The JOURNAL of THE SCOTTISH ROCK GARDEN CLUB

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APRIL 1976

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NOTICE

The ANNUAL GENERAL MEETING will be held at British Medical Association House, 7 Drumsheugh Gardens, Edinburgh, on **Saturday 13th November 1976, at 3 p.m.**

Members are notified that nominations are required for President and other Office-bearers, for three Vice-Presidents and for five Ordinary Members to serve on the Council. Nominations *in writing, seconded by another Club member or members*, must be sent to the Hon. Secretary no later than 20th August 1976, the nominator having ascertained that the nominee is willing to serve if elected.

Alfred Evans, Esq., having served as President for three years is not eligible for re-election as President, but, as immediate Past-President, will serve automatically on the Council as a Vice-President.

All other Office-bearers retire annually but are eligible for re-election.

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High Meadow and Alpine Plants of Mt. Rainer National Park, Washington

by BRUCE H. BARRITT, Washington State University, U.S.A.

ON THE highest mountains of western Washington are sub-alpine parklands and alpine meadows. The parklands include areas where tree dominance has gradually given way under increasingly harsh environments to an open mosaic of tree patches and meadow communities. This area is generally termed "timberline" and is at an elevation of 5200 to 6800 ft. on Mt. Rainier. Three tree species, *Abies lasiocarpa*, *Tsuga mertensiana* and *Pinus albicaulis*, are found in the timberline region. As the elevation increases they are reduced to shrubby forms and dense mats.

The variety and richness of the moist meadow flora make the sub-alpine parkland a challenge to scientists and a world renowned tourist attraction. The plants in the moist meadows attract the most attention because of their massive floral displays in July and August, but two other environments, the very moist stream bank areas both at timberline and above and the high alpine region above timberline, include unique collections of plant species.

MEADOW FLORA

The first plants to emerge, often through the edge of the melting snow, are the white avalanche lily, *Erythronium montanum*, and the yellow glacier lily, *E. grandiflorum*. Both arise from underground corms and form extensive displays of early colour. Also emerging through the snow is the yellow buttercup, *Ranunculus eschscholtzii*. The spectacular two-inch wide creamy yellow blossoms of *Anemone occidentalis* (fig. 1) emerge early and precede the unfolding of finely dissected foliage and stem elongation. By early August this common plant produces attractive plumose seed heads, nature's hippies.

The moist meadow reaches its spectacular peak of colour and lushness in August with the white flower heads of *Valeriana sitchensis* and *Polygonum bistortoides*, the yellow of *Arnica latifolia* and *Pedicularis bracteosa*, the magenta *Castilleja parviflora*, the blue of *Lupinus lati-*

folius and the lavender of several *Aster* species. *Xerophyllum tenax*, a member of the lily family, produces a striking three-foot floral spike with hundreds of small white flowers from a basal clump of stiff straw-like evergreen leaves. *Gentiana calycosa* is one of the last plants of the moist meadow to bloom, usually not until September. This common plant has deep blue upright bell-shaped flowers up to $1\frac{1}{2}$ ins. long atop eight in. tall tufted stems.

Pedicularis ornithorhyncha, occurring in drier meadows, has a dense terminal cluster of purple flowers with bird-like beaks on stems up to eight ins. tall. The dainty carpet forming *Phlox diffusa* with $\frac{3}{4}$ in. pink blossoms can be found blooming early in open sunny sites on dry soils or rocks. In the drier areas of the meadows are four low-growing Ericaceous shrubs: *Vaccinium deliciosum*, which produces highly flavoured blueberry fruits and becomes a flaming mass of red in September, *Phyllodoce empetriformis*, with deep pink flowers, *Phyllodoce glanduliflora*, with creamy-yellow urn-shaped flowers, and *Cassiope mertensiana*, with white drooping bells. The last three species, rarely more than ten ins. tall, are locally called red, yellow and white heather, respectively.

STREAM-SIDE FLORA

Pink-flowered *Mimulus lewisii*, up to two ft. tall, forms large patches lining cold rushing meadow streams. Often in the running water is the dwarf yellow *Mimulus luteus* whose one in. long blossom is disproportionately large in comparison with the two in. tall plant that supports it. In peat and muck areas at the edge of alpine ponds, but not usually in association with *Mimulus* species, are the cream-coloured *Caltha leptosepala*, the robust 15-ins. tall purple-flowered *Dodecatheon jeffreyi*, and the pink-flowered elephant-head, *Pedicularis groenlandica*, with flower spikes up to 12 ins. tall.

ALPINE FLORA

True Arctic-alpine vegetation exists in a narrow elevation band of approximately 1500 feet between 6800 feet and the region of permanent snowfields and glaciers. The soils are thin and include various mixtures of rock, sand and pumice. Little snow accumulates in these exposed areas and the soil has little water holding capacity. Plants of these regions must be adapted to a very short growing season, high light intensity, extremes in temperature and a limited moisture supply.

On rocky pumice soils *Silene acaulis* forms dense mats up to three

ins. tall with small dark pink flowers. *Spraguea umbellata* on sandy sites produces a flat rosette of thick glossy leaves with small pinkish flowers clustered in dense heads radiating out from the foliage mass. In rocky crevices the bright red fruits of *Oxyria digyna* are more conspicuous than the small green flowers. In the same habitat *Smelowskia ovalis*, up to six ins. tall with finely dissected grey foliage, produces small white flowers on several erect stems.

Penstemon rupicola produces a mass of bright scarlet flowers up to 1½ ins. in length on a prostrate shrub with grey-green foliage. *Castilleja rupicola*, an eight-ins. tall tufted plant, has bright crimson scarlet floral bracts. The species name 'rupicola' refers to growing on cliffs, as both these species can also be found on exposed rocky cliffs in the timberline region. Another species found both in alpine regions and on rocky outcroppings is *Sedum divergens*, a prostrate plant with a compact three-ins. tall cluster of bright yellow flowers and ¼-in. long thick fleshy sessile leaves.

Luetkea pectinata is a mat forming shrub with soft feathery leaves and a three-inch tall spike of tiny cream-coloured flowers. Another abundant mat forming species with small white flowers and Sedum-like evergreen basal foliage is *Saxifraga tolmiei*. Often growing together on rocky pumice soils in a mosaic of blue and gold are the miniature *Lupinus lepidus* var. *lobbii* with flowers compressed into small globes encircling a tuft of tiny finely dissected grey leaves, and *Erigeron aureus* (fig. 2) with one-in. wide golden flowers borne singly on four-ins. tall flower stems.

This is obviously an abbreviated list of mountain plants of Mt. Rainier. The four references listed below will provide a greater appreciation of the area's flora. "Vascular Plants of the Pacific Northwest" by Hitchcock, Cronquist, Ownbey and Thompson was the authority for botanical names. It must be stressed that collecting plants in Mt. Rainier National Park is forbidden.

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North American Plants in British Gardens

by ROBERT J. MITCHELL

WHEN THE topic of Western North American plants is mentioned my immediate thought is of the early plant collectors of the area. People like David Douglas, William Lobb, Thomas Nuttall, John Jeffrey and Lewis and Clark, experienced great hardships over difficult terrain in order to explore, to map, and to find many new plants. There is sufficient documented material for this subject on its own.

Perhaps the first plants which spring to mind are the forest trees. That this is so is only natural, for we owe a great deal to these early explorers who introduced to Britain many tree species which are of paramount importance to the forestry economy of this country. Wherever we see trees planted on a forest scale it is not surprising to find at least one species from North West America. Plants such as Douglas Fir, Lodgepole Pine, Sitka Spruce, and Western Hemlock are only a few of the commercially exploited timber trees.

In the wetter areas of British Columbia, trees appear from horizon to horizon, but yet in the higher altitudes alpine plants are plentiful among the alpine species of conifer and scrubby plants. Alpines such as *Cassiope mertensiana, Phyllodoce glanduliflora, Phyllodoce empetriformis,* occur in profusion in many areas together with a host of lupins, *Arnica, Antennaria, Castilleja* and the scrubby *Rhododendron albiflorum.*

In drier areas inland and the coastal belt, and particularly in the spring, many lovely bulbous plants flourish. In these dry areas, for example the Okanagan and the Cascades, such bulbous plants as *Fritillaria pudica* and species of *Calochortus, Cammassia, Dodecatheon, Erythronium* and *Triteleia* are found.

From this short list of genera it becomes apparent that there are similarities in the floras of Western North America and Europe. In the wetter climes of Europe, species of *Cassiope, Phyllodoce, Antennaria, Linnaea* are found, while in the drier Mediterranean region species of *Erythronium* and *Fritillaria* are present.

Nor should we forget the great variety of alpine plants from Eastern North America. The carpets of *Cassiope, Linnaea, Phyllodoce,* etc.,

which occur abundantly at sea level in Newfoundland; the little *Pyxidanthera* of the Pine Barrens of New Jersey; the hosts of Trilliums which are found in eastern provinces and states as well as western areas, only give a small sample of the alpine plant range.

This, then, is the background of the subject. But how do we start to evaluate the impact of North American alpines in British gardens, and how deeply should we delve?

Not all of the species of North American plants are easily grown in British gardens. Some mentioned by Bob Woodward and Jimmy McPhail are downright impossible, even in British Columbia gardens. Nevertheless, the keen growers and plantsmen among our members grow a wide range of plants to perfection and these are frequently shown at the various Scottish Rock Garden Club Shows.

Many lovely North American alpines feature regularly on the Show bench and frequently gain awards. The records of each and every Show are so vast in material to sift through to seek out those species which come from "the land across the water". However, the Club keeps a record of the Forrest Medal winners and this will be the means of showing the extent to which North American plants are respected in Scotland. Here the most coveted award at any Club Show is the Forrest Medal, awarded to commemorate that plant hunter "par excellence", for the most meritorious plant in each Show. Since the medal was first presented in 1934, just two years after George Forrest's death, 217 medals have been awarded. 22 of these medals have gone to North American alpines encompassing 8 families and 11 genera. While this does not give in any way a complete picture of the wealth of alpines, it does, I hope, help to give an idea of the range of alpines.

Portulacaceae is well represented by six species of *Lewisia.* The plant which Lewis and Clark found the Indian tribes using for food has become a favourite to a great many people. Not only are the species grown but the range of colours produced by the nurserymen help to create an interest for the non-specialist grower. This genus so engendered considerable interest both north and south of the border, that the Alpine Garden Society published a booklet on it. Forrest medals were awarded to *Lewisia columbiana rosea, heckneri, cotyledon, trevoseana* (twice) and *tweedyi* (fig. 6). Surprisingly the original or type plant, *Lewisia rediviva,* has so far failed to appear in the list.

The family with most awards, perhaps not surprisingly, in the land of the heather, is the Ericaceae with seven awards to three genera. The most prized plant among the North American alpines is *Kalmiopsis*

leachiana with three medals to its credit and the form 'M. le Piniec' with a further two awards. It is interesting to speculate that perhaps two people had these marvellous plants which appeared regularly on the show bench and nobody could compete. This, however, is not the case for there are in fact five different growers involved over a period of 17 years. This is a marvellous achievement which only *Androsace imbricata* and *Cyclamen neapolitanum* can surpass. Interest in the Ericaceae and its related peat-loving alpines is synonymous with Scottish growers. It is due to the climatic conditions which are ideal for these plants—the Scottish mist effect. *Cassiope mertensiana* and *Phyllodoce empetriformis* complete the members of the Ericaceae.

Closely related to Ericaceae—the Diapensiaceae is not a family with many genera, but those included are excellent plants. *Shortia galacifolia* and *Gallax aphylla* are easy to grow and excellent in the garden. *Diapensia lapponica* is grown in alpine houses but is still a rare plant. One of the most difficult plants to flower in cultivation is the Eastern American *Pyxidanthera barbulata* from the acid sandy pine barrens of New Jersey. Plants introduced to Britain have grown well and flourished in the alpine house. They all flowered well during the first year but, alas, no one seems to have found, as yet, the magic formula to induce flower buds to form.

Douglasia laevigata (Primulaceae) from the Cascade Mountains and *Phlox triovulata* (Polemoniaceae) from New Mexico have each received two awards. Both are excellent plants in the alpine house although *Douglasia* does extremely well out of doors.

To round off the plants receiving awards, *Aquilegia scopulorum* (Ranunculaceae), *Erigeron aureus* (fig. 2) (Compositae) and *Mertensia coriacea* (Borginaceae) have each received one medal.

Aquilegia scopulorum is only one of a range of species of very fine plants which are grown in the rock gardens. Their problem mainly is their habit of freely hybridising with other species. *Erigeron aureus* produces dense carpets of growth and is a valuable plant in the rock garden. Of the name of *Mertensia coriacea* there appears to be some doubt. It is recognised as a name but has since been placed as synonymous with *Mertensia lanceolata* by some authorities.

As I stated earlier, this method of sampling the North American alpines is far from adequate. It has, I hope, given some measure of the wealth of alpines from this vast area. Ten per cent of the awards to North America, however, does reflect favourably on the excellence of the quality.

Asiatic Primulas Growing in Scotland in 1975

by R. S. MASTERTON

THE GENUS PRIMULA is widespread throughout the world, but nowhere do they grow in such profusion and with such great beauty than in Asia. The real home of the Primula is the high mountains in the Highland areas of Yunnan and West Szechwan in North West China. Here more than one third of all known species of primula is indigenous.

From this heart-land the genus spreads West along the ranges of the Himalaya to the Orient and then into Europe.

Only two sections overlap from Asia into Europe, Vernales and Farinosae. To the East primulas spread through North China to Korea and Japan and again East to the Continent of America, where some members of the Sections Cuniefolia, Farinosae, Nivales and Parryi occur.

Some of the primulas are true alpines, but many are bog and meadow plants, so that the cultivation of each species requires the intimate knowledge of the conditions in its natural habitat.

For the purposes of this article on the species of Asiatic Primula in cultivation in Scotland they will be listed according to the classification of the Genus Primula compiled by Sir. W. Wright Smith and Dr. H. R. Fletcher.

SECTION AMETHYSTINA

This is a small Section of 12 species and sub-species, only one of which is still in cultivation. The Section is characterized by the pendant bell-like flowers and by the horny margin to the leaves. The species are restricted to the Eastern Himalaya and to North West China.

Primula kingii. The only representative of this Section in cultivation in Scotland is *P. kingii* which grows in a very few gardens and mainly kept in cultivation by the skill of Mrs. Elizabeth Sherriff of Ascreavie. This beautiful primula is from Bhutan, the Assam Himalaya and South East Tibet. It is a small perennial plant with a stout rootstock and leaves 1 to 2½ inches long. The scape is 4 to 8 inches in height and carries an umbel of up to 10 bell-shaped flowers of the deepest crimson. Propagation is by seed.

SECTION BULLATAE

This is a section of sub-shrubby primulas. They form thick stems on which are perched the rather rough surfaced leaves. They prefer a dry position between stones in a wall or under an overhanging rock. More commonly they are grown in a pot. Both species in cultivation flower in early Spring.

Primula forrestii. This primula was introduced by George Forrest from Yunnan in 1909 where he found the plants growing on limestone cliffs. The strong scape bears an umbel of large orange-yellow fragrant flowers coming from a woody rootstock covered at the base with wrinkled leaves. This must be the longest living primula, as it is thought to live up to 50 years in nature. It can be grown outside in Scotland, but it is more often seen as a pot plant. Propagation is by seed.

Primula redolens is the other member of this Section in cultivation. It also produces a pronounced woody rootstock and in nature is a cliff dweller in North West China. The flowers are of a rose colour and it is grown as an alpine house plant.

SECTION CANDELABRA

This section contains many plants of easy cultivation and propagation. The leaves of this section are like the common primrose and from the centre of the foliage rises a tall flower scape on which are produced at intervals whorls of stalked flowers. The number of whorls depends on the species.

All the Candelabra section are plants of moist meadows and stream sides and are found the length of the Himalayas and into Western China. Cultivation is easy if the conditions of moisture, semi-shade and humus are given. Propagation is by seed and division. Flowering season is usually May and June.

Primula anisodora was found by Forrest in Yunnan. Leaves are up to 10 inches long and the flower scape up to 2 feet with 3 to 5 superimposed 8 to 10 flowered whorls. The colour is purple.

Primula aurantiaca was found by Forrest in 1922 in West China. One of the easiest and smallest of this section with reddish-orange flowers on a stem of up to 1 foot. This is one of the primulas that form a bud at the end of flower scape and which can easily be rooted either by pegging into the surrounding ground or in a propagating frame.

Primula beesiana found by Forrest in the mountains of North West China. The flower scape is strong and up to 2 feet in height and farinose. The colour of the flower is rose-carmine with a yellow eye,

but as it hybridises freely the colour may vary.

Primula bulleyana was found by Forrest on the mountain meadows of the Lichiary area of Yunnan. This is a very strong-growing plant with a flower stem of up to 2½ feet with 5 to 6 tiers of crimson buds which open to orange flowers.

Primula burmanica was found by Kingdon-Ward in Upper Burma. It is close to *P. beesiana* but without farina. The flowers are purple with a golden eye.

Primula cockburniana was introduced by Wilson from South-West Szechuan and is the smallest of this section, but a delightful little plant up to 1 foot in height with two or three whorls of dark orange-red flowers. As it is short-lived, seed should be sown each year.

