponement till 1951, and it seemed better to attempt immediately an Excursion on the modest scale that the circumstances of the post-war world dictated.

The Irish Committee, in whose names the invitations were sent out, consisted of the following members:

Professor H. H. Dixon, Dublin,
Professor J. Doyle, Dublin,
Dr. A. Farrington, Dublin,
Professor M. J. Gorman, Dublin,
Dr. J. Heslop Harrison, Belfast,
Mr. G. F. Mitchell, Dublin,

Dr. P. J. O'Connor, Dublin,
Dr. R. Ll. Praeger, Dublin,
Professor J. Small, Belfast,
Mr. A. W. Stelfox, Dublin,
Dr. M. De Valera, Galway,
Dr. D. A. Webb, Dublin.

Invitations were sent out at intervals between October, 1948, and March, 1949. Considerations of transport and accommodation made it necessary to restrict the membership of the Excursion to 25. At the last moment, unfortunately, Dr. Lebrun of Brussels and Professor Klika of Prague found it impossible to participate, so that the actual number of members was 23. Twelve different countries were represented, so that the international character of the Excursion was well maintained. In addition to those members whose names are given below, Professor A. G. Tansley, one of the two surviving members of the first I.P.E., came over to Dublin from Cambridge to attend the first two days of the Excursion.

List of Members.

AUSTRIA

Professor H. Gams, University of Innsbruck.

DENMARK

Professor K. Jessen, University of Copenhagen.

Dr. J. Iversen, Danish Geological Survey, Charlottenlund.

FINLAND

Professor M. J. Kotilainen, University of Helsingfors.

Professor A. Kalela, University of Helsingfors.

FRANCE

Dr. J. Braun-Blanquet, Station Internationale Géobotanique,
Montpellier.

GERMANY

Professor F. Markgraf, Botanic Garden, Munich.

Professor F. Firbas, University of Göttingen.

Professor R. Tüxen, Zentralstelle für Vegetationskartierung,
Stolzenau-Weser.

GREAT BRITAIN

Professor T. G. B. Osborn, University of Oxford (July 8—22).

Professor W. H. Pearsall, University College, London (July 8—21).

Professor A. R. Clapham, University of Sheffield (July 12—25).

Dr. H. Godwin, University of Cambridge.

Dr. A. S. Watt, University of Cambridge.

ICELAND

Dr. A. Löve, Institute for Applied Genetics, Reykjavik.

ITALY

Professor G. Negri, University of Florence.

NORWAY

Professor R. Nordhagen, University of Oslo.

SWEDEN

Professor H. O s v a l d , University of Uppsala (July 8—19).
Professor E. H u l t é n , National Museum, Stockholm.

SWITZERLAND

Dr. W. L ü d i , Geobotanisches Institut Rübel, Zürich.
Professor W. R y t z , University of Berne.
Dr. M. W e l t e n , Spiez.

U. S. A.

Dr. S. A. C a i n , Cranbrook Institute of Science, Bloomfield Hills,
Michigan.

The following Irish guides accompanied the excursion: Dr. D. A. W e b b , July 8—25; Mr. G. F. M i t c h e l l , July 8 and 10—25; Dr. J. H e s l o p H a r r i s o n , July 12—21; Professor M. J. G o r m a n , July 8—10 and 15—17; Miss M. D e V a l e r a , July 15—17.

The weather during the excursion was, on the whole, very favourable. The exceptional drought of the spring and early summer meant that the vegetation of the eastern half of the country presented a rather abnormal aspect, but in the west its effects were not so marked. Some heavy rain on July 14, 15 and 20, and thick mist on the mountains on July 8, 13 and 21 were sufficient to afford the visitors a fair sample of the Atlantic climate, but most of the remaining days were fine and sunny.

In the course of the tour the members of the Excursion met together on five occasions for the transaction of business and for organized discussion. At two of these the organization and future of the I. P. E. came up for review. It was unanimously agreed that its organization should continue on the present basis, with a permanent committee of three in Switzerland to provide the link between one excursion and the next. Several proposals with regard to the nature and date of the next excursion were put forward. Dr. C a i n urged the claims of the eastern United States; Dr. B r a u n - B l a n q u e t suggested northern and central Spain and Portugal; Professor G a m s the eastern Alps. It was agreed that the possibilities of an excursion in America should be explored, with 1952 as the most likely date; but as the difficulties in the way of executing this project were obvious, it was agreed that a European Excursion should in any case be held not later than 1954.

The other three discussions were on topics relating to the present tour. The first was on the glacial and post-glacial history of Ireland, and consisted principally of an exposition of the facts,

as they are at present understood, by Mr. Mitchell. The second was on the methods of classifying plant communities: Dr. Braun-Blanquet, assisted by Professor Tüxen, gave an exposition and defence of his methods and classificatory schemes, against some determined if respectful criticism from other members of the party. At the third Dr. Webb introduced a discussion on the Atlantic flora and the problems presented by its disjunct distribution.

Diary of the Excursion

Friday, July 8. The members of the Excursion and of the Irish committee assembled in the Regent House of Trinity College, Dublin, where an exhibition had been arranged of Irish plants of phytogeographical interest, accompanied by maps showing their Irish and European distribution, and of books on the Irish flora. Dr. Praeger made a speech of welcome to the visitors on behalf of the Irish committee, and Dr. Lüdi and Professor Tansley spoke in reply.