Primula helodoxa was discovered by Forrest in 1916 in Yunnan, where it grew in open positions on stream sides and marshy meadows. It is a very strong-growing primula up to 3 feet in height with 4 to 6 whorls of up to 20 flowers in each of a rich golden-yellow colour.

Primula ianthina was found in Sikkim in 1915 by Mr. Cave. The leaves and scape are covered with a sulphur-yellow farina. The flowers are of a violet-purple colour rising to 20 inches. My experience with this primula is that it is one of the duller members of this section.

Primula japonica. As its name indicates, this primula comes from Japan and was introduced into Britain late last century. It is a good perennial and a rather gross feeder. The flower stems may be up to 3 feet in height and the colours vary from white to pink to magenta and rich crimson. Many of the colour forms come true from seed.

Primula poissonii was found by Abbé Delavay in Yunnan in 1891. This is a very distinct member of this section with a somewhat stiff appearance. The flower stem may be up to 20 inches carrying 2 to 6 tiers of deep purplish-crimson flowers with a yellow eye. It is a good perennial which does not hybridise as some of the other members of this section.

Primula prolifera comes from Assam and has only recently been cultivated in this country. It flowers in May with two or three tiers of golden-yellow flowers growing to about 2 feet. The plant is without farina.

Primula pulverulenta is one of the best and easiest of the garden primulas. The flowers are set in many tiers up to 3 feet in height and covered with a white farina. The colour of the flowers varies from white to red, often with a purple eye. It is an excellent plant for massing in the wild or woodland garden and flowers in June.

It was introduced by Wilson from North-West China in 1905.

Primula serratifolia was found by Abbé Delavay in Yunnan in 1884, but since has been collected in many parts of the Himalaya.

It is one of the smaller growing of the Candelabra section and can be recognized by its serrated leaves.

In my experience the flower stems rarely grow more than 1 foot. The flowers are yellow with a very distinct bar of orange yellow running from the mouth of the tube to the edge of the corolla. It may flower a second time in the autumn. Very rare in cultivation as it very seldom sets seed.

Primula smithiana comes from Bhutan and Tibet and is like a smaller and paler *P. helodoxa.*

SECTION CAPITATA

Of this section only one species, *P. capitata,* is in cultivation in Scotland with its three varieties or sub-species. The flowers in this section form a compact mass with each individual flower carried on a very short pedicel. They have what is called an apical crown and the flowers expand in succession from below upwards.

The cultivation of *P. capitata* and varieties is quite easy as they do not object to an open situation with moderately dry conditions, so it is one of the best species for the rock garden. As they are short-lived, it is best to propagate from seed each year.

Primula capitata. This primula and its sub-species are found over a wide area of the Himalaya, Tibet and West China. It was introduced by Hooker in 1849.

The leaves are like our own primrose, but narrower and covered in white farina. The flowers form a tight truss of a violet colour up to 10 inches in height. It flowers in May.

The other sub-species in cultivation are:—

Primula capitata var. *crispata* was collected by Cooper in Sikkim. It is entirely without farina.

Primula capitata var. *mooreana* is larger in both foliage and flower than the other sub-species. It also comes from Sikkim and is one of the latest primulas to flower in the Summer.

Primula capitata var. *sphaerocephala.* This is the Chinese *Primula capitata* and was found by Forrest in Yunnan. It is without farina and the violet flowers are funnel-shaped and and the head globose.

SECTION CORTUSOIDES

The foliage of the plants in this section makes it one of the most decorative for outside cultivation. The leaves are large, crinkled, heavily veined and are carried on a conspicuous stalk. The flowers appear on a scape of 8 to 14 inches in height. There appears to be considerable confusion in this section because of unstable species and hybridisation.

Primula cortusoides is a plant of the eastern Asiatic mainland. It forms an underground branching rootstock from which arise many small tufts of hairy leaves, followed later by mauve-pink flowers. Cultivation is in pots or in rich humus in shade. Propagation is by division or from seed.

Primula geraniifolia was found in the Chumbi Valley, which is in a corner of Tibet lying between Sikkim and Bhutan. It usually grows in forests and among shady boulders. It has geranium-like leaves with a truss of deep red to purple flowers. It is a good perennial in gritty, well-drained soil. Seed is set in plenty.

Primula heucherifolia is very similar to *P. geraniifolia.* It is a hairy leafed little plant with deep purple flowers. It was found in 1869 by Abbé David in Western Szechwan.

Primula jesoana is also similar to *P. geraniifolia* and comes from the woods of Manchuria and Japan, living in deep leaf soil. It is not common in cultivation.

Primula kisoana is very close to *P. sieboldii* and is a native of Japan. It is a very hairy perennial with deep rose-coloured flowers.

Primula latisecta was discovered by Kingdon-Ward in 1924 in S.E. Tibet. It is a hairy perennial with a slender creeping rhizome. The flower colour is rose-pink. In nature it grows in forest in deep shade.

Primula mollis is a tender species with hairy leaves and lilac-pink flowers and should be grown in a heated greenhouse. It is from Assam and Burma.

Primula polyneura has many sub-species, so must be variable in the wild. It was first found by Soulie in 1895 at Litang and it extends all over North-West China. It is one of the larger members of this section, reaching 18 inches in height. The flower colour varies from pale rose to purple. It is an easy plant to cultivate in woodland conditions.

Primula saxatilis is very close to *P. cortusoides* and comes from Manchuria and North Korea, where it is found growing in rock fissures rich in humus.

Primula sieboldii was introduced from Japan in 1861. Its range is

from Central Siberia to Japan. It is a variable plant with many forms. It has soft hairy leaves with a loose head of flowers often with fringed petals. The best forms are rose in colour but may be lilac, crimson or white. Propagation is by seed or division of good forms.

SECTION DENTICULATA

This is an important section in gardens owing to the presence of one of the most popular of garden primulas, *P. denticulata*. The leaves are narrow-toothed and crinkly and the flowers are carried on stout stiff stems, many blooms to a truss. Propagation is by seed or division.

Primula atrodentata is very like the type species but much smaller in all parts, having lavender flowers with a white eye. It comes from Assam, Bhutan and Nepal, where it grows in the open as a meadow plant. It is not common in cultivation and shorter-lived than the tough *P. denticulata*.

Primula denticulata is one of the best known primulas, being of easy cultivation, and is seen in many gardens in herbaceous borders, etc. It comes from Nepal, Sikkim, Bhutan, Tibet and Assam, and was introduced to cultivation in 1840.

It has large primrose-like leaves and flowers in early Spring with a large, tight, round head varying in colour from white to lilac. Good colour forms should be propagated by division.

SECTION FARINOSAE

This section is the largest in the genus and is also the most widespread and is named after a primula native to Britain, *P. farinosa*. Our own *Primula scotica* is a member of this section.

Primula auriculata has been in cultivation since 1784. It is found in Asiatic Turkey, Persia and the Caucusus growing in wet meadows and on the banks of streams. It resembles *P. farinosa* but has no farina and grows somewhat taller. Flower colour varies from rose to bluish-purple.

Primula clarkei was found in 1876 in Kashmir by Clarke but was not in cultivation until the 1930s. It is a small plant with round leaves and no farina with rich pink flowers on short pedicils. In cultivation it requires a fair amount of moisture and plenty of humus. Propagation is easiest by division. It flowers in April.

Primula involucrata. This is another gem of this section. It was discovered by Wallich in 1825 in Garhwal and is widely distributed throughout the Himalaya. It is a perennial plant with glossy leaves

Fig. 1 *Anemone occidentalis* *Photo* B. H. Barritt

Fig. 2 *Erigeron aureus* *Photo* B. H. Barritt

up to 5 inches long with a scape of up to 12 inches in height. The flowers are white or slightly pink with a yellow eye and they have a delicious perfume. By nature it is found in moist meadows and on the banks of streams and in cultivation similar conditions apply. Division is necessary at frequent intervals and seed is often set.

Primula rosea occurs frequently in the North-West Himalaya where it grows in marshes and near melting snow. It was first found in Garhwal in 1831.

This plant has tufts of small glossy leaves and flower heads of wonderful pink-carmine flowers which appear in early Spring before the leaves. There are various forms found in nature and in gardens. Propagation is by seed or frequent division.

Primula yargongensis was discovered by Pratt in North China in 1890. It is very similar to *P. involucrata* in size and habit, but has pink to purple flowers. Cultivation is also similar.

Primula yuparensis was found in 1913 in Japan, but this plant is not common in cultivation. In form and size it is like *P. farinosa*, but the flowers are much larger. The scape of 2 or 3 inches has 3 or 5 flowers, each half an inch across, of deep purple.

Section Floribundae

This is a small section with involute leaves and yellow flowers arranged in superimposed whorls. The various species inhabit dry areas in West Persia, Afghanistan and the North-West Himalaya.

Primula floribunda is distributed widely in the North-West Himalaya and was first found by Wallich in 1825. It is a hairy plant with a short, thin rhizome. The leaves are up to 6 inches long and the scape up to 12 inches in height, usually several to a plant, with gold to sulphur-yellow flowers. It is grown only in a greenhouse in Scotland.

Primula gaubeana was recently discovered in South-West Persia. It is very close to *P. verticillata*. It grows to over a foot in height with yellow flowers in 2 to 4 superimposed whorls.

Primula verticillata is an attractive early flowering species for the greenhouse coming from South Arabia. The scape reaches about 10 inches with 2 to 4 superimposed whorls of yellow flowers.

Section Grandis

Primula grandis is the only representative of this section. This plant comes from the Caucasus and is rarely cultivated, as even those that grow it do not count it as one of the most favoured of primulas. It

has huge heart-shaped leaves with small flowers that are too insignificant for the size of the plant.

SECTION MALACOIDES

The plants in this section come from warm areas and require greenhouse cultivation.

Primula malacoides in its native habitat frequents the regions of the rice fields, which means the warmer and less elevated regions of China. It has many varieties, all of which are tender and are greenhouse plants. They are short-lived and should be raised each year from seed. It is a Winter flowering plant with mauve flowers.

SECTION MINUTISSIMAE

This is a small section of high alpine Primulas found in the Himalaya and Tibet. The inflorescence is very reduced, in many cases only a single flower with the shortest of scapes. The species in this section tend to be stoloniferous, forming dense low-growing mats.

Primula reptans. The only primula in cultivation in Scotland in this section is *P. reptans.* This is a delightful minute plant cultivated only in pots or under glass. It is a native of the North-West Himalaya. It is pronouncedly stoloniferous and mat-forming and is only about 1 to 1½ inches in height. The flowers are produced singly and a rich violet colour with a white eye.

Propagation is easy by division. The short rhizomes can be repotted and will soon grow into large plants. Its greatest enemy is the greenfly and an attack will quickly kill the plant.

SECTION MUSCARIOIDES

This section is distributed over the Eastern Himalaya, Tibet and provinces of Western China.

The leaves are usually hairy and grow in distinct rosettes. The flowers are carried in close heads or spikes, pedicels being almost entirely absent, and the flower scape is long and slender.

Primula bellidifolia. Found in Sikkim in 1877. In nature it grows in crevices and ledges on cool moist rocks in shade, usually with a Northern exposure. In cultivation it is short-lived and requires a dry situation or to be grown in a pot. It flowers in May.

It has deep purple-blue nodding bells gathered into a short pagoda-like spire on a stem of about 8 inches. Propagation is by seed only.

Primula concholoba. This plant was found by Kingdon-Ward in 1926 in Assam growing on steep grassy slopes and on ledges on cliffs.

The leaves are toothed and hairy. The flowers are bright violet and covered with white farina outside. A difficult plant because of Winter damp on the hairy leaves.

Primula muscarioides. The type species was found by Forrest in South-East Tibet in 1904. This is quite a large plant, flowering up to 18 inches. It has slightly hairly leaves and flowers of a deep purple.

Difficult in cultivation, it should be grown in a greenhouse or frame and seed sown each year.

Primula viali. This is by far the easiest and most popular primula of this section. It was discovered by the Abbé Delavay in marshy meadows in Yunnan and introduced into cultivation by Forrest.

This is a first class primula and a reliable perennial. It goes completely underground during the Winter, which gives it the necessary protection from damp. The plants previously described in this section usually form resting buds above ground, which increases the risk of rotting or damping off.

It has narrow leaves up to 10 or 12 inches and the scape can rise to 2 feet and is covered with farina towards the apex. It ends in a dense spike. The calyces of the immature flowers are bright crimson and the flowers, which begin opening at the base of the spike, are bluish-violet. This gives an overall impression of a "red hot poker".

Cultivation is easy in soil rich in humus with good drainage but ample moisture. Seed is set freely.

Section Nivales

One of the largest sections of the genus primula, it contains some of the loveliest species, but only a few are in cultivation. The leaves are thick, fleshy and riband-shaped, of approximately the same width throughout. They are usually covered with meal. The flower trusses are usually large and rather loose, followed by a cylindrical seed capsule.

They all grow best in a rich soil in semi-shade and they can stand drier conditions than some other sections.

Propagation is by seed but crossing takes place very often.

Primula chionantha was found by Forrest in North Yunnan in 1913. It is easily grown. The leaves are long and strap-like with flower stems up to 24 inches covered with a golden meal. The flower head is loose and the individual flowers large and of a pure white colour. It is scented and flowers in May.

Primula macrophylla is widely distributed throughout the Himalaya

mountain ranges. It is a very variable plant and many varieties have been named. The earliest collection was by Wallich in Nepal in 1820.

It is smaller than the other Nivalids described, having purple flowers with a yellow eye.

Primula melanops is very similar to *P. chionantha* but has rich purple flowers with a black eye. This plant was introduced in 1922 from South-West Szechwan.

Primula sinoplantaginea has narrow leaves covered below by a white meal, as is the flower scape. The flower colour is deep purple. It was introduced by Forrest in 1913 from West China and South-East Tibet. It is a smaller plant than the following.

Primula sinopurpurea was found by Abbé Delavay in Yunnan but introduced into cultivation by George Forrest who found it in Tibet. The flowers are purple with a white eye on a stem up to 2 feet in height.

Section Obconica

Obconica section usually are plants from warm areas which require greenhouse cultivation in Scotland.

Primula obconica comes from West China and parts of Burma. The flowers are pale lilac, but this species has been "improved" so much by selection that the greenhouse plants bear little resemblance to the plant in nature. It is Winter flowering.

Primula obconica var. *werringtonensis* is similar but hardier.

Primula sinolisteri is another tender primula from Yunnan. The whole plant is downy with mauve flowers on a scape of 4 to 6 inches.

Section Petiolares

This is one of the finest sections of the genus. We are lucky in Scotland that cultivation of many species in this section is easier here because of our climatic conditions. They grow best in an area with a rainfall of around 40 inches per annum, although with care they can grow in very much less.

We are also fortunate in benefiting from the collection of Major George Sherriff and Mr. Frank Ludlow, who sent home many plants in this section. I was very interested to go through their herbarium specimens at the British Museum to see not only the dried material with notes, but superb photographs of the various species taken by Major Sherriff.

In nearly every species mention was made that the habitat was a grassy slope, the bank of a stream or somewhere that had plenty

moisture with good drainage with the plant growing on a slope. This points to how these primulas should be grown in the garden.

Another interesting point is the seed capsule in this section, which is flat and covered by a thin membrane. This membrane ruptures when the seed is still green. The seed should be sown immediately, in which case they may germinate within 10 days.

In order to understand the botanical differences in this section, the sub-sections and groups will be listed as defined by Sir William Wright Smith and Dr. H. R. Fletcher in their monograph 'The Genus Primula'.

SECTION PETIOLARES

The section is divided into five sub-sections of which two contain plants in cultivation, namely sub-section Griffithii and sub-section Petiolaris-Sonchifolia.

Sub-section Griffithii. The scape is well-developed at flowering time and usually longer than the leaves. In this sub-section all the plants go underground for the Winter. The plants in cultivation in this sub-section are *Pp. calderiana, strumosa, griffithii, nepalensis* and *tsariensis.*

Sub-section Petiolaris-Sonchifolia is divided into seven groups, of which four contain plants at present in cultivation.

In GROUP VERA the scape either does not exist or is short at flowering time, much less than leaves. In it are *Pp. cunninghamii, deuteronana, gracilipes* and *petiolaris.*

In GROUP SCAPIGERA the scape is very short at flowering time and elongates when in seed. Here we have *Pp. aureata* and *aureata forma, boothii, bracteosa, irregularis* and *scapigera.*

GROUP EDGEWORTHII has only one species, *P. edgeworthii.*

GROUP SONCHIFOLIA has two species in cultivation, *P. sonchifolia* and *P. whitei* (*bhutanica*), both of which in Winter have large resting buds covered with large scales, and are above ground.

Propagation of this section can take the form of division, by seed or by leaf cuttings, or rooting the vegetative buds that are frequently produced on some of the species. The leaf cuttings are made in Summer by detaching the leaf with the dormant leaf bud at its base and inserting the leaf bud and about one inch of the petiole into sand in a frame or under mist.

SECTION PETIOLARES—SUB-SECTION GRIFFITHII

Because the members of this sub-section go underground in Winter it contains the easiest species to cultivate in our gardens. They are

also the most promiscuous. The distribution of the sub-section includes the Eastern Himalaya and South and South-East Tibet. They are robust plants with well-developed bud scales and inflorescence.