Lunch was taken in the Dining Hall of Trinity College, and immediately afterwards the party set out in private cars for a short tour of the Dublin mountains, which consist of a large intrusive mass of granite of Silurian age. The altitudinal zonation of the vegetation could be seen, the lowest zone of farmed land giving place at about 250 m to bushy communities dominated by *Ulex europaeus*, which in its turn is succeeded at about 350 m by hill-pasture in which small rounded bushes of *Ulex gallii* are abundant. Above this is moorland, with *Calluna vulgaris* dominant on the steeper, better-drained slopes, and *Scirpus caespitosus* or *Eriophorum angustifolium* on most of the flatter summits. On parts of the summit, however, burning and weathering have led to a degeneration of the vegetation, so that much bare peat is exposed, and *Rhacomitrium lanuginosum* and *Cladonia* spp. become at least as prominent as the dwarfed vascular plants. A walk over moorland of this type at about 500—550 m led the party to a region between Glendoo and Killakee Mts. where denudation and gully-formation had gone far enough to reveal, below the peat, sub-boreal pine-stumps and a podsolized layer of downwash granite debris. On the way down from the mountains the party

paused to look down on Ballybetagh bog, the site from which late-glacial deposits rich in plant remains had been described by Jensen and Farrington. It was pointed out that the steep, south-facing slope at the head of the valley had permitted the development in Zone III especially of a rich phanerogamic vegetation, mainly of species that are now arctic-alpine in distribution, having been obliterated in the lowlands of Ireland by the growth of forest and bog in post-glacial times.

At 21.00 the members attended a reception given at Iveagh House by the Minister of External Affairs and Mrs. MacBride.

Saturday, July 9. The party set out from Dublin at 09.00 in the private omnibus in which the tour was made. The first two days were devoted to the midland plain, a nearly flat sheet of Carboniferous limestone which covers most of the centre of Ireland, covered to a variable extent by boulder-clay and other glacial deposits, and in certain places by extensive peat-bogs.

The first stop was made 3 km north-west of Newbridge, County Kildare. Here calcareous springs, emerging from the large gravel plain known as the Curragh into a badly-drained valley, have given rise to an extensive fen—a type of community not often seen in Ireland. Most of it is occupied by *Cladium mariscus*, accompanied by some *Schoenus nigricans* and *Phragmites communis*. The absence of any colonization by *Salix*, *Alnus* or other arbuscular plants is very striking: it is perhaps to be explained by seasonal fluctuations in the watertable. Throughout the fen, and especially at the margins, a tendency for the vegetation to pass over, under climatic influence, to a more oligotrophic type, with *Erica tetralix* and plentiful *Sphagnum* spp., is very noticeable. In the marginal zones the display of orchids, especially *Platanthera bifolia*, *Gymnadenia conopsea* and *Orchis fuchsii* was particularly striking.

12 km south-south-west of the fen, near the village of Nurney, is a well-developed esker, which was next inspected. The eskers—irregular, sinuous ridges of sand and gravel, laid down by water flowing beneath the retreating ice-sheets in late-glacial time—are a characteristic feature of the Irish midlands. They bear, in regions where the natural climax scrub or woodland has been eliminated, a rather dwarf grassy vegetation (stabilized by rab-

bit- and cattle-grazing), marked by the relative abundance (by Irish standards) of calcicole and dry-soil species. In this example *Antennaria dioica*, *Carlina vulgaris*, *Leontodon hispidus*, *L. leyseri*, *Anacamptis pyramidalis*, *Trisetum flavescens*, and *Briza media*, all characteristic species, were well represented. On account of the dry summer all the surface-rooted species were suffering severely from drought.

Lunch was taken by a roadside cutting between Kildare and Monastrevan, in which alternate layers of peat and marl showed how the raised bog which had developed from the fen vegetation in this basin in the post-glacial period had reverted for a while to open water and then gone through the same development a second time.

The party next proceeded to inspect the large raised bogs which stretch northwards for many kilometres from Portarlinton, where a large power-station for the development of electricity from peat has just been completed. Derrylea bog, 3 km north-east of the town, is still almost intact, and although, as a result of the drought, the pools were empty, their floors coated with a felt of dead algae and *Sphagnum*, the typical regeneration-complex with hummock and hollow could be clearly seen. Two notable Atlantic features of the bog were the abundance of *Narthecium ossifragum* everywhere (in full flower, rather before its usual time), and also of the large metallic-red cushions of *Sphagnum magellanicum*, frequently suffering from the attacks of the parasitic lichen *Gyalecta gloeocapsa*. A few km to the north-west of Derrylea lies Clonsast bog, which has been extensively exploited for fuel. A brief visit was paid to it, and in the deep cuttings some 6 m of peat could be seen, with a clear transition from eutrophic *Cladium* and *Phragmites* peat at the bottom to oligotrophic *Eriophorum*, *Calluna* and *Sphagnum* peat on top. In this region, which lies at the margin of a very large bog, the development has been complicated by local factors which obscure the Grenzhorizont.

At 18.30 the party reached Tullamore, where the next two nights were spent.

Sunday, 10 July. This day was devoted to a further exploration of the central plain, with its eskers, raised bogs and limestone lakes. The party first drove 3 km north-west from Tul-

l a m o r e, to the point where the Clara road cuts through a fine esker. Here, in contrast to the esker visited on the previous day, there is little grazing, so that a mixed scrub, which does not perhaps depart very far from the true climax, has developed. It contains *Corylus avellana* and *Fraxinus excelsior* (both species characteristic of limestone soils) and a dense and almost impenetrable undergrowth of *Crataegus monogyna*, *Prunus spinosa*, *Rosa canina*, *Rubus* spp. and *Ulex europaeus*. The herbs of the field layer are mainly woodland species. A visit was then paid to an interesting spot some 15 km south-south-west of Tullamore (near Clonaslee), where a small esker runs along the flank of a large raised bog. From the esker issue small springs, and around these develop local spring-bogs, while the highly calcareous streams, running for a short distance into the peat between large tussocks of *Molinia caerulea*, carry with them a calcicole flora. *Cirsium dissectum*, *Gymnadenia conopsea*, *Parnassia palustris* and *Schoenus nigricans*, all characteristic of habitats such as this where peat and limestone meet, were present in abundance, and a much rare species, *Ophrys muscifera*, was seen in considerable quantity.