Primula calderiana comes from Sikkim, Bhutan and Tibet. It is one of the first primulas to flower in Spring. The flowers come with or before the leaves, the flower scape reaching 12 or more inches. The colour is a rich dark purple and the flower has a velvet texture. Good forms should be divided as this plant crosses with *P. strumosa* very easily and you may get a multitude of colour forms—white, yellow, pink, purple striped, etc.

Primula griffithii comes from South-East Tibet and Bhutan and has been known for a long time, but was introduced to cultivation by Ludlow and Sherriff.

In structure and growth it is like *P. calderiana*, but is more robust. It has purple flowers with a yellow eye and the scape may grow to 18 inches. In nature it grows in forests under Abies or Rhododendron and in cultivation it prefers a rich deep loam with some shade.

Primula nepalensis and *Primula strumosa*. Botanists now regard these two species as synonymous. *P. strumosa* was first found by Cooper in 1915 and it was later introduced into cultivation by Ludlow and Sherriff. These primulas are variable in nature and found growing in turf on steep hillsides.

In cultivation they are usually strong-growing plants with leaves up to a foot long and flower stems of 18 inches to 2 feet. The flower colour is yellow from very pale, almost white to a golden yellow with a golden eye. They flower in April and like a rich damp loam. If moisture is present shade is not so important. Seed is set profusely.

Primula tsariensis comes from Central Bhutan and Tibet where it grows on moist hillsides and on banks of streams from the snow-line to the bamboo forest. There is considerable variation in this primula in nature. It was introduced by Ludlow and Sherriff in 1937.

The flowers are a rich blue-purple at their best but are very variable, perhaps through crossing with *P. calderiana* and *P. griffithii*, both of which are very close.

SUB-SECTION PETIOLARIS-SONCHIFOLIA

GROUP VERA. In this group the basal bud scales are inconspicuous, and no scape is present at flowering time. The previous year's leaves usually persist throughout Winter and flower buds can be seen from Autumn onwards.

Primula cunninghamii. This species is confined to the Eastern districts of Sikkim and the adjoining Tibetan areas. It is a small plant with leaves 3 or 4 inches in length forming a tight rosette with numerous congested pink flowers, the pedicels being shorter than the corolla with some white farina. In cultivation the rosette may require some Winter protection.

Primula deuteronana. This species has been found only in West Sikkim. It is close to *P. petiolaris* but is the only species with the corolla tube densely covered with hairs. It has pale purple flowers and is rare in cultivation.

Primula gracilipes has a distribution over Nepal and Sikkim to Bhutan and South Tibet. A common plant in nature and one of the easiest to grow in gardens and has been in cultivation off and on since 1886.

A compact plant with leaves up to 5 inches long with cream-coloured farina on the undersurface. The flowers are bright pink with a yellow eye.

In cultivation it requires frequent division.

Primula petiolaris. This plant has only been found in Nepal and may be a local form of *P. gracilipes.*

A small plant without farina, forming a loose rosette close to the ground. The flowers are pale blue on short pedicels. Cultivation is as for *P. gracilipes.*

GROUP SCAPIGERA. In this group the scape is very short at flowering time but elongates when in seed. The old leaves persist during Winter and flower buds form in the Autumn, but the rosette is much looser than in Group Vera.

Primula aureata. This plant had an interesting introduction into cultivation, being spotted as a rogue in a germination of Swertia seed. This took place at the Royal Botanic Garden, Edinburgh, in 1935. This rogue was a primula and when it flowered it was found to be a new species. It comes from Sikkim.

The leaves are broad with farina on both surfaces. The flowers appear on a short scape and are cream in colour with a golden centre. Seed is sometimes set.

Primula aureata forma. The history of this plant is obscure, but it appears to have come from Nepal in 1935. It is like a poor form of *P. aureata.* It has creamy flowers and is not a strong grower. Propagation is by division.

Primula boothii. There is still a great deal of confusion surrounding

this plant and it may be a local manifestation of a similar species. It comes from the Eastern Himalaya.

It is a strong grower and flowers in early Spring on a short scape. The flowers are a dark pink with a yellow eye and 1¼ inches across. The leaves are dark green with reddish petioles and there is no farina. It is easily propagated by division or leaf cuttings.

Primula bracteosa. Having been discovered in Bhutan over 100 years ago, this primula was re-introduced to cultivation by Major George Sherriff in 1937.

The leaves are up to 6 inches long and covered with light farina. The flowers are pink with a yellow eye—up to 20 on a short scape. It is named because of its ability to form a vegetative bud at the end of the scape which can be made to root if pegged into the surrounding soil or if treated as a cutting.

Primula irregularis. There is still some confusion as to the specific status of this plant. It was first collected by Hooker in 1848 in West Sikkim but has only been in cultivation for a short time. It has a dense rosette of leaves and a very short scape, and up to 20 purple-blue flowers which at first, like the leaves, are covered with a yellow farina.

Primula scapigera. First reported by Hooker in 1848 when it was found in woodland in Western Sikkim. It is a small plant with leaves up to 6 inches in length. The flowers are pink and are borne on a very short scape which lengthens as the seed ripens. They have a well-defined yellow eye surrounded by a white margin. It is best grown in a cool spot in soil rich in humus.

GROUP EDGEWORTHII. There is only one species in this group, *Primula edgeworthii.*

This plant was first known as *Primula winteri* when it was first found in Kumoan in 1924. It is widespread in the North-West Himalaya where it grows in woodland.

During the Winter it loses some of its outer leaves, but the centre is formed by a close mass of leaves covered with a white meal as are the tightly packed flower buds.

The flowers open very early in the year and are pale mauve with a white eye and yellow in the throat. The leaves vary in shape at different stages of growth and as the year progresses they lose much of their farina. Propagation is by seed or division.

Primula edgeworthii var. *alba.* This lovely plant is identical in every respect and requirement with typical *P. edgeworthii* except in the colour of the flowers, which are a rich creamy-white.

GROUP SONCHIFOLIA. This group loses all the old leaves in Autumn and forms a large tight resting bud covered in scales. These buds are entirely above ground.

Primula sonchifolia. One of the most beautiful of all garden plants. It was first discovered by Abbé Delavay in the mountains of Western Yunnan in 1884. It is also found in South-West Tibet. It grows in nature in steep mountain meadows and on mossy rocks.

In the resting period it forms a bulb-like structure up to the size of a hen's egg completely above ground. The leaves appear at flowering time but are little longer than the bud scales, lengthening afterwards to up to a foot. The flowers are a wonderful lavender-blue on a short scape which lengthens as the seed ripens. This plant likes a lot of moisture during the growing period and likes to grow on a slope. Propagation is by seed sown green which will germinate in 10 days, usually in June, so that the young seedlings go into Winter dormancy at a fair size.

Primula whitei. The first collection of this species was made in 1905 by Sir Claude White in Bhutan. It grows on steep moist banks in woodland. Later plants were found by Kingdon-Ward in Assam, and Ludlow and Sherriff in South Tibet, which were thought to be a different species and were named *P. bhutanica.* They are now regarded as one species.

In Winter it forms a tight resting bud somewhat like *P. sonchifolia.* In early Spring this bud opens to show the tightly packed blue flowers. The scape and the leaves lengthen together. The flower scape may vary and this was described by Sherriff when he collected a blue primula under L. & S. 12299, and wrote "that specimens under this number should not be separated. All specimens were collected from one spot and represent one species, but it will be seen that the corolla (petal) lobes of some are finely crenulately toothed, whereas the lobes of others are coarsely tridentate".

Propagation is by seed or division. Some Winter protection is perhaps necessary.

SECTION REINII

A small section of five species all native to Japan, two of which are in cultivation in Scotland.

Primula hidakana has copper-coloured leaves and rather large magenta-rose flowers on individual stalks. It is rare in nature and in cultivation.

Primula takedana is named after Professor Takeda, an authority on Japanese primulas. A small perennial hairy plant with kidney-shaped leaves. The scape is up to 4 inches in height and carries one or two umbels of 3 or 4 white flowers.

SECTION ROTUNDIFOLIA

The distribution of this small section is confined to the Himalaya and Tibet. Its members are easily recognized by their orbicular leaves with long petioles. The leaves are usually covered with farina.

Primula rotundifolia is the only member of this section in cultivation and was discovered in 1841 by Hooker in Nepal. The plant is a perennial with a short root stock, heart-shaped leaves with a definite petiole; the under surface of the leaf is densely covered with yellow farina. The flowers are pink with a yellow eye in superimposed umbels.

It is not an easy plant in cultivation and it must be kept going by sowing seed each year. It prefers a moist soil with sharp drainage with plenty of humus.

SECTION SIKKIMENSIS

After the candelabra primulas, this section is the most important in gardens containing many easy and very beautiful species. They all have clusters of long, toothed leaves and scapes bearing an umbel of graceful drooping flowers.

All the species in cultivation are hardy, growing in moist areas or half shade. Propagation is by division and seed.

Primula alpicola (*microdonta*) grows to about 20 inches in height, although never so tall as *Pp. florindae* or *sikkimensis*. It is a very graceful plant giving a good display when massed. It flowers in June.

There are various colour forms: *P. alpicola alba*—white; *P. alpicola luna*—pale yellow; *P. alpicola violacea*—violet. It requires ample moisture in a peat soil.

Primula chumbiensis grows in the Chumbi Valley in Tibet, where it was found by a native collector in 1912.

It is similar to, but smaller than, *P. sikkimensis*, with yellow nodding densely farinose flowers. It is easily identified by its purplish-green leaves. Cultivation is the same as *P. sikkimensis*.

Primula firmipes is a small version of the type species but is not common in cultivation. The flowers are pale yellow in colour and are powdered both inside and out with farina. It was first found by Forrest in 1919 in South-East Tibet.

It requires similar conditions to *P. sikkimensis* in cultivation.

Primula florindae was found by Kingdon-Ward in Tibet in 1924, where it grows in shady bogs or even in running water. Given bog conditions, it is a very strong-growing plant and the scape will reach 3 feet with a large head of yellow flowers.

It can be increased by division or seed.

Primula ioessa was found by Ludlow and Sherriff in South-East Tibet. This is one of the loveliest plants in this section or in all the primula family.

The flowers have a distinctive funnel-shape and are usually violet in colour. It never exceeds about 12 inches in height. Propagation is easiest by seed but it crosses freely with other members of this section.

It flowers in May and June and is a first-class easy plant. Propagation is easy, as masses of seed are set.

Primula sikkimensis var. *hopeana* is a smaller form with white to pale yellow flowers. Found in Tibet and Bhutan.

Primula secundiflora was first found in 1884 by the Abbé Delavay in Yunnan and introduced into cultivation by Wilson in 1905. It is a charming plant with glossy leaves and a scape up to 18 inches in height with purple flowers that droop more than those of *P. sikkimensis.*

The stem has white farina near the apex.

Primula vittata was at first regarded as a separate species, but now recognized as a synonymous plant coming from lower regions.

Primula waltoni was found by Captain H. H. Walton in 1904 on the hills above Lhasa and since then has been found in many parts of Tibet and Bhutan. The best forms have the typical flowers of *P. sikkimensis* but with a deep port-wine colour thickly covered inside with a white meal. It flowers in May and June.

Section Soldanelloideae

One of the loveliest sections but unfortunately one of the most difficult. With finely-toothed hairy leaves the plants carry flowers on close heads or spikes. The flower scapes are long and slender.

In cultivation the only member of this section to be grown commonly in the open garden is *P. nutans.* The rest are grown in pots or in frames or alpine house.

P. reidii var. *williamsii* can also be grown outside, but is short-lived. The members of this section require a situation in some shade with an abundance of humus: too wet conditions would cause damping off.

Propagation is mainly by seed which is usually set profusely.

Primula cawdoriana. This very beautiful but difficult primula was found by Kingdon-Ward in Eastern Tibet in 1924. It grows on steep rocky slopes and in Scotland is grown with Winter protection.

The leaves are coarsely toothed and hairy with a flowering scape of up to 8 inches. On each scape appear 3 to 6 nodding tubular violet flowers with a large white eye.

Primula nutans is the easiest species in the section to grow in the open garden and is a most beautiful plant. Said to be monocarpic, but this is not so, as in Scotland it will live 5 or more years. George Forrest introduced it to cultivation in 1914.

The leaves are narrowly elliptical and hairy without farina. The scape grows up to 15 inches and ends in a dense head of lovely nodding lavender flowers. Like so many difficult primulas, it likes moist sloping ground with plenty humus in some shade. It flowers in May and June.

Primula reidii is a gem found by Duthie in Garhwal and Kumoan growing on wet rocks. It has very hairy leaves which makes it a difficult subject for cultivation.

The scape is farinose up to 6 inches in height and has 3 to 10 lovely ivory-white scented campanulate flowers. It has been grown outside for short periods but is best treated as an alpine house subject. Propagation is by seed.

Primula reidii var. *williamsii* is very like *P. reidii* in leaf and in flower. Found in Nepal by Stainton, Sykes and Williams in 1954, it has proved hardier than *P. reidii* itself. It is more vigorous and will out-Winter in Scotland in the open garden. It likes a shady bank full of humus. The flower colour varies from white to blue.

Primula sapphirina, a plant with a very tenuous hold on cultivation in Scotland. Found by Hooker in 1849 in Sikkim, it grows in moss on damp rocky ledges. It is cultivated only as an alpine house subject.

The leaves are very serrated with the scape up to 2½ inches with flowers of violet-purple.

It is one of the miniatures of the primula family.

Primula sherriffae was found on cliffs in South-East Bhutan in 1934. A beautiful plant with the hairy leaves of this section. It has pale violet flowers flecked with farina, the flowers being borne on a long slender tube slightly curved.

Cultivation is difficult but has been mastered by Mrs. Sherriff and the Royal Botanic Garden, Edinburgh. The Royal Botanic Garden exhibited a wonderful pan about 24 inches in diameter full of perfect plants in flower at the S.R.G.C. Show in Edinburgh 1975.

Primula wattii is a native of the mountains of Sikkim and Assam and the Burma-Tibet border, and was discovered by King in 1877. Like many of the difficult primulas it is kept in cultivation by persons with the knowledge of what it likes and climatic conditions to satisfy it. This time I refer to Messrs. Jack Drake of Aviemore, who have made it available to enthusiasts over many years. It is a lovely plant with a compact head of large bell-shaped violet flowers.

In conclusion I would like to apologise for the colour definitions given in the descriptions of the various primula species. I have checked their colours as given by various references, as well as knowing most of the plants myself. It is still confusion.

To illustrate my point I checked the colour of *Primula bellidifolia* with seven references, with the following results:—

Blue Violet	The Royal Horticultural Society Dictionary of Gardening
Velvety Purple	A Quest of Flowers, Dr. H. R. Fletcher
Mauve	The Genus Primula, Sir W. Wright Smith and Dr. H. R. Fletcher
Deep Blue	Primulas in the Garden by K. C. Corsar
Blue Purple	The English Rock Garden, Reginald Farrer
Purple Blue	Asiatic Primulas, W. Ingwersen
Violet Blue	The Peat Garden, Alfred Evans

This covers about 60 pages of the R.H.S.'s colour charts (out of 200)!

I would like to acknowledge referring to the books listed above in the preparation of this article and my thanks to Alfred Evans, our President, for his list of primulas growing in the Royal Botanic Garden, Edinburgh.

I would be delighted to hear from anyone who can add to my list of Primulas growing in Scotland.

The Blue Columbine Itch

by ROY DAVIDSON, Seattle

GOOD BLUE flowers are everybody's favourites, and so are the harlequin stars of the Columbines. Put them together and what have you got?

A bad disease, that's what!

The European *Aquilegia vulgaris* was undoubtedly the first of these to come into cultivation, and it is to be found pictured in all the old garden publications, often in the multi-petaled form. We then recall the sensation of the "Mrs. Scott Elliott long-spurred hybrids", poised so ethereally on their stalks. Occasional among them was a blue, and these were most prized. Wild-flower enthusiasts grew the Colorado Blue Columbine, *A. caerulea*, and following Dr. Worth's Rocky Mountain searchings, we marvelled at the variation to be found there, and came to know some of the dwarf sorts, many of them blue, but in the main difficult to grow.

We tried *A. jonesii*, the up-turned blue one, and even without its flower we loved it for the bluish foliage holding a pearled dewdrop. By happenstance and in a roundabout manner, a seedling plant of an unknown blue columbine came to us; it too was a delightful bluish-leaved miniature plant, and it grew thriftily, flowered freely, and gave much seed, and the seedlings appeared to be duplicates. When the old plant had grown to a sizeable crown, it was lifted, divided into five, and all grew along readily; it was an "easy doer"!

In trying to puzzle out the identity of this charmer, which certainly by its stability seems to be a good species, I have turned a lot of the leaves of botany, yet without conclusion. It forms a little mounded bluish glaucous plant about 3-4 inches across, and the flowers, blue all over, top 3-inch stems, sometimes with a second flower, but usually solitary. The medium short spurs not hooked at the ends present that very pleasant nodding, but not hanging poise.

After the research, I seem addicted all over again. I secured and grew a number of both American and European columbines in the process, but none seems to be it, "It" in the garden named "Blue-Berry", for the seed had come from Mrs. A. C. U. Berry's garden, I had been informed. Among the Europeans I flowered *alpina*, a very much condensed version of *vulgaris*, with short, hooked spur; *pyrenaica*, similar and yet smaller, stems naked (scapose), the spur un-hooked; *discolor*, like a bitoned *pyrenaica*, from Spain, and delightful; *aragonensis*, in effect a smaller glabrous *pyrenaica* from the eastern end of the Pyrenees; *bertolonii*, also similar to *pyrenaica*, but with pilose underleaf, from Italy's Appenines; and *glandulosa*, pastel blue and creamy white of great delicacy, a mini-miniature. I read of others that seem similar, some from the east end of the Alps.

The American blue Columbines mostly relate to *A. caerulea* (long-

spurred); *scopulorum* is like a miniature of it (also long-spurred); *saximontana*, however, is short-spurred, and *jonesii*, with its upturned flower, is sort of in-between; Munz in his monograph relates it to the Asian members because of a total lack of staminodes. The natural variation of established taxa is perplexing, even to spurless forms in many species having been accorded recognition. Munz has reduced a very great number of those described to synonymy. Their separations seem to be more nearly geographical than morphological in their "distinction".

Nearly all the known species are diploids which have not yet reached the sophistication of genetic isolation from one another, as is well known to gardeners, so that the "pure" of any of them is to be retained only through isolation. Perhaps it is not really important, the background of "Blue-Berry"; it certainly cannot be, in the opinion of Clausen, Keck and Heisey, who held that the results of their cytological studies "lead to the conclusion that Aquilegia is one huge cenospecies composed of only a few ecospecies, (and that) probably most of the recognized (taxonomic species) are merely morphologically distinguishable ecotypes or sub-species".

Nevertheless "Blue-Berry" remains the prize of them all here, probably the result of the mating of *saximontana* and some unknown European miniature, the epitome of what a dwarf columbine should be. How it perpetuates itself through seed is a mystery . . . its offspring now are into the fifth generation.

Munz Monograph of the Genus Aquilegia—Gentes Herbarum VII, I; 1946.
Clausen, Keck & Heisey, Carnegie Report, 1945.

The Role of the Rock Garden within a Botanic Garden

by ALFRED EVANS

VISITORS to Edinburgh, if interested in horticulture, invariably find their way to the Royal Botanic Garden, where within an area of approximately 70 acres they find a wealth of plant types on display equalled in very few places. This is a national collection maintained

by the Crown.

All manner of plants are cultivated and the visitor, whether his keen-ness be focused on glasshouse plants or on the woody, herbaceous or annual types which are hardy in Scotland, will find plenty for his attention. The alpine plant enthusiast in particular is well catered for and in a rock garden covering two and a half acres he can spend many hours browsing over the collection. No doubt he will mentally compare the quality of what he sees with the standard of his own plants at home or note the names of plants new to him on which he wishes further information.

Two and a half acres is a lot of ground and so, quite obviously, the rock garden was not a feature developed overnight. Nor was it a lay-out sacrosanct once established, for over the years it has seen many changes. James McNab, Curator of the Royal Botanic Garden in 1871, actually constructed the first rock garden in a fashion very much alien to the designs of the well proportioned rock gardens seen today, particularly those constructed on the south bank at the famous Chelsea Flower Show. McNab, using squared masonry from a dismantled building, boasted about the number of compartments he had arranged and of the number of different kinds of alpine plants grown (figs. 3 and 4).

Not unnaturally McNab was well pleased with his efforts, but not so succeeding Regius Keepers for, at the beginning of this century when Professor Isaac Bayley Balfour held that post he, keenly interested in alpine plants, saw in his mind's eye the type of natural rock work more suited to an aesthetic display of these plants. It is reported that in the beginning his reconstruction progressed slowly until following a visit by Reginald Farrer, who subsequently published in his book, "My Rock Garden", a criticism of the Edinburgh rock garden which he described as the "Devil's Lapful". Apart from the plants which he very much appreciated, Farrer saw no virtue in the rock-work whatsoever. This apparently stung the Professor into action. He resolved to change this eye-sore into something more pleasing and informal, in the then modern idiom, and starting in 1908 it was not until 1914 that he considered the development complete. A "Devil's Lapful" it may have been, but when that lapful consisted of hundreds of tons of rock it was no easy matter to rearrange them in a more effective manner. Seven years it took, during which time hundreds of tons of rock of a different kind were introduced into the new construction. Slabs and slivers as well as some large lumpy pieces of red sandstone were brought from Dumfries, more than 70 miles away, and at least an equal amount

Fig. 3 Rock Garden, Nineteenth Century *Photo* Royal Botanic Garden, Edinburgh

Fig. 4 Rock Garden, Nineteenth Century *Photo* Royal Botanic Garden, Edinburgh

Fig. 5 Moraine in R.B.G. *Photo* Royal Botanic Garden, Edinburgh

of conglomerate rock was transported from the Callander area of Perthshire, a distance of over 50 miles. Neither is ideal for building. In the first instance, the bedding planes of the numerous sandstone slabs were too narrow, and to obtain height and attempt to retain soil at that level it was necessary to place some of these rocks on their edges. Laid flat they looked just like stone steps, in fact many were eventually used for that purpose. So, even with the importation of a sedimentary rock, natural lines of strata were difficult to arrange so that they looked just right, and sometimes they were ignored altogether. On the other hand, the loads of conglomerate consisted of big lumps of unrelated rock. This had been procured by blasting and many pieces still bear evidence of the drills. Unfortunately, alas, this is also far from being ideal material with which to build a rock garden. It was simply shattered rock and to lay this in a sequence suggesting a continuous rock bed was not possible to any extent. Furthermore, many pieces tended to be angular and difficult to match up with neighbouring rocks even as clusters in an attempt to fashion simple outcrops. Nor was it porous or moisture holding and therefore was not sympathetic to penetration by plant roots. Despite these discouraging factors, an extensive rock garden was eventually built and planted and these two and a half acres have had their share of successes and failures.

The soil at Edinburgh is of the acid type and as one of the major scientific projects at that time was the classifying of the numerous species being introduced from China, in particular, rhododendrons, primulas, gentians and many other lime-hating genera and species from Asia, no lime was ever applied. That it suited most plants is without doubt, but it has to be admitted that such a deficiency contributed to a less than ideal environment for numerous lime-tolerant species in the collection.

The rock garden certainly holds a very large collection of plants, a migrating collection some may say, for naturally, in the normal course of replanting, and in an effort to find them more conducive sites, their distribution throughout the rock garden has changed over the years.

The upsurge of interest in what is termed natural rock-gardening influenced some later building and this rearranging of rocks still goes on in some of the more overgrown areas. When this is done an opportunity is taken to improve the fertility of the soil before replanting. This statement may appear superfluous, but when one considers how extensive is the rock garden and as this revitalising is treated as winter work, it could take all of 25 to 30 winters to resoil effectively the many

mounds and handle the depauperate plants even only once. Thus the state of the soil can, at times, be quite desperate.

There are numerous advantages provided by the various types of rock building, including coolness for roots protected behind rocks, acute drainage by being planted in elevated positions, and the effect of sun-heat being reflected from rock faces ripening the shoots of ligneous plants. An especially bold feature, a moraine, was constructed in a most prominent site. Naturally it had to be in the open, but nowhere could it have been more obvious for it dissects the lawn at the north approach to the rock garden. This original concept proved highly successful and has since been enlarged. It now supports hundreds of plants, many of them forming cushions of vegetation (fig. 5).

In dead of winter enthusiasts can find much that interests them, while in spring, at a time when the rock garden is considered to be at its most colourful, a casual visitor may still be heard to ask, ''But where are the flowers''? This really brings forth other questions, for example, ''what plants do grow there''?, ''why are they grown there''? and, ''to what extent is the rock garden set-up successful''?

This then brings me to the point where it is time to assess the living collection. As the alpine plants are but a small part of a much bigger botanical collection, the principles governing the forming of such an assemblage are much the same for every department and the reasons given here could be applied to practically every group in the garden.

Obviously the main object is to serve botanical research. This must be catered for and if it were not for the fact that the raw materials worked on by botanists were attractive and harmless this research would probably proceed behind closed doors. Being colourful and interesting to the layman and being very much an environmental asset, however, it would be criminal to lock this wealth away and so the plants are on public display. On the other hand, if grown solely for research purposes the plants could be laid out in straight lines in nursery beds and, in many cases, this would suffice, the nursery beds being treated in various ways to provide the special conditions deemed necessary for the plants under investigation. However, by arranging the plants in a more pleasing fashion a garden is created and that is how a botanic garden of three hundred years and more, at first laid out as an apothecary's herbal plot, is now a garden of renown. The narrowly based interest of studying and providing medicinal specimens expanded into the study of all plants regardless of their present intrinsic value to man, and to classify them and provide each with a name, an

extremely important part of botany, became the aim. It is on the foundation of correctly identified plants that all other botanical research programmes are built. It developed into pure taxonomy, the classifying of plants, and of course to carry this out certain principles on how best this should be done had to be worked out. In the first instance, with the simple techniques of the time and because of the limited material available and due to the lack of contact between workers, this was not too difficult. It brought its problems, however, as we horticulturists know in the form of synonyms—something which still plagues the gardener. Today's workers have the sort of scientific technology to aid them which was denied to the early taxonomists, such as chemical analysis, electron microscopes and computers. They have access to the whole world's flora in the form of herbarium specimens, as well as a vast store of knowledge in botanical literature, and are able to make more critical studies of plants than was possible before. The value of this work may not be apparent to visitors to the garden, but every new discovery may open a channel of investigation to benefits more directly seen.

The plants in the rock garden, although laid out in a pleasing and instructive manner, are still considered as forming a reservoir of plant material which can be drawn on by anyone engaged in botanically scientific research or teaching. That is why it is important to cultivate as wide a range of the world's alpine flora as possible, maintaining plants from every country and continent and displaying them in an enlightening manner. Making people aware of their environment and the plants which comprise it are all important at this time of diminishing natural countryside, and displaying plants in simulated associations, as in an artificially created alpine zone, helps to serve this purpose. The rock work, while helping in many ways towards the successful cultivation of some species, also provides the appropriate background, adding greatly to the effect. Rocky summits, crevices, cracks and ledges are used to hold some species, open sites, south-facing slopes, dry situations and well drained places cater for others, while north-facing rock work furnishes shade, coolness and moisture, essential to the well-being of still more. Sub-arctic plants, high mountain species, pasture plants, dwarf denizens of woodland and shade are in constant battle for survival and the staff at the garden are forever taking sides on the part of the suppressed. The preserving of a balanced collection is important, for while it may be extremely interesting for a limited number of people to assemble a complete range of a given group of plants, and this is

what happens when an extensive botanical project is in progress, this could prove dull to many others. To stimulate and retain the public's interest in the widest sense is the aim.

Obviously some plants are more valuable than others and this is not in the monetary sense. Emphasis placed on a complete collection or individual plants by research scientists is important and must be acknowledged. The historical aspect is also of some moment for in the collection are species which are almost unique. Now this hardly seems the correct word to use when new plants can be raised with ease vegetatively, but certain species, not necessarily decorative ones, can often be maintained in a minimum capacity because of their botanical affinities. These are found among plants raised from seed from original collections in the wild or even specimens which are the direct descendants, by divisions or cuttings, of plants introduced directly from the wild. The label tells some of this story and visitors familiar with collectors' names will find some of these with their field numbers printed there. Many plant collectors searching the world for plants shared their harvests with scientific bodies and individuals, and a scrutiny of the labels in the rock garden will illustrate that the labours of more than one plant collector have contributed to the Edinburgh collection. Invariably the plant family is included on the label and this indicates the wide group with which this species has an affinity. Following this prominently is the generic name focusing attention on a much more compact association. Next comes the specific name which virtually makes an individual of a plant although, recognising a degree of variation within a species, there may be a need to follow this by adding a varietal name. This could take the form of var. *alba* if the flowers are white when normally they are expected to be red, or conversely, it could read var. *rubra* if the original description of the plant indicated that it bore white flowers. This is only significant in botanical nomenclature if the variation occurs widely in the field and is of little value where the difference may have occurred as a single mutation. The present known world distribution of the species is also given. Somewhere prominent on the label is a six figure number and the first two usually indicate the year in which this particular plant arrived in the garden. These are followed by the individual running number unique to that plant. Some other labels carry another set of letters and numbers which are of even greater value, in fact they pin-point a special plant. They are the symbols and figures used for plant collectors, and visitors to the rock garden using this knowledge can glean much from

their interpretation. Plants introduced into cultivation by eminently successful collectors are indicated thus: COM—Harold Comber; DAV—Peter Davis; ELL—Clarence Elliott; FAR—Reginald Farrer; FOR—George Forrest; FUR—Paul Furse; KWA—Frank Kingdon-Ward; LLS—Ludlow and Sherriff; ROC—Joseph Rock; SSW—Stainton, Sykes and Williams; WIL—Ernest Wilson; YTT—T. T. Yü.

Apart from those bearing collector's symbols and numbers there are many others which have been collected in the wild. The label doesn't tell us this directly, but on reference to the plant records the accession number can be the key to a great deal of subsequent information. Seed lists are received from all over the world and not a few of these include seeds harvested from wild sources. These are the worthwhile seeds for a botanical institute, for there is little chance of hybridisation where seeds were gathered in nature. The identity of plants raised from seed collected in gardens is forever being questioned because of the likelihood of their being fertilised by another species, and for that very reason the ideal situation would be to procure 100% wild source material. The kind of plants we rock gardeners place in this category are *Adonis vernalis*, *Jankaea heldreichii*, *Leucogenes leontopodium*, *Milligania densiflora*, *Penstemon newberryi*, *Primula edgeworthii* and *Shortia uniflora*. Forms of species are next in order of importance, for quite often these are but slight variations from accepted descriptions, e.g. *Lychnis alpina* var. *alba*, a plant bearing white flowers where the species is recorded as having pink ones, and *Juniperus communis* var. *saxatilis*, a prostrate form of a shrub which normally grows upright. There are clones, plant selections of nurserymen and gardeners, which can throw light on the diversity of a particular species. Garden hybrids play a very small rôle in a botanic garden collection. They are not unimportant but their inclusion is more for educational reasons, to demonstrate the influence of hybridity on plants, e.g. the numerous forms of *Aubrieta deltoidea* and *Helianthemum chamaecistus*, although only a small representative nucleus can be held. These are all very colourful and of value to the gardener and they are included in the collection so that members of the public may see and perhaps note the wide range of cultivars available.

In addition to the obvious differences found in flowers, a display of the range of plant types within a genus is also attempted. For example, in Potentilla there are shrubby kinds with silver and green leaves, with upright and prostrate habits of growth and with white, orange and yellow flowers. Furthermore, Potentilla includes plants which are

herbaceous, evergreen and dwarf alpine species and within each of these groups there is much variation. The maintenance of a collection based on this very wide spectrum poses many problems. It aims at a broad representation of all the types that can be grown. Naturally, it still excludes the possibility of growing all the cultivars of say *Primula juliae* that ever were or even all the forms of *Primula marginata* no matter how attractive this prospect may be. It does allow, however, the assembling of the cream of horticulturally interesting and decorative plants.

The Edinburgh rock garden provides a very mixed environment and, while the purpose is to clothe the soil in each microclimate with suitable plants, it is not just a case of selecting the species which does best in a particular site so much as compromising with the environmental conditions present for the plants to be sustained. This does cause problems for it means that many plants have less than optimum surroundings but, thankfully, most survive.

How many plants are there? Thousands! Where do they come from? Practically every alpine and high pasture in the world. How are they displayed? They are shown in a number of ways. They are not segregated geographically yet, in fact it is doubtful if they ever will be completely, but as a token there is one mound devoted solely to New Zealand plants, displaying over 100 species in approximately 50 genera. Plans exist to concentrate a number of Japanese, Himalayan, American and European species in selected areas. Naturally each demonstration will hold only a small percentage of the whole, but their juxtaposition should engender an effect. Other plans include the bringing together of plants of similar genera such as Sedum, Sempervivum and Saxifraga to facilitate study. Plants favouring certain similar soil conditions have been catered for on two mounds which have had lime rubble incorporated into the medium and on these numerous lime-tolerant species prosper.

It would be futile to try to put into a few lines a description of all the plant types accommodated here, in fact to list a few could definitely be misleading. Obviously the rock garden is worth visiting at any time of year because of its extremely varied plant population. As an indication of the range to be seen, a computer page lists 25 lines of plantings, 207 pages are devoted to the rock garden alone, which means that within a space of two and a half acres it is possible to see and inspect well over 5000 plantings. A single entry may record a drift of 100 *Saxifraga aizoon*, 75 *Primula viali*, 50 *Phyllodoce empetriformis*, 10

Orphanidesia gaultherioides or 100 *Dactylorhiza elata*, therefore to put a remotely accurate figure on the actual number of plants in the rock garden is just a little bit beyond being possible—at present.

The Burren of County Clare

by HELEN DALES

THE SEVENTEENTH century description of the Burren as a "country where there is not water enough to drown a man, wood enough to hang one, nor earth enough to bury him", has become almost a cliché. Some say that it was made by General Ludlow who was then in charge of the Cromwellian forces in County Clare, others attribute it to Cromwell himself. At first sight of the bleak landscape the description might be considered to be apt. The Cromwellians, however, did not know what they were missing, for the Burren is one of the most interesting regions in Europe.