Proceeding further west through Birr, the party reached the north shore of Lough Derg, just west of Portumna, at lunch-time. Here were seen the typical features of the large limestone lakes of central Ireland: highly calcareous water, from which a crust of calcium carbonate is freely deposited on stones and algal colonies; a rather sparse aquatic flora, with species of *Chara* and *Potamogeton*; a well-developed reedswamp of *Scirpus lacustris* or *Phragmites communis* (the former being apparently the pioneer, and tending to be replaced by the latter), backed in some places by extensive beds of the rather rare *Carex lasiocarpa*, among which *Ranunculus lingua* was conspicuous; a stony shore with sparse, grassy vegetation, from which project here and there reefs of limestone rock with *Juniperus communis*, *Sesleria caerulea*, etc.; and behind this, ground which, wherever the grazing was not too heavy, was colonized by mixed wood in which *Fraxinus excelsior* was eventually dominant.

On the return journey a more northerly route was followed from Birr, and another large raised bog at Derrybrat (between Claghan and Frankford) was briefly visited. It was largely untouched, but a few drains had been cut with a view to future ex-

plotation, and it was interesting to note how anywhere within 100 metres of these drains the colour of the vegetation was noticeably darker, on account of the partial replacement of *Scirpus caespitosus* (the principal dominant on the bog) by *Calluna vulgaris*. Some of the party visited a «swallow-hole» in the middle of the bog and saw the typical change of vegetation produced by better drainage and a small increase in mineral supply, with the advent of *Betula pubescens*, *Salix atrocinerea*, *Pinus sylvestris*, *Juncus effusus*, *Vaccinium myrtillus*, *Osmunda regalis*, *Dryopteris spinulosa*, *Pteridium aquilinum*. On the bog surface *Andromeda polifolia* and *Oxycoccus quadripetalus* were seen in fair quantity.

Monday, 11 July. The party left for Sligo at 08.30. The first stop was at Clonmacnoise, on the east bank of the Shannon 13 km below Athlone. Fortunately the morning mist dispersed at the moment of arrival at Clonmacnoise, and a good view was obtained both of the Early Christian remains for which the place is celebrated, and also, from the summit of a neighbouring esker, of the enormous raised bogs of the Shannon basin.

Thence the route ran northwards through the somewhat featureless grazing land of Co. Roscommon, where the limestone is covered by a thin layer of glacial drift. Beyond Boyle the sandstone anticline of the Curlew Mountains (with *Calluna-Eriophorum*-moorland) was crossed, and near Lough Arrow the party stopped for an inspection of Carrowkeel, a limestone hill of 320 m which overlooks the lake from the west. One group climbed the eastern ridge of the hill, noting the extraordinary freedom with which acid peat, with a typical moorland flora including *Calluna vulgaris*, *Carex binervis*, *Juncus squarrosus*, *Deschampsia flexuosa*, etc., develops on bare limestone surfaces, presumably in response to the hyper-Atlantic climate. Here and there, where the peat has not developed, patches of a calcicole vegetation break through, so that a remarkable mosaic results. The freedom with which here, as elsewhere in north-west Ireland, woodland plants grow without any shelter on the exposed hillside was also clearly seen. The other group crossed the northern spurs to the north-east flank of the hill to see the curious miniature raised bogs which develop in the small rift-valleys by which the hill is intersected: in these the lateral drainage along the fault-lines leaves the centre of the valley free from flush-water and so permits of the development

of peat. Cutting in one of the bogs had revealed a bronze-age charcoal hearth buried beneath some 2 m of peat.

At 19.00 the party reached Sligo, which was their base for the next three nights.

Tuesday, 12 July. The morning was spent on the south shore of Lough Gill, which is surrounded partly by limestone and partly by siliceous metamorphic rocks. Although much of the woodland around the lake has been cleared, and that which remains is subject to a good deal of human interference, the contrast between the vegetation of the siliceous and of the limestone regions is clear; while on some of the islands small samples of nearly natural woodland could be seen. On the siliceous rocks *Quercus petraea* is dominant; the undergrowth, in which *Luzula sylvatica*, *Vaccinium myrtillus*, *Blechnum spicant* and *Dryopteris aemula* are conspicuous, is tall and luxuriant, in response to the very mild climate which this region enjoys. On the limestone the arboreal vegetation is chiefly *Corylus* and *Fraxinus*, with some *Quercus* and *Fagus* (the latter not native, but regenerating freely). There is no appreciable soil-cover over the limestone—a fact which some members interpreted as simply a result of excessive leaching, but which to others suggested that the woodland must once have been cleared, and that the present scrub is secondary.

On the shore of Lough Gill two trees of *Arbutus unedo* were seen, growing here in its most northerly known station, and almost certainly native.

In the afternoon a visit was paid to the sand-dunes at Strandhill, west of Sligo. The strong winds and the constant heavy increments of fresh sand make these, like most of the other western dunes, relatively barren and poor in species. Stabilization is difficult, and a large part of the dunes remains indefinitely in a semi-stable condition, with *Ammophila arenaria* generally dominant. *Viola curtisii* was here seen in some abundance.

Only 3 km south-east of these very exposed dunes a vivid contrast is provided by Knocknarea Glen, a small cliff-walled ravine which intersects the limestone hill. Here the warmth and moisture of the Atlantic climate can find their full expression without the usual counteracting effects of strong winds; and the vegetation, though poor in species, is astonishingly luxuriant for so northern a latitude. Species as diverse as *Fraxinus excelsior*, *Hedera helix*

(which drapes most of the cliffs), *Circaea lutetiana*, *Chrysosplenium oppositifolium* and *Phyllitis scolopendrium* all attract attention by their unusually large size. The fronds of the last named average 75 cm and occasionally attain to 1 m in length.