The central plain of Ireland is a massive area of carboniferous limestone. Most of it is covered by raised bog but in certain places, notably in the north-west of County Clare, the bare limestone appears at the surface. It is known as "karst" like a similar region in Jugoslavia. Lying in horizontal layers it rises in terraces from sea level to 1100 feet. At the coast it forms a flat "pavement", cut at right angles by deep fissures and cracks, and it is in these fissures, sometimes three feet or more deep, that most interesting plants are found.

This article is to deal mainly with the wonderful flora of the Burren, but the region is of interest too for its birds, its butterflies and other insects, its caves and its relics of pagan and Christian antiquity. Near Slieve Elva there are caves and potholes, some with stalactites and stalagmites. In several places streams and rivers disappear underground to reappear elsewhere. There are lakes called "turloughs" which are sometimes full of water but are sometimes dry. For the archaeologist there are megalithic circles and tombs, high crosses with fine carving, old castles, churches and abbey ruins. As might be expected in this strange country legends abound, but that is another story.

The Burren is unique in that its flora includes plants of northern and southern origin. Plants of mediterranean regions such as the Dense-flowered orchid (*Neotinea intacta*) (fig. 7) and the Maiden-hair

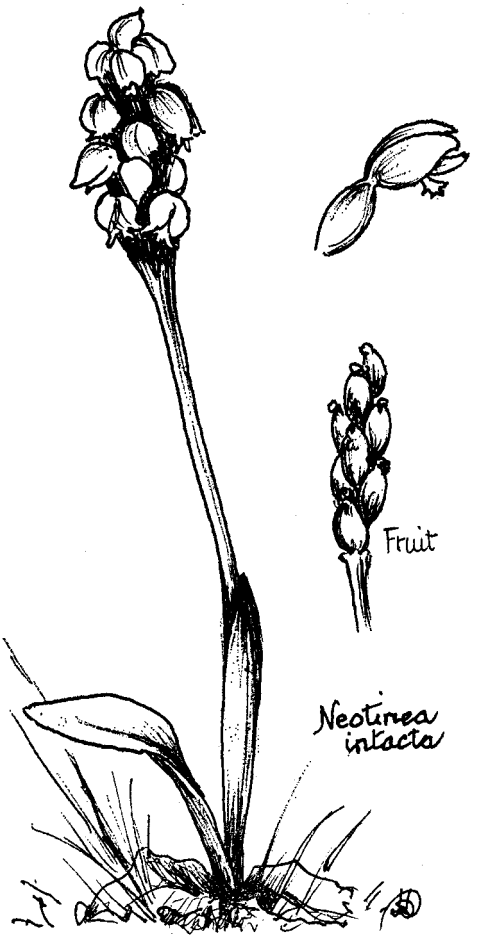

Fig. 7

fern (*Adiantum capillus-veneris*) grow here along with arctic-alpine plants such as the Spring gentian (*Gentiana verna*) and the Mountain avens (*Dryas octopetala*).

It is in May that the Burren is seen at its most spectacular. Conditions are ideal for a natural rock garden. The fissures and crevices in the rock provide a micro-climate where humus has collected and the atmosphere is moist; there is protection from Atlantic gales and

from grazing animals. Bright patches of the Bloody cranesbill (*Geranium sanguineum*) catch the eye along with the clear yellow of the Hoary rockrose (*Helianthemum canum*), the creamy flowers of the Mossy saxifrage (*Saxifraga hypnoides*) and the rare *Saxifraga rosacea*, together with brilliant patches of *Lotus corniculatus*. Interspersed here and there and less conspicuous but equally lovely are *Rubia peregrina*, *Minuartia verna*, *Thalictrum minus* and the Burnet rose of the Burren (*Rosa pimpinellifolia*) with its creamy white flowers. Occasionally one may see a spindle tree (*Euonymus europaeus*) dwarfed by the wind to less than a foot in height, or a hawthorn bush, its roots deep in a crevice and its branches spread out and pruned by the wind making a round patch like an open umbrella covered with white may blossom. Among the rocks by the sea is an unusual sea lavender (*Limonium transwallianum*), a variety of the endemic species occurring elsewhere only on sea cliffs in Pembroke.

Ferns grow easily in the rock crevices, Rusty-back (*Ceterach officinarum*), characteristic of limestone rock, Hart's-tongue (*Phyllitis scolopendrium*), Green Spleenwort (*Asplenium viride*), and on cliffs facing the sea, the Sea Spleenwort (*A. marinum*). In damp crevices, usually near the sea, the treasured Maiden-hair fern (*Adiantum capillus-veneris*), a plant of tropical and warm temperate regions, may be seen. In other places by the sea or on grassy slopes further inland are dainty plants of Columbine (*Aquilegia vulgaris*) in many shades of blue and purple and sometimes in white or lovely pink. Here too, Stone Bramble (*Rubus saxatilis*) creeps among the rocks.

By the Cahir River on the slopes of Slieve Elva, *Dryas octopetala* covers the ground in sheets, as daisies might do elsewhere, with yellow patches of the rockrose and blue patches of the gentian. At times one may walk up the dry river bed, at other times there is quite a flow of water. In damp grassy spots *Pinguicula vulgaris* flourishes. A procumbent juniper (*Juniperus communis* ssp. *nana*) is here on the banks and is also found in rock crevices throughout the region. This is one of the stations of *Neotinea intacta*, sometimes called the Irish orchid, as it is not found in Britain. It is a native of Mediterranean Europe, Cyprus, North Africa and Asia Minor, yet it grows here alongside the northern gentian.

At Black Head a thin layer of peaty humus has accumulated over the limestone in depth sufficient to support calcifuge plants, especially those that are shallow-rooted such as *Calluna vulgaris*, *Arctostaphylos uva-ursi*, *Antennaria dioica* and *Empetrum nigrum*. The grass *Sesleria*

Fig. 8

caerulea, typical of calcareous soils, is here too in quantity. On grassy slopes nearby are *Saxifraga hypnoides* and *S. rosacea*, the latter occurring in Ireland but not now in Britain. Hybrids between the two species are occasionally seen. By the roadside, at the foot of Capanawalla, on the walls of the Well-house, *Erinus alpinus*, an introduced plant, has become naturalised, seeding itself on the walls and on the ground and rocks around, with its purple flowers.

At Lisdoonvarna where the coal shales are on the surface there are mineral wells. On a perpendicular cliff amongst liverworts and mosses and dripping water there is a colony of *Pinguicula grandiflora* (fig. 8), a plant of the Lusitanian flora. It was formerly considered to be an introduction here, but since another station has been found near Corofin, the Lisdoonvarna station is now accepted as native.

Going from Lisdoonvarna down the Corkscrew Hill one must

Fig. 9

pause for a moment to view the landscape. In Spring the ground is carpeted with orchids. Looking northwards, in a hollow there is scrub, with hazel, stone bramble, blackthorn, holly and spindle. On either side rise the grey limestone terraces and in the distance one may look to Galway Bay and the hills of Connemara.

In damp fields near Ballyvaughan the Shrubby Cinquefoil (*Potentilla fruticosa*) forms dense thickets along with *Viburnum opulus, Rosa pimpinellifolia* and *Rhamnus catharticus.* Flowering in May, the potentilla flowers again in autumn. On one occasion we met the owner of the field who told us that when it became invasive (!) it was burnt to keep it in bounds, but it came up thicker than ever. These fields are flooded in winter as evidenced by the festoons of moss on the lower branches of hawthorns and other shrubs. Near by in the grass are butterfly orchids (*Platanthera* spp.), *Listera ovata* and the ferns *Botrychium lunaria* and *Ophioglossum vulgatum.* The potentilla is abundant locally, occurring also in the neighbourhood of Corofin. In the terraced hills above Ballyvaughan the hawthorns have been pruned by the Atlantic gales so that they appear to be lying horizontally.

Stretching some five miles along the south-west coast of the Burren are the Cliffs of Moher. Horizontal layers of millstone grit and sandstone rising about seven hundred feet from the sea afford perching and nesting places for a host of sea-birds. On the top of the cliffs one may find specimens of *Jasione montana,* in crevices are colonies of *Sedum rosea,* and on grassy slopes nearby the yellow pansy, *Viola lutea.*

In damp ditches inland the Royal Fern (*Osmunda regalis*) occurs and in similar situations the Irish Marsh Orchid (*Dactylorchis majalis* ssp. *occidentalis*). In various places throughout the region are many fine orchids with variants and hybrids. The Early Purple Orchid (*Orchis mascula*) abounds. Occurring here and there one may see *Ophrys apifera, O. muscifera* (fig. 9), *Coeloglossum viride, Dactylorchis maculata* ssp. *ericitorum, D. fuchsii* and *Gymnadenia conopsea.* More rarely encountered is *Dactylorchis fuchsii* ssp. *okellyi,* white and fragrant, and locally the rare Dark-red Helleborine (*Epipactis atrorubens*). Locally also, one may find *Ajuga pyramidalis,* broomrapes such as *Orobanche alba* or thyme, and later in the season Elecampane (*Inula helenium*). Altogether a botanists' paradise.

Conservation of any native flora should always be in mind, but in a region such as this it is of special importance. The Burren is unique. Long may it remain so.

Know Your Compost

by B. T. BARRETT

The Clark Memorial Lecture given at Glasgow on 8th November 1975

ONE OF the first recorded plant hunting expeditions was that sent out by Queen Hatshepset of Egypt to Somalia—the Land of Punt—with the object of collecting bushes of frankincense (*Boswellia carterii*) for her magnificent temple near Thebes. These she brought back growing in large earthenware vessels, as can be seen from carvings on her temple walls.

That event took place some three and a half thousand years ago and I am quite sure that the Egyptian gardeners concerned—like many gardeners since—were exercised by the fact that plants growing in containers grow rather poorly in "ordinary" soil dug from the field or garden.

Why is this? Plants in containers have access to a greatly reduced volume of soil as compared to similar plants growing in the field. In a pot or pan you have a high concentration of roots and therefore a high and constant demand for oxygen from the root zone. Products of root respiration must, at the same time, be able to diffuse readily from the soil. Such a concentrated root system will need a steady supply of water—at least at times of active growth—and an adequate supply of nutrients. Nutrients, on the other hand, tend to be washed out of a restricted volume of the soil by constant watering.

So, the soil you use in a pot or pan must be rather special. Garden soil, as such, will not do and gardeners over the years have developed favourite recipes—adding a little of this and a little of that to achieve good soil ventilation and what we would now call a good air/water/nutrient relationship.

Considerable mystique was attached to the compost formulations used by practising gardeners. These remained the property of the individual and, since they were largely based on variable ingredients, seldom produced consistently uniform results. My own diary for 25 April 1938 contains the following formula for a potting mixture:

24 bushels loam; 6 bushels woodash; 6 bushels mortar rubble; 6 bushels leafmould; 1½ bushels coarse sand; ½ bushel bone flour; 1 bushel crushed bones and ½ bushel charcoal.

This type of conglomerate was typical of the period and it is interesting to note the much earlier advice of Cushing (1812), 'The Exotic Gardener', p. 153, as quoted by Louden, J. W. (1850): "Loam, peat and sand seem to be the three simples of nature, if I may so call them, most requisite for our purpose; to which we occasionally add, as mollifiers, vegetable or leaf mould, and well rotted dung; from judicious mixture and preparation of which, composts may be made to suit plants introduced from any quarter of the globe".

In 1939 the first edition of Lawrence and Newell's "Seed and Potting Composts" was published summarising the work that had been going on since 1933 at the John Innes Horticultural Institute, and proposing the John Innes Composts as we now know them.

For the first time, the horticultural world was presented with two relatively simple and standardised mixtures, together with well-defined increments of nutrition to take account of plant types and stage of growth. So long as they were correctly prepared these composts could with confidence be expected to yield good, and repeatable results whenever they were used.

Now an essential ingredient of the John Innes Composts is "loam" —the rotted down remains of good, thick turves which have been stacked upside down for some months, the stack having been enriched with layers of "farmyard manure" and the pH having been corrected to pH 6.3. In order to reduce populations of organisms likely to cause plant diseases, *and in order to eliminate weed seeds*, the loam must be steam sterilised.

Although many weaker disease organisms and some seeds are killed at soil temperatures between 160°-170° F. (70°-76° C.), little progress has been made towards developing equipment which would make soil sterilisation in this temperature range a practical possibility and consequently it is usual for the temperature of the soil to be raised to that of boiling water (212° F. or 100° C.).

Unfortunately this practice creates certain difficulties—especially, perhaps, for some of the more 'sensitive' alpine plants. When you so heat a soil containing high levels of decomposable organic matter, you interrupt the normal biological chain of events by which the organic matter is turned into nitrate—a nitrogenous compound readily accepted by most plants. The process is halted half way as it were and dangerously high levels of ammonium compounds, even ammonia gas under some conditions, build up in a compost made with loam sterilised in this way.

Bunt[1] working at the John Innes Horticultural Institute demonstrated that John Innes composts under glasshouse conditions developed ammonium nitrogen levels far in excess of the 18 to 20 ppm suggested as the danger level for sensitive seedlings by Baker *et al*[2] working at the University of California.

Figure 10 shows the chemical changes that occur in a JIP 3 potting compost and Figure 11 plots the changes in pH that follow as a direct consequence of these chemical changes.

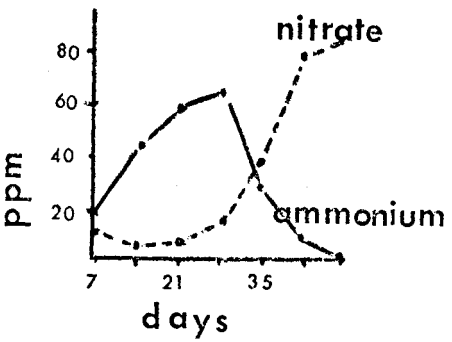

Fig. 10: *Chemical changes in a JIP 3 compost*

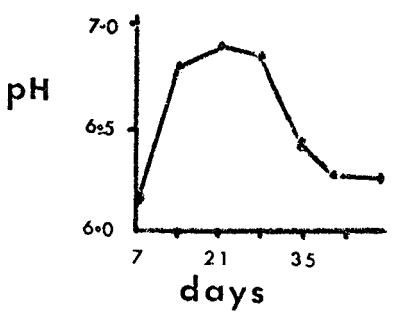

Fig. 11: *pH changes in a JIP 3 compost*

The dangers arising in practice from high ammonium concentrations have been demonstrated by Barrett and Speirs (1971).[3] Cuttings of chrysanthemum, 'Bright Golden Anne', were grown in either sterilised or unsterilised loam at two levels of added fertiliser nitrogen and three pH levels. Table 1 shows the mean weight of the plants after one month's growth.

TABLE 1: *Fresh weight of chrysanthemums in g*

Loam treatment	N Level	pH	Watering regime Dry	Normal	Wet
Sterilised	200 mg N/pot	6	6.4	4.5	6.7
		7	2.3	3.2	6.0
		8	1.8	2.7	4.3
	400 mg N/pot	6	1.7	1.8	2.2
		7	1.1	1.3	1.5
		8	0.7	1.0	1.7
Unsterilised	200 mg N/pot	6	10.1	12.9	11.4
		7	8.6	11.5	12.5
		8	6.4	7.5	6.8
	400 mg N/pot	6	7.6	7.7	9.2
		7	3.4	5.5	5.1
		8	2.1	2.9	3.1

se $\pm$ 0.865

Increasing the level of watering tended to increase weight yield but this effect was minor compared to the influence of N-level, sterilisation and pH level on yield.

Growth was consistently better at low level of N than at high, and consistently better in unsterilised loam than when the loam was sterilised.

Increments of lime generally decreased fresh weight but sterilisation had a more deleterious effect on growth than lime level. Growth was more retarded in sterilised loam, even at low N level, than at either N level in the unsterilised loam.

Thus composts based on sterilised loam, far from being inert, standard mixtures, are highly dynamic and may present a hazard to the growth of young sensitive plants. Anyone who has sown antirrhinum seed into sterilised compost will know the effect only too well.

Fig. 6 *Lewisia tweedyi* *Photo* H. Esslemont

How can this disadvantage be overcome? Is loam essential to a compost? It is true that loam, due largely to its clay content, imparts a considerable "buffering" effect in a compost which makes for greater tolerance to variations in management skills on the part of the grower. Fruhstorfer[4] in Germany, popularised mixtures of clay (montmorillonite)—screened to a particle size of $\frac{1}{8}$ to $\frac{1}{2}$ in. peat and "fine" sand. He patented such a mixture in Britain in 1952.[5] Such mixtures are now used in many parts of the Continent. The clay should be dug from the sub-soil; it is therefore relatively free from weeds, organic matter and disease organisms. Hence it does not require sterilisation. On the evidence available, *gardeners might well be better to use sub-soil clay for the "soil" fraction of their composts than seek for rich, highly organic loam.*

But experience with the development, over more recent years, of so-called "soilless" composts indicates that mineral soil is by no means an essential ingredient. First developed in Holland, these growing media are based on peat which does not readily transmit plant diseases, does not contain weed seeds and therefore needs no sterilisation; thus avoiding high ammonium ion levels. That the pH remains constant in a typical peat compost is shown by values noted during work in Edinburgh[6] in 1971-72.