Wednesday, 13 July. The greater part of the day was devoted to the range of limestone mountains which lies to the north of Sligo and is usually named after Ben Bulbin, its most westerly summit. The ascent was made from the west end of Glencar Lough, up the south-facing slopes, which are relatively dry and barren, with a rather dwarfed calcicole flora, *Sesleria caerulea* being plentiful on the rocky outcrops. Approaching the summit plateau *Epilobium pedunculare* was seen: this alien from New Zealand has spread very rapidly through Ireland during the last twenty years, favouring chiefly wet, stony places in the mountains. A thick peat-cap on the summit plateau (400—500 m) obliterates the influence of the limestone, and bears a purely calcifuge moorland flora. On the north side of the plateau the Annacoona cliffs harbour a fine collection of arctic-alpine species, for which this range is celebrated; and though thick mist obscured the landmarks and made observation difficult, the species seen here by the party included *Saxifraga nivalis*, *S. oppositifolia*, *S. hypnoides*, *S. aizoides*, *Thalictrum alpinum*, *Cochlearia alpina*, *Draba incana*, *Euphrasia salisburgensis*, *Sedum rosea*, *Asplenium viride*, *Silene acaulis*, *Poa alpina* and *Oxyria digyna*. Several of these species are confined to a small outcrop of shale which overlies the limestone at one place on the cliff margin. The most remarkable plant of the range, *Arenaria ciliata*, in the form of its endemic subspecies *hibernica*, although confined to a few km of these cliffs, is remarkably abundant there, and unlike most of the arctic-alpine species spreads eastwards on to the drier grassy slopes. It was seen in full flower. In the descent of the long valley (Gleniff) which runs into the northern face of this range the most notable features were the abundance, rising to dominance over large areas, of *Juncus acutiflorus*, and, even more abundant, of its hybrid with *J. articulatus*; and a good display of the alien *Mimulus guttatus*, which spreads along mountain streams in Ireland far from its original areas of cultivation.

To conclude the day a visit was paid to the dunes of Claisie Bawn (just north of Cliffony, on the Sligo-Donegal road).

Here a plantation of *Pinus pinaster*, made just 100 years ago, is degenerating, whether from inevitable ageing and failure to regenerate, or from an increase in wind-exposure from some cause; and a vivid impression could be obtained from the steady drifting of the sand among the dead but still standing trees of the destructive power of the Atlantic gales.

Thursday, 14 July. The party left Sligo at 09.00 and drove westwards to Ballina, turning southwards there for Pontoon. East of Ballina there was well seen for some miles a characteristic feature of the Irish landscape—a flat road running along an embankment, 2 m or so above the level of the fields on either side, the latter having been lowered by the cutting away for burning of the blanket-bog which originally covered them. At Pontoon, where lunch was taken, there are considerable patches of native oakwood, and these were visited. They are generally similar to the Killarney woods, but *Betula pubescens* forms a major ingredient, especially as a colonist of clearings, where it is temporarily dominant; and *Populus tremula* is locally abundant at the margins. The level of the lake (Lough Conn) was exceptionally low, and extensive beds of *Lobelia dortmanna* were seen growing several cm above the level of the water, associated with *Baldellia ranunculoides*, *Littorella lacustris*, *Eleocharis multicaulis*, etc. Between the boulders on a steeper part of the shore, where the woods came down to the water's edge, a first glimpse of *Saxifraga spathularis* (one of the Hiberno-Cantabrian species) was obtained.

The remainder of the route, through Westport and Newport to Mallaranny, lay first over blanket-bog, and then through limestone drumlins, without any features of special botanical interest.

Friday, 15 July. The most spectacular plant of Mallaranny is *Erica mediterranea*, and within five minutes' walk of the hotel it could be seen in great abundance and luxuriance. Northwards for several km on both sides of Bellacragher Bay it runs up every mountain stream to about 150 m, and here and there spreads out into broad patches on the boulder-moraines.

North of Mallaranny stretches the most extensive area of blanket-bog in Ireland, and a visit was paid to this at a point about 9 km north of the hotel. In its general floristic composition and structure it resembles the raised bogs of the midlands, but a not-

able feature is the abundance of *Schoenus nigricans*, despite the apparent poverty of bases in the peat. *Eriocaulon septangulare*, one of the Hiberno-American species to which no suspicion of human introduction attaches, was abundant in bog-pools here, forming with freely-flowering *Utricularia minor* and large floating mats of *Drosera intermedia* a conspicuous patch of colour in the monotonous monochrome of the bog.

Driving back through Mallaranny the party headed westwards for Achill Island. A short stop was made at Sraheens Lough, as an example of the oligotrophic western type, with *Isoetes lacustris* and *Lobelia dortmanna* as characteristic species in the rather scanty flora.

After lunch at Keel, a walk south-eastwards along the shore brought the party to the foot of the Meenawn cliffs. Here were seen examples of «Plantago-sward», the characteristic association of very exposed places near the west coast, in which *Plantago maritima* and *P. coronopus* are usually dominant, and no plant reaches a greater height than 2 or 3 cm. The ascent of the hill that lies above the cliffs led first up a stream in a small ravine, in the shelter of which grew quite luxuriant *Saxifraga spathularis* and *Dryopteris aemula*; but above this the exposed slopes exhibited in very extreme form the effects of maximum Atlantic exposure, reinforced by grazing and burning. On a thin and discontinuous skin of peaty soil grew a very poor moorland flora in which *Empetrum nigrum* was plentiful and locally dominant. The strength of the wind could be deduced from the regularity with which all the leaves and branches even of this dwarfed vegetation pointed uphill. Towards the summit there are considerable patches of bare peat and fragmented rock, while at the summit itself (470 m) *Saxifraga spathularis* reappears and *Salix herbacea* is abundant.