TABLE 2

pH levels of aliquot samples taken from a bulk of peat compost over two months

Date	*pH*	*Date*	*pH*
18/10/71	5.9	10/12/71	6.0
21/10	5.9	14/12	5.9
25/10	5.9	17/12	5.9
28/10	5.9	21/12	5.9
1/11	6.0	28/12	5.7
4/11	6.0	6/1/72	5.7
8/11	6.1	10/1	5.6
11/11	6.2	14/1	5.7
15/11	6.1	20/1	5.5
19/11	6.2	24/1	5.7
22/11	6.1	28/1	5.8
26/11	6.1	1/2	5.9
29/11	6.2	4/2	5.5
2/12	6.2	14/2	5.9
6/12	6.0	18/2	5.9

The term peat is, however, applied to the humified remains of a

wide range of plant genera and species and to materials of varying degrees of decomposition. A broad division can be made between "low moor" and "high moor" peats. *Low moor peats* include those sold as sedge peat, lake peat or black peat. They are highly humified, contain relatively high levels of mineral matter, have a relatively high volume weight and were formed in conditions of reasonably high nutrition. They are derived largely from a flora of sedges, grasses and rushes. *High moor peats* have been formed in conditions of low nutrition and consist largely of *Sphagnum sp.* with admixtures of cotton grass. They are marketed as young "white" peat of low volume weight, as imported from Finland and Russia, or the browner, denser sphagnum peats found in Scotland and Ireland.

Because of the morphology of the parent plant, sphagnum peat has ideal water holding and air capacities, the air capacity being maintained even when the peat is wet.

Table 3 compares the air and water holding capacities of different proportions of peat and sand with those of a John Innes Compost. These values were taken at "water capacity" (Puustjarvie, 1968).

TABLE 3: *A comparison of water and air capacities of six mixtures*

Ingredients % by vol. "Fine" sand	Peat	Water capacity % of total vol.	Air capacity % of total vol.
100	0	42.0	1.6
75	25	49.0	2.2
50	50	60.7	2.2
25	75	65.7	12.2
0	100	69.3	25.5
John Innes compost		62.1	1.7

(Source: Boggie, R. (1970), Sci. Hort. *22*, 87)

Comparing these wet materials, pure peat and the 75 per cent peat/25 per cent sand mixture have adequate air capacity.

John Innes compost on the other hand is little better than pure

sand in this respect, and the effect of adding 'fine' sand (horticultural definition) to peat has been to fill up the larger pore spaces in the peat and thereby reduces its air capacity.

On this basis, then, sphagnum peat is an ideal growing medium, but what of its ability to store added nutrients so that they may be made available to the plant over an extended period? A measure of a compost's ability to store nutrients is its cation exchange capacity.

Cation exchange refers to the adsorption of positively charged nutrient ions and is measured in milliequivalents per litre of compost. Table 4 compares four peats of increasing density and decomposition.

TABLE 4: *Relation between volume weight and exchange capacity*

Peat type	Volume g/*l*	Exchange capacity me/*l*
Danish peat	52	29
Polish peat	71	63
Swedish peat	112	132
German peat	198	164
Soil	1230	62

(Source: Klougart and Bagge Olsen (1969), Acta Hort. *15*, 25.)

As the peats become successively more humified, denser and darker in colour, so the exchange capacity improves. The dark German peat in Table 4 has an exchange capacity more than twice that of soil.

Can these dark peats be used in composts to improve the nutrient economy of the mixture? Table 5 compares the air/water relationships of five commercial peat types.

The dark sedge peat has adequate air and water holding capacities —in terms of air capacity it is as good as brown peat rototilled from the bog. This table further shows that the air and water capacities are also dependent on 'particle' size, coarse peats have greater air capacity than fine grades.

Balancing all these considerations it is possible to suggest a peat-based growing medium with good air/water/nutrient relationships.

Trace elements are deficient in peats—particularly in young sphag-

TABLE 5: *Air/water relationships of differing peat types*

Type of peat	*Per cent of volume* Solid matter	Water	Air
Rototilled from bog	12	74	14
Fine grade sphagnum	4	65	31
Medium grade sphagnum	3	55	42
Coarse grade sphagnum	3	42	55
Sedge peat (East Lothian)	29	52	19

num peats and a "Fritted Trace Element Mixture" sold as FTE 253A has been added to make good this deficiency. A sulphur-coated urea fertiliser has been suggested as a "slow release" nitrogen source because of its ready availability to amateurs as "Harvest Gold", ICI. However, the appropriate amount of EnMag, Ureaform or Osmocote 18:6:12 could be substituted if available; all have given good slow release characteristics in the author's trials. The amount of lime suggested will suit most non-calcifuge subjects. Half the stated amount of lime should be used for calcifuges such as the Ericaceae. The old volumetric term "bushel" has been retained as being easily applied by amateur gardeners—1 bushel = 8 gallons. If "sand" is used as ballast it should be coarse material of $\frac{1}{8}$ to $\frac{1}{4}$ in. grist.

Suggested all peat compost:

50 per cent "white" sphagnum peat, medium grade
50 per cent "sedge" peat

plus . . . . 4 oz. ground limestone
6 oz. magnesian limestone
1 oz. sulphur-coated urea
$3\frac{1}{4}$ oz. superphosphate
1 oz. potassium sulphate
$\frac{1}{2}$ oz. FTE 253A frit

per bushel

Finally, a few suggestions when using peat composts:

Don't over-compress the mixture.

Fill the pots to the brim (adding broken rocks around the neck of the plants as necessary).

Don't use too much "fine" sand—it does more harm than good.

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Alpines and Rock Garden Plants at Inverewe

by RICHARD J. FULCHER

To WRITE solely on alpine plants at Inverewe would I feel be somewhat restricting, almost frustrating, since we do not have a great collection of true alpines. Perhaps our mild, wet winter is one of the main reasons for this. Nevertheless, the rock garden contains many interesting plants, and if you are prepared to accept such strangers as *Beschorneria yuccoides*, *Myosotidium hortense* and *Olearia insignis*, then you will most certainly enjoy a look around. However, don't come too late in the summer, because you will miss the full beauty of the woodland garden, which judging by the number of Rhododendrons smothered in bud, promises to be good this spring.

In my relatively short time at Inverewe it is easy to see how my predecessor, Geoffrey Colins, was so interested in New Zealand species, because without doubt it is this part of the world to which Inverewe is indebted for so many good garden plants, which readily lend themselves to cultivation, so much so that a small corner at the top of the rock garden has been devoted entirely to New Zealand Alpines. Here can be seen such species as *Celmisia ramulosa* with its spreading mounds of stiff, stubbly shoots, similar in habit to *Celmisia hectori* which is a more silver-grey; while *C. incana* of the same woody nature has a more

woolly leaf. Other celmisias here include fine clumps of *C. hookeri*, *C. holosericea*, *C. monroi*, and the low-spreading *C. sessilifolia* and *bellidioides*. *Celmisia viscosa*, recently planted, looks a very desirable species. Adding a little height is *Olearia algida*, not truly a New Zealander but coming from nearby Tasmania and S. Australia, growing up to three feet in height and distinct with its tiny sessile leaves, between 1 and 2 mm in length, grouped together in little clusters and each with a revolute margin which partially covers the felty grey underside. It is this felty covering which is most prominent in the stems which makes the species so distinct from *Olearia floribunda*, which is otherwise very similar, even with the strong scent given off from its leaves, especially when crushed in the hand, that of *O. floribunda* being much stronger.

Other shrubby plants here include *Pernettya macrostigma* with a rather straggling habit up to about 18 ins. high; *Helichrysum tumida* and several of the smaller-growing Hebes such as *H. gillesiana*, *H. buchanani nana*, *H. decumbens* and *H. propinqua*, one of the best of the Whipcord Hebes. Perhaps the showiest plant amongst these in summer is *Craspedia uniflora*, producing numerous slender stems up to 18 ins. long, each terminating in a dense globose head of bright yellow disc florets.

The top of the rock garden is separated from the lawn by a long narrow border about 3 ft. wide which when viewed from the path below becomes a raised bed. This contains a random selection of the smaller alpines, especially the cushion forming species and dwarf bulbs. Some of the more notable plants here include that delightful summer-flowering member of the Hypoxidaceae from the Drakensburg Mts., S. Africa, *Rhodohypoxis baurii*, 'E. A. Bowles', *Aquilegia bertolonii*, *Helichrysum coralloides*, a choice rock plant with its minute shrubby habit up to 12 ins. tall and adpressed, somewhat woolly leaves. A plant which supposedly dislikes winter wet, but seems to grow all right with us unprotected. We do, however, cover *Helipterum albicans alpinum*, which seems a short-lived plant at the best of times, but very rewarding and well worth growing for its lovely grey foliage alone. In flower it is even better with its papery white everlasting flowers, not unlike those of *Helichrysum milliganii* which also grows here and is perhaps the most odd member of the genus, for this is a plant which produces neat rosettes on a somewhat branched rootstock and forming quite an attractive cushion plant not unlike some of the house leeks. The flowers in bud are red but open out papery white, so characteristic of the genus.

Nearby is a plant of *Helichrysum plumeum*, similar in habit and growth to *H. coralloides* but much more felty grey. Others include a fine clump of *Celmisia longifolia* and a spreading mat of *C. gracilenta*. *Verbascum dumulosum* survives the winter wet with the aid of a barn cloche. Both *Gentiana saxosa* and *verna* grow well but are relatively short-lived and need regular propagation from seed. *Edraianthus serpyllifolius* and *pumilio* grow surprisingly well in our acid conditions and *Ourisia caespitosa gracilis* is quite at home creeping among the gravel. A number of Aciphyllas grow very well and perhaps one of the most noticed and respected plants in this area is a smallish unnamed Aciphylla, probably *A. pinnatifida*, with its bright golden leaves terminating of course in the most lethal spines so typical of the genus. We wouldn't be without the dwarf bulbs despite their vigour, but always reliable, especially *Narcissus minor conspicuus* and *asturiensis*. *Lilium mackliniae* is also very consistent in flower.

On the rock garden below is a rather mature collection of plants tending to be dominated, which so often happens, by the shrubby members like *Cryptomeria japonica elegans*, *Genista pilosa prostrata*, *Juniperus procumbens*, and *J. squamata* 'Wilsonii', *Potentilla fruticosa* cultivars and *Escallonia rubra pygmaea*. *Olearia insignis* has spread to 4 ft. but is well worth while with its delightful shiny dark green, leathery leaves up to 10 ins. long and the contrasting under-surface of felty white. The nodding white flowers up to 2 ins. across on long stems appear in August and although well spaced out can make quite a show. That other tender aristocrat—*Beschorneria yuccoides* from Mexico—has spread to some 3 ft. and maintains a most prominent position with its large grey lanceolate leaves. It last flowered apparently in 1971. In the same category three nice young plants of *Yucca whipplei* var. *parishii* look very promising.

The whole area was originally built using stones taken from the first Inverewe House, which was burnt down in 1914. Most of these stones, therefore, having been cut to a formal shape, are really most unsuitable so that any building has simply resulted in a collection of raised beds one above the other on a steep site in a fairly exposed situation. In the centre is a flight of steps cutting the area in two. Any changes on the rock garden are slow and merely involve the replanting of small pockets as they become worn out.

Some of the more rewarding and this time more familiar alpines here worth mentioning include the ever reliable *Gentiana septemfida* and several sizeable clumps of *Cyananthus lobatus*, *C. sherriffii* and *C.*

microphyllus. All three look somewhat similar until one compares them together, when the many different morphological characteristics appear distinct. A plant which has been a great success this year is *Helichrysum apiculatum* from South Australia and Tasmania. The shoots, which are covered with soft silvery wool, have an untidy habit, but this is soon hidden beneath myriads of golden flowers which last into the autumn. I suspect it is rather tender. *Jasione jankae* from Hungary is well established in various spots. I suspect it is like the ubiquitous *Hypericum olympicum* whose seedlings arise in every available nook and cranny, really quite a weed, but a lovable one. Indeed, like *Drimys lanceolata* is in the woodland garden, so is *Hypericum olympicum* on the rock garden.

A number of Codonopsis are well established, especially *C. ovata* and *clematidea*; another could be *cardiophylla*, but perhaps the most unusual is a small obscure plant of *C. purpurea* producing slender straggly stems terminating in the smallish maroon-coloured campanulate flowers about ½ in. long.

If one plant had to be picked out above all else for sheer profusion of flower it would have to be *Lithospermum diffusum* 'Heavenly Blue', for certainly it receives the most attention and deservedly so; after its main flowering period in June, it continues to flower throughout the year, growing quite happily in the most acid situations and forming dense carpets of long wiry stems; a habit of growth which soon engulfs neighbouring shrubs or plants. Certainly it needs a sunny place, but it also seems to enjoy our climate.

Because of the south-facing aspect of the rock garden and lack of north-facing moist, shady situations, one has to 'shop around' for the other good plants. There are many places throughout Inverewe where the underlying rock which is of Torridon sandstone comes boldly to the surface. In the damper shady areas many plants thrive with little or no attention. Rhododendrons can be seen perched in the most awkward places, often growing simply on the moist rock surface. We gardeners would find it difficult to create more impoverished conditions and yet this is where *Ourisia macrophylla* flourishes; in fact, so well at home is it that numerous seedlings are readily produced. It is probably the most successful Ourisia in the garden, yet not the most beautiful. This right should be reserved for *Ourisia macrocarpa*. In New Zealand the mountain foxglove which although similar in leaf to *O. macrophylla* is superior in flower with its stout creeping rhizomes which turn upwards, terminating in arching flower spikes up to 18 ins. long, bedecked

with large white corollas an inch across with yellowy green throats. These are followed by capsules quite similar to our own foxglove. It was *O. macrocarpa* crossed with *O. caespitosa gracilis* which produced the most excellent and showy *O.* 'Snowflake', originating at Jack Drake's nursery at Inshriach. Like its parents, *Ourisia* 'Snowflake' requires a cool moist acid position where it soon spreads with its tight stubby stems forming large dense mats on which appear numerous white heads in June. The underside of the leaf shows maroon, a characteristic derived from *O. macrocarpa.* Another interesting hybrid resulting from a cross between *O. coccinea* and *O. macrocarpa* was raised at Inverewe about 1970 and named *O.* 'Loch Ewe'. This plant has flowers of a fine pink shade, halfway between its parents (although the inflorescence resembles more than of *O. macrophylla*), and again needing a similar cool moist position where it will spread with great vigour. *O. coccinea,* one of the South American members of the genus, is much slower growing with us, but seems to have established itself on the rock garden, where it produces its scarlet flowers not unlike those of *Zauschneria californica.*

In the lighter areas where the rocks are not festooned with *Mitraria coccinea, Pernettya mucronata* or *Gaultheria shallon,* they have been cleared and are well used. Such an area is the next port of call from the rock garden. Here next to the path grows a fine clump of *Senecio bellidioides.* This species, which is a small and common plant in its native alpine fields of the South Island, New Zealand, grows to a height of 15 ins. when in full flower at the end of June, producing numerous bright yellow daisy flowers 2 ins. across set against a fine background of bright grey leaves. Other New Zealanders here include *Ourisia* 'Snowflake', *Astelia* sp., probably *cockaynei,* and a very fine natural plant association of *Celmisia hookeri* with *Aciphylla aurea,* at least eight large plants presenting a formidable prospect to any intruder. Nearby and very effectively covering a large area of underlying rock is a fine carpet of the lovely little *Rubus nepalensis* with its nodding white flowers followed by a delicious crop of juicy orange-red fruits in August—one of the many successful plants from the 1971 BLM Nepal Expedition. Here also grows a good group of the blue *Synthyris stellata* next to a spreading clump of *Parahebe cataractae* which is at least 3 ft. high and 5 ft. broad. In the background, higher up, a big mass of blue from *Gentiana asclepiadea* makes a fine splash of colour in late summer.

In a similar way but at the far end of the garden and providing a

little relief from the many Rhododendrons in this area, the rocks have been cleared and with the addition of similar sandstone, together with some soil, the whole planted. Here can be seen a good group of *Celmisia asteliaefolia* with a large spreading mat of *Ourisia* 'Snowflake' in the foreground. *Euryops acraeus* seems quite happy in the peat and nearby a group of Aciphyllas and *Helipterum anthemoides*. Two good clumps of *Ranunculus lyallii* with its large shiny peltate leaves look very prosperous; so also does *Podolepis jaceoides* from S. Australia. *Gunnera hamiltonii* seems most happy here in the open at the edge of the path near a drain where a continual supply of moisture encourages it to spread its runners in all directions. It thrives in the wet gravel, eventually forming dense mats of dark grey rosettes.

In October 1972, Inverewe received a number of seeds collected by the Beckett, Cheese and Watson expedition to Chile, Bolivia and Peru. Up to now the most rewarding have been the Calceolarias, especially *C. arachnoidea* with its charming little nodding heads of a velvety maroon held above the grey foliage. There are several good yellow species, especially Numbers C.W. 5247 and C.W. 5230, often very similar but all worth growing, and I hope they will like being with us. Of the many bulbous plants, one which recently flowered is B.C.W. 4570 *Solenomelus* sp., not unlike *Sisyrinchium brachypus*, but the yellow flowers are more open with a darker marking near the centre of the corolla, otherwise an interesting little plant which flowers over a long period.