Saturday, 16 July. The party left Mallaranny for Galway. A stop was made at Furnace Lough, 3 km north-west of Newport. The mean level of this lake lies below high-water-mark of spring tides and its water is slightly saline. Its aquatic and littoral flora includes a mixture of halophytic and ordinary freshwater species: a dwarfed *Fucus*, probably *F. vesiculosus*, is present in abundance, as well as *Samolus valerandi*, *Glaux maritima*,

Juncus gerardi, *Carex extensa*, *Scirpus maritimus* and *Ruppia spiralis*, but these are accompanied by plentiful *Phragmites communis*, *Littorella lacustris*, *Carex tumidicarpa*, *Myriophyllum alterniflorum*, and *Potamogeton perfoliatus*. A nearly continuous belt of *Erica mediterranea* fringes its shore. To the west lies a very striking glacial landscape, with several parallel steep moraines of sandstone boulders with a very scanty soil cover, separated by narrow lakes which are beyond the reach of tidal influence and lack, therefore, all the maritime species of Furnace Lough.

The route ran thence south-east through Westport and Partry, running nearly along the junction between the limestone plain and the acid rocks of the south Mayo mountains. Lunch was taken just north of Ballinrobe, and this gave an opportunity for a short examination of the southern extremity of Lough Carra. This is similar to Lough Derg in many respects, but the calcicole aspect is more marked: the water is very highly charged with calcium carbonate, which separates out freely as a very fine marly deposit on the lake bottom. The scrub adjoining the lake showed exceptionally vigorous regeneration of *Corylus avellana*, seedlings and young plants being very abundant: other common species were *Fraxinus excelsior*, *Betula pubescens*, *Alnus glutinosa*, *Prunus spinosa*, *Salix atrocinerea* and *Malus pumila*. Below this was a zone of calcareous grassland with plentiful *Juniperus communis*, which was, despite its highly calcicole facies, being invaded here and there by *Calluna*. On the stony shore *Galium boreale* was very abundant. Alternating with this were beds of *Myrica gale* and *Schoenus nigricans*, which passed over into reed-beds (mostly dried out at this time) of *Phragmites*, etc. *Orchis cruenta*, a species recently recorded from this part of Ireland and not known elsewhere in the British Isles, was plentiful here, and there was a remarkable display of *Epipactis palustris* a short distance above the shore.

The remainder of the route to Galway lay over the very flat limestone plain east of Lough Corrib, in which the vegetation shows every possible transitional stage between calcareous grassland and blanket-bog.

On arrival at Galway the members of the excursion were entertained to tea at University College, where a very full exhibition had been arranged, by members of the departments of

botany and chemistry, of the marine algae of the west of Ireland and the various products that had been derived from them.

Sunday, 17 July. This day was devoted entirely to the Burren, the very remarkable district which lies to the south of Galway Bay and forms the north-west portion of County Clare. Here a karst-like limestone formation and the extreme Atlantic climate combine to produce a unique and curious flora. Its most notable feature is the abundance, right down to sea level, of alpine and arctic-alpine species which occur elsewhere in Ireland only on mountains; but mingled with these are a few other species of purely southern affinities. Over wide tracts of country there is no soil cover, and the vegetation is virtually confined to the crevices which arise along the joint-planes of the horizontally bedded rock.

The first stop was made 3 km east of Ballyvaughan. Here the characteristic Burren flora runs down from the terraced rock on to the sand-dunes, which are composed of a very calcareous sand. *Anacamptis pyramidalis*, *Blackstonia perfoliata*, *Thymus* sp., *Galium verum*, *Asperula cynanchica* and *Carlina vulgaris* are all extremely abundant, and combine to form a flora of almost alpine brilliance. *Gentiana verna* is also plentiful here, but there were, of course, only a very few flowers to be seen at this time of year. *Neotinea intacta*, perhaps the most remarkable member of the Burren flora, was seen in small quantity; this essentially Mediterranean orchid is separated in its Irish stations by eight degrees of latitude from its most northerly stations on the continent (Istria and Asturias). Another notable feature of these dunes was the profusion of *Orobanche alba* growing on the *Thymus*.

Turning inland at Ballyvaughan, the route led up to the plateau on which lies Lisdoonvarna. Here the limestone is replaced by shales, and there is an abrupt change in the vegetation, soilless rocks, covered with cushions of *Dryas octopetala* and *Saxifraga hypnoides*, suddenly giving place to heavy clay fields badly invaded by *Juncus effusus*. North-west of Lisdoonvarna the road returned to the limestone, and here a stop was made for lunch, and to examine the *Corylus*-scrub which covers a good deal of the more sheltered areas of the Burren. How much more extensive this scrub would be without human interference was

the subject of some debate, certain members holding that the profusion of alpine species was best explained by supposing that most of the district had never been able to support continuous arboreal vegetation.

On reaching the coast again the road turns northwards towards Black Head. A short stop was made at Poulsallagah, just south of Black Head, to see *Adiantum capillus-veneris*, which is fairly plentiful in the crevices here, and occasionally ventures out on to exposed rock faces, and *Helianthemum canum*, a locally abundant species of the Burren. Large plants of *Asplenium marinum* were also seen here. A final halt was made at Black Head, where the general Burren flora is well developed, and a local form of *Saxifraga rosacea*, glabrous and very tufted, is fairly plentiful. In addition to the species already mentioned *Arenaria verna*, *Geranium sanguineum*, *Rubus saxatilis*, *Galium pumilum*, *Rubia peregrina*, *Sesleria caerulea* and *Euphrasia salisburgensis* deserve mention as characteristic Burren plants which were all seen here in some quantity.

Monday, 18 July. This day the route led westwards from Galway, to Connemara, the district which forms the most westerly part of County Galway. As far as Oughterard the road follows the limestone: to the east, between the road and Lough Corrib considerable patches of limestone pavement could be seen, covered here and there by dense *Corylus* scrub. But on the left of the road rise hills of granite and other acid rocks, covered with blanket-bog and an ericaceous vegetation, and immediately after Oughterard the road leaves the limestone and strikes westwards across the blanket-bog towards Clifden.

The main objective of the day was the locality known as Craiggamore, which lies about 8 km south-east of Clifden, near the eastern limit of a remarkable area in which small lakes are so numerous as to give an intricate mosaic of approximately equal areas of land and water. This locality is celebrated as the only Irish station for *Erica mackaiana*, the most restricted in its distribution of all the Hiberno-Cantabrian plants, which is found nowhere else but in the Asturias. The party saw it in full flower at Craiggamore, where it is abundant over an area of about 2 sq. km, and hybridizes freely with *Erica tetralix*, giving the hybrid (*E. praegeri*) and other forms which seem to result from

back-crossing with *E. tetralix*. Another Hiberno-Cantabrian species seen here in small quantity, and much more plentifully by the roadside on the homeward journey, was *Daboecia cantabrica*, which favours chiefly the lighter and less peaty soils to be found on the rocky outcrops which protrude from the blanket-bog.

The bog here is generally similar in structure and composition to that which had been visited earlier in Mayo, but contains as a rule more *Molinia caerulea*. *Drosera anglica* and *D. intermedia* are common as well as the more widespread *D. rotundifolia*, and *Rhynchospora alba* is very abundant, rising locally to dominance.

The flora of the small lakes (in which, despite the bog which surrounds them, the water is almost neutral) includes, apart from the commoner species of oligotrophic waters, *Lobelia dortmanna*, *Eriocaulon septangulare*, *Utricularia intermedia* and (rather surprisingly) *Cladium mariscus*, which in the west of Ireland seems to demand a much smaller supply of bases than it does elsewhere in the British Isles. In many of the lakes are small islets, which are rocky and covered with a low and wind-shorn but dense scrub, which would doubtless cover all the rocky outcrops from the bog were it not eliminated by grazing. In this scrub *Ilex aquifolium*, *Sorbus aucuparia*, *Quercus petraea*, *Taxus baccata* and *Juniperus sibirica* are among the most frequent species.

After lunch the party drove a short distance further south, noting, as they passed through Roundstone, the peat-beds there which are now submerged at high tide, indicating a substantial degree of marine transgression since they were laid down. 3 km beyond Roundstone, at Dog's Bay, a stop was made to inspect the calcicole flora which is developed here by the blowing inland by the westerly gales of the extremely calcareous sand of these beaches, which is composed largely of the shells of *Foraminifera*. Several of the characteristic species of the Burren reappear here in small quantity, including *Neotinea intacta*; and such plants as *Asperula cynanchica*, *Blackstonia perfoliata*, *Carlina vulgaris* and *Anacamptis pyramidalis* are frequent. The distance to which *Euphrasia salisburgensis* here penetrates inland (far beyond the apparent range of blown sand) suggests that the relation of this flora to the base-status of the soil may not be a simple one; this is corroborated by the presence on the apparently

acid blanket-bog in this region of base-loving species such as *Junctus obtusiflorus* and *Eriophorum latifolium*.

Tuesday, 19 July. The party left Galway in the morning for Glenbeigh, Co. Kerry, and most of the day was of necessity spent in travelling. The route led southwards past the eastern fringe of the Burren country, and a short halt was made at Tirneevin, 4 km west of Gort, to visit a «turlough», which is the name given to a depression in the limestone which drains or fills up with water from below according to the weather, and so constitutes a small, irregularly intermittent lake. The vegetation, which is mainly grassy, exhibits a fairly precise zonation. The upper limit of flooding is seen by the cessation of bushes such as *Prunus spinosa* and *Crataegus monogyna*, which are plentiful in the surrounding fields. The lower zones contain curious mixed communities in which aquatic plants such as *Myriophyllum alterniflorum* and *Fontinalis antipyretica* are found in close conjunction with marsh species (*Eleocharis acicularis*, *Ranunculus flammula*, *Rorippa amphibia*) and terrestrial species (*Agrostis stolonifera*, *Potentilla anserina*). The rare *Viola stagnina* is a characteristic plant of the intermediate zones. On the occasion of this visit the turlough was almost completely dry, and the luxuriant growth of *Fontinalis* on a dry stone wall a metre above water-level was very striking.

Another turlough about 15 km further to the south-west (near Killinaboy), surrounded this time by the bare limestone of the south-easterly fringe of the Burren, was visited for the sake of the plentiful fringe of *Potentilla fruticosa* which grew all round it near flood-level. This is a circumpolar species of very disjunct distribution, which occurs in only two localities in the British Isles. Near the bottom of this turlough *Teucrium scordium*, another rare species, was found growing in fair abundance.