Of the many species and, of course, hybrid Celmisias grown at Inverewe few seem to set good seed, although I would say a great deal depends on the sort of summer we get. *Celmisia hookeri* is perhaps the most reliable. *Celmisia hectori*, already mentioned, along with *Leucogenes leontopodium*, the North Island Edelweiss, which is also similar in general appearance, both abound in the moist, mild, acid conditions. In fact it is quite surprising to see how much they do enjoy our mild, wet winters. *Leucogenes leontopodium* grows more vigorously than its complement *L. grandiceps*, making large dense, springy mats of bright silver-grey. Certainly with us a first-class perennial with all the attributes of the best ground cover plants. It is little less attractive in midwinter as it is in summer when it takes on the appearance in flower of the European edelweiss. One of the best clumps of this plant can be seen on first entering the garden, where it grows nearby a group of *Cytisus* x *beanii* and *Aquilegia flabellata*, behind which is a good group of *Celmisia coriacea*, highlighted by a magnificent specimen of *Olearia*

moschata as a background. The whole composing a very fine plant association, especially the yellow of *Cytisus* x *beanii* against the nodding blue heads of *Aquilegia flabellata*, which itself is probably the best of the smaller columbines in the garden.

The genus Helichrysum is well represented at Inverewe from the shrubby, often tender species such as *Hh. siculum*, *hookeri*, *angustifolium*, *splendidum* and *ledifolium*, etc., to the lower-growing more alpine types such as those already mentioned in describing the rock garden, but to these should be added *H. acuminatum* and *H. bellidioides* which thrives in most situations at Inverewe, providing quite a show in late spring as a ground cover plant.

To devote more space to plants from the Himalayas and Far East would tempt a digression into the herbaceous borders and the world of Rhododendrons, without which Inverewe would be so much poorer. Nevertheless, there remains that strongly associated pair of genera whose presence in May and June add so much to the beauty of Inverewe. Here I refer of course to Meconopsis and Primula, which need no introduction. Most of the Meconopsis are grown in the shelter of the woodland garden wherever sufficient light is available. We have a good collection of the stronger-growing types, especially *M. grandis*. Perhaps the best rock garden species which is growing in the peat walls is *Meconopsis quintuplinervia* from Tibet and W. China. It never fails to make a show with its delicate nodding heads of pale mauve on 12-18 in. stems. *M. sherriffii* has flowered during the past two years with its large pink solitary flowers up to 18 ins. high, with a central boss of yellow stamens, a most desirable perennial. *Meconopsis delavayi*, has flowered but is not very happy. Of the Primulas which seem to bear so many mutual attributes, especially with regard to cultivation, it is again the big strong leafy growing species in the woodland garden which grow so well, especially those of the candelabra, sikkimensis and nivales sections. Of the muscarioides section *P. vialí* is by far the best, in fact one of the most desirable species of the whole genus, producing handsome spikes of lavander pink flowers opening out below a slender cone of crimson buds and flowering late into August. Those large spikes up to 3 ins. long much coveted gems of the petiolares section will grow with us, but need much care and protection from the winter wet (not to mention the depredations caused by one of our worst pests, the vine weevil, which feeds through the summer on the foliage of most of our outdoor Primulas, laying its eggs in and around the plants so that the resultant white maggot-like larvae, semi-circular in shape, spend the

Autumn and Winter feeding on the roots, often completely severing the crown from the rest of the roots. The stronger-growing types seem more able to recover. I believe a series of mild winters has led to quite a build-up of this pest throughout the garden. *Primula whitei* is a beautiful plant and one of the most successful, together with *P. gracilipes*, of the smaller more alpine type Primulas Inverewe cannot boast.

I hope this short description will encourage some of your readers to pay us a visit to enjoy not only these but the many other interesting plants grown at Inverewe.

Branklyn Garden

by J. STEWART ANNAND

BRANKLYN GARDEN was bequeathed to The National Trust for Scotland by John Renton on his death in 1967.

After walking round the Garden many people are surprised to be told that Branklyn was developed in three stages for the whole design is so clever and satisfyingly complete with pleasing vistas continually opening up as one moves along. John Renton was the designer and Dorothy, his wife, was the gardener and plantsman. Both worked a great deal in the Garden. In their time they built up close friendships with many collectors and leading horticulturists. As they were generous with their plants, they received many plants from others, thus fostering the great brotherhood which exists amongst gardeners.

Some of the plantings of the shrubs and trees had been given much careful thought and have stood the test of time, such as the *Acer japonicum aureum* in the middle of the Garden, the three plants of *Viburnum tomentosum* var. *mariesii*, and the sheltered site chosen for *Hydrangea sargentiana*. There are two large specimens of *Tsuga canadensis pendula* and *Cedrus atlantica aurea* and several well-grown trees of *Acer rubrum*, all giving wonderful foliage contrasts.

The soil is a medium loam in most parts of the Garden, though there are some beds where it verges on being nearer clay in texture. The soil is acid, having a pH of 5.8. Therefore, Rhododendrons and all ericaceous shrubs are happy with these conditions. One of the best collections of the small type of Rhododendrons has been built up over the years with many superb forms of species such as *R. schlippenbachii*,

R. racemosum, R. campylogynum, R. keleticum and *R. cephalanthum* var. *crebreflorum*, just to mention a few.

Branklyn has long been known for the many varieties of Meconopsis, totalling 26, which grow so well. They include a magnificent stand of *Meconopsis grandis* 'Branklyn', which received a First Class Certificate from the Royal Horticultural Society in 1963, other forms of *M. grandis, M. betonicifolia, M.* x *sheldonii, M. quintuplinervia, M. dhwojii, M. integrifolia, M. aculeata, M. horridula* and various monocarpic forms of *M. regia* and *M. napaulensis* which hybridise very freely with seed being saved only from the best forms.

With the help of peat and leaf mould many varieties of Primula are grown, including ten species of the petiolares section, a great variety of the candelabra section and some of the more difficult ones, including *P. cawdoriana, P. calderiana, P. reidii, P. nutans, P. viali* and *P. forrestii*, which is grown outside with an open-ended cloche for protection against the winter rains. Altogether, over 120 different species of Primula are grown, but not all successfully, as for example *P. sieboldii* surprisingly has not proved easy, *P. takedana* has been shy to flower, and *P. suffrutescens* has been difficult to keep. In fact, the North American species, apart from *P. rusbyi*, have not been easy to grow and keep in cultivation.

The hardy orchids are being re-introduced. The following North American species have flowered well in recent years—*Cypripedium acaule, C. pubescens, C. parviflorum* and *C. reginae*. We are seeking to increase the hardy orchids in the Garden.

Some of the other interesting species being cultivated are worth mentioning. *Corydalis cashmeriana* is very happy and seeds freely, as does *C. solida*. *C. wilsonii* is also grown and has lovely glaucous foliage. *Megacarpa polyandra*, a tall growing member of the crucifer family, is a spectacular plant topping 6ft. but it only flowers once in four or five years. Fortunately, our plant flowered very well two years ago and gave us viable seed and we have been able to increase our stock until we have now five good stands which should provide a succession of blooms in the years ahead. We managed to make a wide distribution of the seed. *Paraquilegia anemonoides* was introduced to the Garden under a collector's number. It is a much coveted gem from the limestone slopes of Kashmir. We grow the plants in the stone troughs and in the screes with only open-ended cloches to keep off the winter wet. They have proved very hardy and we find them easier to keep outside than in the cold greenhouse. In fact, we have only the seedlings in the greenhouse

and all the main plants are in the screes. Another member of the Ranunculaceae family is the charming spring-flowering *Isopyrum thalictroides*. It has lovely white blooms and dies down completely soon after flowering. *Stellera chamaejasme* was contributed by Ludlow and Sherriff in 1949. Though the flowers when in bud remind one of a Daphne, it is a member of the Thymeleaceae family. Our plant has never set seed and so far we have not found it possible to propagate it from cuttings. It is a charming attractive plant with the shell pink blooms gradually opening to become white when in full flower. Our plant is grown in the scree without protection.

Branklyn would be the poorer without the large number of plants we grow from North America. They include *Kalmia latifolia* and *K. angustifolia*, *Clethra acuminata*, *Clintonia andrewsiana*—a much admired plant, *Oxydendrum arboreum*, *Lysichitum americanum* which seeds freely, *Aquilegia canadensis* and *Actaea rubra*, but unfortunately in recent years the bullfinches have taken a liking to the lovely red berries which used to be a feature of the Garden from August until October. Perhaps two of the happiest contributions are *Tiarella cordifolia* and *Cornus canadensis* as ground cover plants and the lovely Erythroniums and *Sanguinaria canadensis*. Pride of place must go to the Trilliums. They are wonderful plants and lasting so long. Though we grow seven species, there are many more we are anxious to cultivate, for we believe our conditions are ideal for these plants of the Liliaceae family. And of course we can grow very well some of the North American liliums, *L. superbum* and *L. canadense*.

The Gardens of the United Kingdom are the richer for the massive introductions we have had from the North American continent. There are so many plants which are so useful for ground cover as well as autumn effect. There are the Dicentras, the Shortias, the Irises and that much admired shrub *Viburnum alnifolium*, just to mention a few more. They have given such pleasure to gardeners in this country.

Branklyn extends to only two acres, but so clever is the design that despite the fact that there are hundreds of plants in the many borders they never appear to be overcrowded or drawn. It is visited annually by gardeners from all over the world, some of whom have come specially to see it. It will be the Trust's policy to maintain the quality of this very special personal type of Garden.

Alpines of British Columbia

by BOB WOODWARD and JAMIE MACPHAIL

BRITISH COLUMBIA is a vast province: mountainous, widely diverse in climate, latitudinally stretched from the 49th parallel to the 60th. The population huddles in the south-west corner, amassing a concentration around the large city of Vancouver. We live there. Our alpine adventures radiate in almost all directions throughout the province. The alpines are ubiquitous in such mountainous terrain.

We search for them on the peaks surrounding our home. These are part of the Coast Range with a very similar flora to the Cascades Range. We find many accessible alpines in these mountains, culminating in the beautiful meadows of Manning Park, a naturalist preserve maintained by the provincial government.

We search for them in the hot and dry intermontane Okanagan Valley, although here the flora is mostly sub-alpine. But as many of the plants are eminently suitable for alpine cultivation (a neat phrase designed to preclude any definitions of: what is an alpine) we search diligently.

We search for them in the Rocky Mountains, spectacularly displayed, more so than in the American Rockies, where many of the plants are more special.

We search for them in the North, but we have much more territory to explore.

We search for them on Vancouver Island, which has a unique flora, where many of the alpine plants of the north descend to sea level.

We search for them in the Interior mountains, but here they are far from accessible. Most of the Interior plants can be found more readily in other areas.

We hope sometime soon to search for them on the Queen Charlotte Islands, which also have a unique, alluring flora.

Let us take a tour. We begin at home. On the upland hills surrounding our beauteous city one can find many exciting plants. Some of them colonize and are reminiscent of plants of the Old World: fragrant *Linnaea borealis* var. *longiflora*, *Cornus canadensis*, which is such a perfect miniature of the tree dogwood, *Cornus nuttalli*, our provincial emblem; *Clintonia uniflora*, with its late-summer translucent blue berries, the size of birds' eggs. Here and there are spry violets such as

blue *Viola adunca* or the evergreen and yellow *V. sempervirens.* Often one is startled by the brilliant orange-red of the showy *Aquilegia formosa.* Almost all these plants of the upland hills are very easy to grow in woodland or peatbed gardens.

The most important family is Liliaceae. We find and grow: common and always lovely *Trillium ovatum*; various quietly appealing Disporums (*D. smithii* in jade green is the best); and *Streptoptus* species (we like *S. roseus*). There are two fritillaries: multi-coloured, easy, variable *Fritillaria lanceolata* and the Sarana lily, *Fritillaria camschatensis,* also a ready colonizer in the garden; in summer comes the showy tiger lily, *Lilium columbianum.* Here we should mention the province's rarest plant, although it grows not on the mainland but on Vancouver Island in remote, inaccessible habitats. This is the miniature (about 3 ins.) *Trillium hibbersonii,* richly pink, easy to manage and propagate, proportionate in all its parts.

But as we climb the nearby peaks we find Liliaceae gives way to Ericaceae. There is a wealth of good plants. The heathers include medium-belled, white *Cassiope mertensiana,* certainly a favourite; purply *Phyllodoce empetriformis*; greeney-yellow *Phyllodoce glandulifloral*; and often the natural hybrid *Phyllodoce* x *intermedia.* They are all good garden plants, grown for their architectonic appeals as well as their floral displays (May in gardens, July in the mountains). The same could be said for most of the local ericades: *Gaultheria ovatifolia* forms widely roaming mats with beautiful rotund leaves; *Gaultheria humifusa* is smaller, found nearer the heights, miraculous when one finds the huge red berries on such a fragile plant; *Cladothamnus pyrolaeflorus* is perhaps too tall, but its uniquely coloured flowers (''copper bush'') make it desirable; *Menziesia ferruginea* is not the best of a charming genus but has its own quiet appeal; the most desirable huckleberry is minute, deciduous *Vaccinium caespitosum* (the evergreen, prostate *V. vitis-idaea* var. *minus* is one of the most beautiful plants of the Rockies in its own quiet way); occasionally the crowberry, *Empetrum nigrum,* is vivid with black berries (you need male and female to achieve this effect in the garden). Even small-flowered whitish, tallish *Rhododendron albiflorum* appeals to us, perhaps because it is one of the most difficult of this genus to establish, not worth all the trouble if it's gawd and display you're after. But we like it.

Some botanists claim Pyrolaceae as a separate family. Whatever the classification one can find good representatives in our immediate vicinity. Late summer finds the Pyrolas (of which *P. asarifolia* with

leaves like ginger and *P. picta* with leaves like cyclamen appeal the most to us until we get to the brilliant-flowered, northern *P. grandiflora*); and the elfin *Moneses uniflora* in darkest dells blooming along with the pipsissewas, *Chimaphila umbellata* and smaller, rarer *C. menziesii*, flowers with such a waxy texture, such a rhythmical droop.

This is a moist climate and in the alpine bogs or near them are many a good plant. *Menyanthes trifoliata*, a gentian relative, reminds one of a white spider. It is one of the few subalpine plants that can live in water. We grow it without fuss in garden pools. Most of the bog plants here have a rather surprising strangeness to either their foliage or their flowers: think of the sticky, aesthetically satisfying sundew, *Drosera rotundifolia*, or the whiskery flower of *Parnassia fimbriata*, or the gummy little nubs and leaves of *Pinguicula vulgaris*, or even the coruscated handsome foliage of *Leptarrhena pyrolifolia* (grown mostly for its cluster of dark purple seedheads). All of these are nearby, as are more ordinary bog plants such as Anemone-like *Trollius laxus* (difficult to establish and flower), or the creeping *Rubus acaulis*, or fey *Trientalis latifolia*, or Saxifrage-like (actually Hydrophyllaceae) rather special Romanzoffias, with scalloped leaves, aestivating *R. traceyi* by far the best, although aficionados do not dismiss *R. sitchensis* (''mist-maidens'') or very similar *R. suksdorfii*. Even tundra plants such as *Kalmia polifolia* (wonderful in its stunted form, var. *microphylla*) and *Andromeda polifolia* inhabit our local bogs, which fairly burst in early May.

There are few high alpines on these peaks. The trees go to the top. But those we do find also appreciate moisture: more buttercup reminiscence in the Calthas, *C. leptosepala* (with bluish reverse to the petals) and *C. bicolor*, both very attractive poolside alpines. *Luetkea pectinata* is often grown for its feathery foliage alone: its sprays of white spiraea flowers are charming but not much more; occasionally we come across the stately beargrass, *Xerophyllum tenax*, as fragrant as a perfume factory, but this fine, tall (up to two feet) alpine is usually more southern or eastern (central B.C.). The creeping Penstemons are common: serrated *P. menziesii* with fat purply bugles and, higher up, much more compact, quite miraculous in proportions really, *P. davidsonii* (some take it as a variety of *P. menziesii*, but its leaves are almost always smooth).

In drier spots we look in late summer for Eriogonums: our two best species are the felty, silvery *E. ovalifolium* and taller, bolder *E. umbellatum* with masses of greeney-yellow buckwheat flowers.

A day's trip (there and back with time for exploration) takes us to Manning Park, a provincial park near the town of Hope. Symbolic? In early July the meadows are alive with thousands and thousands of two of our best alpines: butter yellow *Erythronium grandiflorum* (in the var. *pallidum* with pale yellow anthers) and silky (in leaf, flower, seedhead), *Anemone occidentale*, which is a close relative of European *A. alpina*. Here and there the mosaic is interrupted by glowing patches of the creeping *Phlox diffusa*, usually soft blue, occasionally white or pinkish; by tiny speedwells such as *Veronica wormskjoldii*; by matted *Saxifraga broncialis* or sedum-leafed *Saxifraga tolmei* (tricky in the garden) or cushiony *S. caespitosa* or hairy-stemmed *S. ferruginea*; by the whimsy of *Pedicularis groenlandica*, appropriately sobriqueted as elephant's ears: in rich purple yet. If we climb higher we discover the alpine willows, ecstatically in the case of glaucous, gleaming *Salix nivalis*, not quite so in very prostrate, tiny-leafed *S. arctica*. In some areas we may even find the minutest of the minute, *S. dodgeana*. The showy blue-purple patches of the heights are either silky-leafed *Lupinus lyalli*, the best of the alpine lupins, or gentle, subtle *Polemonium elegans* or possibly alluring *Phacelia sericea*, with feathery, silvery leaves and pinwheel flowers with such explosive stamens. There is even a confirmed rumour that luscious *Lewisia tweedyi* (hitherto thought to be confined to the Wenatchee Mts. in the state of Washington, U.S.A.) has been found in Manning Park (fig 6). It is an area definitely worth a July or even an August visit.