Southwards of this to Limerick the route continued to run mainly over limestone, but with a covering of drift which meant that the Burren formation gave place to good pasture-land. At Limerick a détour was made to Glenstal, which lies 15 km to the east, on the slopes of the Slievefelim Mountains. Here, in a sheltered glen in the grounds of the Benedictine abbey, the party were able, thanks to the kindness of Mrs. Owens and Fr. Hubert Janssens O.S.B., to see *Trichomanes speciosum* grow-

ing under an overhanging cliff of Devonian sandstone. This species, which is confined to the Macaronesian islands and the extreme Atlantic fringe of Europe, was formerly fairly widespread in Ireland, but it was mercilessly exterminated by collectors in the last century, and now survives only in a few protected or inaccessible glens and waterfalls in the west. The abundance of *Hymenophyllum* spp. and numerous Bryophytes in this glen is noteworthy, and gave the party a foretaste of vegetation of this type, which was seen on a larger scale in the Killarney woods.

The rest of the day was occupied in the drive from Limerick to Glenbeigh, which was reached at 19.30, and formed the base for the next three days' excursions. The route contained little of especial botanical interest, much of it running over wet upland clays with a very restricted calcifuge flora.

Wednesday, 20 July. As the weather was wet, the mountain expedition planned for this day was postponed, and it was devoted instead to the neighbourhood of the Killarney lakes. A visit was first paid to Ross Island, 3 km south-west of Killarney. Here, although there has been much planting and other human interference, some idea can be obtained of the climax woodland which develops on the limestone shores of the lakes. *Quercus petraea* is generally dominant, but *Taxus baccata* is very conspicuous, especially in the more exposed parts. *Ilex aquifolium* is also plentiful, and *Arbutus unedo* (which has its principal Irish station around these lakes) is common as a marginal species. The abundance of these last three, together with a luxuriant growth of *Hedera helix* on most of the trees, gives to the woods an evergreen quality which is unique in the British Isles. Among the ground-flora *Rubia peregrina* is common.

In several patches on Ross Island normally maritime species such as *Silene maritima* and *Armeria maritima* are found in some quantity. They occur close to the outcrops of seams of copper-bearing ore, and it seems possible that an abnormally high copper content of the soil may be responsible for their occurrence.

Among the exotic species planted on the island *Pinus radiata* and *Abies alba* stand out by reason of the very large size to which they attain, and *Rhododendron ponticum* for the freedom with which it spreads from seed, even on the limestone, so as to form an important ingredient of the undergrowth of the woods.

Torc waterfall, a few km further south, was the next objective. Here constant moisture, northern aspect, complete shelter, and the warm and equable climate of south-west Ireland combine to produce a Bryophyte flora of exceptional variety and luxuriance. It also provided an opportunity of seeing *Saxifraga hirsuta*, another Hiberno-Cantabrian species, in its pure form (which is rather rare) and in the numerous hybrid grades by which it merges insensibly into the much commoner and more widespread *S. spathularis*.

Along most of the southern and western shores of the Killarney lakes the limestone gives way to Devonian sandstone, and it is on this sandstone, especially south of the Upper Lake, that the most extensive woods are found. Conditions here approximate more to the natural than on Ross Island (although there has been a fair amount of felling and replanting of oaks), and the only alien species found in any quantity in these woods is *Rhododendron ponticum*, which is, however, very abundant in places and rapidly increasing. *Quercus petraea* is everywhere dominant, with *Betula pubescens* and *Ilex aquifolium* as the most important subsidiary species; and *Arbutus unedo* is again plentiful around the margins. Several species such as *Taxus baccata*, *Euonymus europaeus* and *Sorbus rupicola* which were frequent on the limestone are here rare or absent. A striking feature of the ground flora is the enormous profusion of mosses and *Hymenophyllum* (*H. tunbrigense* and *H. peltatum* being about equally abundant) and the virtual absence of flowering plants over wide areas. *Euphorbia hiberna*, a species of extreme Atlantic distribution is conspicuous as a marginal species. Epiphytism is a pronounced feature of these woods, *Polypodium vulgare* being the most constant species, but it is occasionally joined by several others of normally terrestrial habit (e. g. *Saxifraga spathularis*).

Most of the party explored these woods under the guidance of Dr. Watt, who had previously made a detailed study of them. A few of them also explored the extensive alluvial marsh which lies between the woods and the upper lake. *Molinia caerulea* is dominant here, with *Drosera intermedia* extraordinarily abundant between the tussocks. Near the lake shore *Pilularia globulifera* was seen.

Thursday, 21 July. This day was devoted to South Kerry. The party drove through Killarney and past the woods visited on the previous day, and stopped for a short time at a point where, from a height of 250 m, a general view of the lakes and woods can be obtained. The very sharpe Baumgrenze at about 200—220 m on most of the hills was discussed; it was agreed that it could not be regarded as purely climatic, but some members thought that climate played as important a part as grazing in preventing regeneration above this level.

The route thence descended to Kenmare, which stands at the head of one of the fjord-like bays with which the south-west coast is indented. Driving some 15 km down the south shore of this bay brought them to the Clooneelakes, on whose stony shores grows in abundance the American *Sisyrinchium bermudiana*. This plant has been introduced into several parts of Europe, so that its indigenous status in western Ireland cannot be vouched for with complete confidence, but in this, as in many other places, it has all the appearance of a native. The undoubtedly native *Eriocaulon septangulare* is also abundant here, and some of the small bays on the east shores were packed with dense mats of it which had been detached from the substratum elsewhere in the lake and driven in by the wind. *Rhynchospora fusca*, a markedly western species in Ireland, was here abundant in small hollows in blanket-bog surrounding the lakes; it was associated with much *Drosera intermedia*, but the rarity in South Kerry of *D. anglica*, which had been seen so abundantly in Connemara, was very striking. *Hypericum elodes* was another Atlantic species that was seen in abundance here. On some of the small islands in the lakes a few trees of *Arbutus* could be seen.

After lunch the party drove a few km further south-west to Lauragh, where the sheltered situation permits the woods (mostly planted) to come down to within one or two metres of high-water mark. An indication of the luxuriance of the undergrowth in these woods was shown by the fronds of *Pteridium aquilinum* attaining a height of 3½ metres. In the adjoining salt-marshes *Limonium humile* was very abundant, and a small quantity of *Carex punctata*, a rare southern species, was seen.

On the return journey the route which was followed ran eastwards from Kenmare up the Roughty valley. At Morley's

Bridge *Hieracium scullyi*, an endemic recorded only from this station, was seen. Thence the road runs through a rocky defile to descend to Killarney by the valley of the Flesk. This is the region in Ireland where the Atlantic *Wahlenbergia hederacea* grows most abundantly, and a stop was made to see it forming large mats among the grass in Pteridietum by the banks of the river.

Friday, 22 July. As this was the last day in Kerry the majority of the party decided, in spite of the continuance of rather low cloud, to attempt the ascent of Carruntuohil (1040 m), the highest summit in Ireland. They started from Lough Acoose and ascended by the two lakes that lie in the glacial corrie known as Coomloughra. The lower slopes are covered with typical south-western blanket-bog, in which *Calluna* and *Molinia* alternate as dominants. *Pinguicula grandiflora* is abundant, especially on the rocky outcrops, at the lower levels; higher up it is replaced by *P. vulgaris*. On the cliffs which rise above the Coomloughra lakes there is a fair collection of arctic-alpine species: *Saxifraga rosacea* is the most abundant, covering considerable areas of wet scree, and *S. stellaris* is also common by the streams. The other species include *Sedum rosea*, *Oxyria digyna*, *Asplenium viride* and *Salix herbacea*. Where the cliffs and steep screes give place to the gentler grassy slopes of the summit the alpine flora disappears, and at the summit the plants are almost entirely those of lowland heath, *Carex rigida* and *Armeria maritima* being the only exceptions. The greater part of the cloud cleared away as the day advanced, and from the summit for a moment a good view of the surrounding country could be obtained.

Those members of the Excursion who did not join in the ascent spent the morning on the dunes north-west of Glenbeigh, where *Eryngium maritimum*, *Euphorbia portlandica* and *Arenaria peploides* are among the most conspicuous species. These dunes are the only Irish station for *Lathyrus maritimus*, of which one small plant was seen. In the afternoon they walked over to Carragh Lake, and at different points saw three Atlantic species in abundance: *Anthemis nobilis*, *Parentucellia (Bartsia) viscosa*, and *Carum verticillatum*.

Saturday, 23 July. The party started from Glenbeigh at 09.00 to drive across the south of Ireland to Wexford. The route ran south-east from Killarney over upland blanket-bog into

County Cork, and descended the Sullane River to Macroom. Here a stop was made to visit the Geeragh, which lies just south of the town. It is a stretch of the river Lee in which the stream, running through a gravelly bed, breaks up into a network of small anastomosing streamlets. Between these are islands which are not subject to grazing and bear, therefore, an almost natural vegetation of *Quercus-Salix-Alnus* woods. The herbaceous undergrowth is very luxuriant, with *Angelica sylvestris* over 2½ m high; *Osmunda regalis* is very abundant at the margins and *Oenanthe crocata* in the streams.

Thence the route ran down the limestone valley of the Lee to Cork, where it turned northwards over a sandstone ridge to reach the valley of the Blackwater at Fermoy. It followed the wooded and fertile valley of this river as far as Cappoquin, where it turned northwards again, to skirt the eastern fringe of the Comeragh Mountains in County Waterford. Here there was just time to climb the 250 m of moraine that separates the road from Coomshingaun, a very fine glacial corrie backed by sandstone and conglomerate cliffs and containing the usual small lake. There was not time to examine the cliffs, but *Saxifraga spathularis* and *S. hypnoides* were seen by the stream below the lake.

After a halt for refreshments provided by Mrs. Owens at her house in the Suir valley between Carrick and Clonmel, the eastwards journey was resumed through Waterford and New Ross, and the party reached Wexford at 20.30.

Sunday, 24 July. The morning was spent on the shingle beaches and sand-dunes which separate Lady's Island Lake (15 km south of Wexford) from the sea. Here the chief interest was provided by *Otanthus maritimus*, a Mediterranean species which has become extinct in Great Britain and now is found nowhere else in the British Isles than at this station. Over a limited area of bare, sandy shingle it is very abundant. Other plants of interest include *Glaucium flavum*, *Calystegia soldanella* and *Polygonum raii*, all present in some abundance.

After lunch at Wexford the party left for Dublin, driving northwards along the fertile plain that lies between the Wicklow Mountains and the sea. One stop was made en route, at Ashford, Co. Wicklow, to visit the remarkable gardens of Mount Usher. The party was shown round by the owner, Mr. E. H.

Walpole and his head gardener. In this garden, which lies in a warm and sheltered spot, there has been assembled a very large and varied collection of flowering and other ornamental trees and shrubs, many of which could not be grown out of doors in other parts of northern or central Europe. Species from the warm-temperate regions of the southern hemisphere are especially well represented. Several species of *Eucalyptus* are represented by very tall trees which tower above the rest; and another notable feature is the abundance of well-grown *Eucryphia*, which were just coming into flower. The whole forms a remarkable demonstration of the mildness of the Irish climate, even in the eastern counties.

The party arrived back in Dublin at 19.00.

Monday, 25 July. The morning was spent at the Botanic Gardens, Glasnevin, where the director, Mr. Walsh, and his staff, and Dr. and Mrs. Praeger helped to show the visitors round. Lunch was provided by University College, at their premises at 86 St. Stephen's Green, and was followed by a final business meeting and discussion. An afternoon reception by the Royal Zoological Society of Ireland at the Zoological Gardens concluded the programme for the day and for the whole excursion.