One other Cascade spot lures us. This is Botanie Valley, near the town of Lytton. We shall find many of the typical Cascade plants here (including minute *Lewisia pygmaea*), but also unbelievably handsome clumps of the white ladyslipper, *Cypripedium montanum*. Even the smaller, yellow, not nearly so rare but quite as showy *C. pubescens* (or *C. calceolus* depending on whether you're a splitter or a lumper) is sometimes found this far west. Botanie Valley is also a definite must-visit. And not part of a provincial park.

Vancouver Island may be reached by a relaxing, enchanting ferry trip through the Gulf Islands. Around Easter the lowland wildflowers are glorious: best of all the myriad white *Erythronium oregonum* interspersed in patches of blue *Camassia leichtlihii*. Even better, but scarcer, is *Erythronium revolutum*, surely one of the most satisfactory garden bulbs there is with its warmly pink, nodding "lilies". On the dry rocks colonizes *Dodecatheon hendersonii*, purple and black, occasionally in the white form (at one time a very dwarf, quite unique variety

or separate species grew near the town of Sooke. It has disappeared in the wild but is very firmly in cultivation as *Dodecatheon littorale*); sedums such as *S. divergens* (green and knobby) and *S. spathulifolia* (silvery and tough) also inhabit these rocks. Occasionally with the parasitic *Orobanche uniflora* (this is the way to establish the *Orobanche* in the garden, glommed onto a sedum); patches of purply satinflower, *Sisyrinchium douglasii*, brighten the grassy knolls; and in the deep dells the fairy orchid, *Calypso bulbosa*, even in white, cheers the darkness, although civilization is rapidly encroaching upon it.

If one travels further afield one can discover usually high alpines have crept down to sea level: the silvery, much-textured *Potentilla villosa* with typical not-much cinquefoil flowers; or *Lewisia columbiana* of noble lineage, and a solid pink in the Vancouver Island form. For some of the true specialties one must climb. There is a magnificent stand of the most exciting of all Erythroniums, *E. montanum*, on the island; and this a much more growable form than those from farther south. There is even *Douglasia laevigata*, one of North America's best alpines: its rich pink primulaceous flowers on such neat cushions make it a favourite of everyone.

The Okanagan Valley lies between the great mountain ranges. It is hot, dry, beautiful in spring, rather depressing in summer (at least to those of us who appreciate sun and mountain, rain and lushness). But in April and May one can find most exciting plants. They colonize into veritable Renoirs or Cézannes or Matisses: the brilliantly showy *Lewisia rediviva* (which blooms as its foliage goes dormant: by the by, do not look for the form known as 'Winifred Herdman': there are many large-flowered specimens, many with beautiful overlapping petals, many in richer and richer hues of pink: looking for forms in this plant can become distinctly paranoic). Next to it will often grow "yellowbells", our best fritillery, *Fritillaria pudica*, of such purity of colour, demureness of habit. This is not the most easily grown form of this widespread plant, but kept summer-dry it will perform. Often the pattern includes robin's-egg blue *Mertensia longiflora* (or a near-relative, *M. oblongifolia*, with not quite such well-proportioned relationship between flower and leaf); sometimes there is pert *Dodecatheon pulchellum* (also known unfairly as *D. parviflora*; but it is variable and we have found minute forms of great delicacy). To complete the picture of these meadows: a cutleaf buttercup, *Ranunculus glaberrimus*, often in conjunction with the vivid darkness of blue *Delphinium menziesii*; the charming pinky or whitish Saxifraga relative, *Lithophragma*

bulbifera; blue, undistinguished *Linum perenne* var. *lewisii*; white and roaming *Oenothera pallida*; the daisies (*Erigeron linearis* is splendidly yellow, *E. peregrinus* is purple: these are the best, neat and showy) or the daisy relatives (especially *Eriophyllum lanatum*, one of the cheeriest plants we know).

In early summer (July) the meadows are seeding and only the stately Mariposa "tulip", *Calochortus macrocarpus*, in rainbow-colouring interrupts the dry dullness. Or an occasional cactus such as yellow *Opuntia fragilis*.

If one is looking for rarer plants in the Okanagan, one will begin with an appreciation of the showy hillsides of *Penstemon fruticosus* var. *scouleri*. Although this needs a large rock garden, it is a never-fail plant. *Anemone patens*, so silky, grows in isolated interior spots. And everyone searches for the wee Lewisia relative, *Talinum okanagense*, one of the most perfect trough plants imaginable. The Phlox family (Polemoniaceae) is amply represented from the true species: gangly *Phlox longifolia*, occasionally the mounding cushions of *Phlox hoodii*; a near relative is vespertine *Leptodactylon pungens*, very attractive; or *Linanthus bicolor*, whitish, not quite so important. Even the biennials and annuals are worth growing in this family: *Collomia grandiflora* has such beautiful apricot shades with darker-hued anthers; *Clarkia pulchella* is so flamboyantly bright, almost petunia-vulgar; and of course *Gilia aggregata*, stately and scarlet, is one of the most startling wild plants we know. A pity it is only biennial.

We look to the heights. It is summer. The Rocky Mountains form the border between the two provinces of British Columbia and Alberta. We find so many good plants: at the sub-alpine levels are wondrous willows from legendary *Salix reticulata* to similar but taller, intricately branched *Salix vestita*. There is blue-petalled *Anemone drummondii*; diminutive, slight and white *Anemone parviflora*; gawky but showy yellow *Aquilegia flavescens*; deciduous beardtongues such as *Penstemon lyalli*; masses and masses of an all-time crowd pleaser, *Dryas octopetala*, white, and *Dryas drummondii*, yellow and shy (only rarely does it open its roseaceous flowers to the sun). In moister spots one finds the tiny bird's-egg ladyslipper, *Cypripedium passerinum*. In late summer the hills are fire. *Arctostaphylos alpina* has turned its leaves. The effect is breathtaking. *Primula mistassinica* near stream banks, is the smallest we know. In the north is *Primula egalikensis*.

We are glad of the sub-alpine Rocky Mountain plants. They adapt so easily in our gardens.

As we climb (or latterly take chair-lifts) the plants become more intense, more obstreperous to tame down below. But surely more beautiful. The confinement of so much beauty in such small spaces is one of the great aesthetic wonders of life. The brightest jewel of the mountain is here: golden golden *Ranunculus eschscholtzii*. Fey *Androsace lehmaniana* is softly yellow with a darker centre, a noble representative of a noble family; circumpolar *Saxifraga oppositifolia* in bold purple precedes it on the same screes; *Saussurea densa* is a strange sessile thistle; the Drabas are not quite the best but we all grow *Draba incerta*, slightly laxer *Draba oligosperma*; rarely rarely we stumble upon *Claytonia megarrhiza*, a classic rosette with radiating Lewisia-like flowers; the smallest 'grass of Parnassus' (such an epithet), *Parnassia kotzebui* clings to wet spots; fat-podded *Oxytropis podocarpa*, which like most of its tribe is underestimated by the gardening clan, possibly because of its reluctance to prosper); even cushiony, silky *Potentilla nivea* is one of the best in a second-rate genus; *Gentiana glauca* has neat verna-like foliage with smallish, greeney-blue gentians, by no means unattractive; most of the other gentians are annual, although you may discover *Gentiana prostrata* in its Rocky Mountain form if you are lucky (*G. forwardi*); *Papaver kluanensis* occupies the forlorn tops, yellow and frail, but stoutly magnificent; *Campanula lasiocarpa* is one of the most desirable with foliage no bigger than a minute and huge, upturned bluebells resting, if truth be known, on the soil itself. It grows, flowers and dies in our home screes. Why? *Saxifraga aizoides*, yellow and sedumy-looking, is one of the first alpines to establish as the glaciers retreat (look for it near the overwhelming Columbia Ice Field).

Finally the Compositae, the last to bloom, the sorriest to sort. *Chaenactis alpina* with whipcordy grey foliage and spidery flowers hardly seems a composite at first glance. Not brilliant, but good. The many true daisies are the best: pert, huddled, brightest yellow *Erigeron aureus*; bearded and white or pinkish with hairy bracts, *E. pallens*; and very woolly *E. lanatus*. We grow (or try to) them all. They are very special. We leave the Rockies with a tantalizer or two such as the strange *Besseya* species, no doubt *B. wyomingensis*, but with a warm-purple kittentail flower rather than the usual dingy variety; and the rumour, unconfirmed by us, that the mightiest of the columbines, *Aquilegia jonesii*, inhabits the highest screes of Waterton National Park. As does, so they say, the unserrated, silver-foliage, magenta-beautiful *Douglasia nivalis*. There is obviously much still to be found.

As there is in the North. Most of the plants of the northern part

of the province we know only by reputation or garden acquaintance. Most of the ericaceous breed are tameable, although strangely the dwarf *Rhododendron lapponicum*, in sometimes dull, sometimes splendid purples, is one of the trickiest of that usually happy genus. Needs lime. The Cassiopes are two of the best: creeping slim, *C. lycopodiodes* and angular, very whipcordy *C. tetragona*, sometimes a deal to settle into a garden.

Diapensia lapponica, one of the finest of a fine genus, takes more than a deal. We know of no one who has tamed this intemperate beauty with the glistening white goblet-flowers. *Oxytropis splendens* is another good legume. But the northern iris, *Iris setosa*, is ready for anyone's garden and welcome and pleasant at that. And if *Aquilegia brevistyla* is too tall for most rock gardens (and it is), one can surely find some place for it (the woodland?).

Finally, some we have never seen. True alpines. By all accounts precious and startling: the blue *Corydalis pauciflora* (some say it can rival legendary *Corydalis cashmeriana* in its blueness and all say it is more than paucously flowered); and *Parrya nudicaulis*, which looks to have the largest, most welcome flowers of any in this Cruciferae genus. We look for these two (they are found in the Haines Cutoff area) on all Seed Lists. So far without success.

The flora of the Queen Charlotte Islands is also somewhat surprising but we have still to make first-hand inspection. But we know many of the plants as good garden subjects, including two lovely endemics, *Geum schofieldii*, with rather typical, compact yellow roseaecous flowers, and *Saxifraga taylori* with loose sprays of beautiful white flowers. For fern buffs the islands are a paradise.

Probably the rarest (and one of the loveliest) species in the province grows here: *Mecodium wrightii*, one of the filmy ferns (with all the poetic connotations of the phrase), hitherto known only from Japan and the continent of Asia. Many of the ferns are common elsewhere in the province: the ubiquitous marsh fern, *Dryopteris austriaca*; the wandering lady-fern, *Athyrium filix-femina*; the deer fern, *Blechnum spicant*; and several which prefer rocky situations such as the parsley fern (a superb one to grow), *Cryptogramma crispa*; or the bladder-fern, *Cystopteris fragilis*; or the licorice fern, especially in its reduced form, *Polypodium vulgare* ssp. *columbianum*.

For garden purposes few are better than the reduced form of the lacy maidenhair, *Adiantum pedatum* ssp. *aleuticum*; or the dwarf, creviced spleenworts, *Asplenium trichomanes* with black stem, common

or *Asplenium viride*, green-stemmed, rare. We also like *Polystichum braunii*, a handsome woodland species for any garden (the rarer *Polystichum andersonii* grows on Vancouver Island reminiscent of one of the most beautiful of all rock garden ferns, *Polystichum lemmoni*). All of these ferns are superb sculpture for the garden.

Which might be a good place to close: mentioning some of the other ferns of the province, from the elusive grape ferns such as *Botrychium multifida* and *B. lunaria* (moonwort?) to the limestone-loving rock fern, *Cheilanthes feei*, found, grey and woolly, in the Marble Canyon region of the Interior. There is also a very rare version of the chain fern, *Woodwardia radicans*, found in a spot or two on Texada Island. The Woodsias are dry-belt ferns, difficult to sort, always pleasant as interruptions in a flowering rock garden. In the north and in the Rockies we find two limestone-loving rock ferns, a delicate version of the parsley fern, *Cryptogramma stelleri*, and *Dryopteris fragrans*, which is most temperamental in the garden. One of the best, common on Vancouver Island, found once by us near our home, is the goldback fern, *Pityogramma triangularis*, delicate of shading and shaping, but nearly impossible to establish permanently in the garden (at least in its British Columbia form). There are others and of course when one is really hooked one can take up the Lycopodiums and the Selaginellas. But enough is enough.

We have raced over thousands of miles of territory and stopped for no more than a glimpse and a whiff of so many beautiful plants. We hope soon you will be able to join us for a fuller look, a deeper enjoyment.

SRGC TIE

The Club Necktie is being produced in good quality heavy 100% polyester fabric in the Club colours of mid-blue and silver-white with the dryas emblem woven into the pattern in a repeat design.

The price is £2.50 each. *But* for ties ordered and paid for *prior to Christmas* 1976, a special price of £2 net including postage will apply.

Production of these ties on behalf of the Club is being arranged jointly by the Edinburgh and Inverness Groups, and the official who will look after distribution is Mrs. Edith Lawrie, 82 Craigleith Road, Edinburgh, 4, to whom orders should be sent with the appropriate remittance. Orders given will be fulfilled as soon as the ties are manufactured.

Discussion Week-End 1976

THE UNIVERSITY OF ST. ANDREWS
ST. SALVATOR'S HALL, THE SCORES
ST. ANDREWS KY16 9AR
SATURDAY and SUNDAY, 2nd and 3rd OCTOBER 1976

PROGRAMME

Saturday:

12.30 p.m.	Lunch
2.15 p.m.	Address of Welcome
2.30 p.m.	The W. C. Buchanan Memorial Lecture "Growing Alpine Plants in a Frost Pocket" John Duff, Esq.
4.00 p.m.	Tea
4.30 p.m.	"Bulbs in Pots" Dr. Jack G. Elliott
6.00-7.30 p.m.	Dinner
7.45 p.m.	"North American Excursion"

Sunday:

8.30 a.m.	Breakfast
10.00 a.m.	"In Search of Alpines" Jack Crosland, Esq.
11.15 a.m.	Morning Coffee
11.45 a.m.	"Gentians" by Dr. N. Prichard
1.00 p.m.	Lunch
2.30 p.m.	"Scottish Alpine Plants" James R. Aitken, Esq.
4.00 p.m.	Close of Proceedings
4.15 p.m.	Tea and Disperse

ST. SALVATOR'S HALL is situated between The Scores and North Street in the older part of the town. St. Andrews is one of the most historic and interesting towns in Britain. It is easily reached by road, but please note that the trains only stop at Leuchars, some four miles away, and bus connections are difficult. Anyone in difficulty please write to the Organiser.

Free Car Parking is available in North Street and The Scores. Both areas are adjacent to the Hall of Residence.

Accommodation can be booked for the duration of the Conference

or for the whole weekend. Members may wish to come for the day only, in which case appropriate charges can be made.

CHARGES, INCLUDING V.A.T. AND CONFERENCE FEE:

Full board from Friday dinner till Monday breakfast ..	£18.50
Full board from Friday dinner till Sunday tea ..	14.50
Full board from Saturday lunch till Sunday tea ..	10.50

Day Charges:

Saturday: Lunch, Tea, Dinner	5.00
Sunday: Coffee, Lunch, Tea	3.50

Application should be sent initially to the Registration Secretary, Mr. R. J. Mitchell, University Botanic Garden, St. Andrews, enclosing the appropriate remittance, before Saturday 21st August 1976. Documentation will be issued at the Conference.

An interesting and instructive programme has been arranged. There will be opportunities to visit various gardens during the Saturday morning, and on the Friday and Sunday evenings additional talks are planned. Discussion sessions will be possible in the large lounge of St. Salvator's Hall in the evenings. Donations of plants will be welcome for the "Bring and Buy" stall.

The Autumn Exhibition Show will be held in conjunction with the Conference. A meeting of the R.H.S. Joint Rock Garden Plant Committee will be held at 12 noon on the Saturday of the Show.

EDINBURGH DISCUSSION WEEKEND SHOW 1975

ANOTHER successful Autumn Show was held in conjunction with the Discussion Weekend, and brought exhibits from as far apart as Fort Augustus and Middlesbrough. In fact more than half the exhibits came from outside the Edinburgh area. There were many interesting plants and the standard was very high. The judges were Joe Elliott, John Lawson and Robert J. Mitchell.

The Forrest Medal was won by a perfect specimen of *Cyclamen graecum*, shown by David Mowle of Lancaster. The East Lothian Trophy, awarded for three plants of different genera, was won by J. D. Crosland, Torphins, with plants of *Acaena microphylla*, *Cyclamen hederaefolium*—as *Cyclamen neapolitanum* is now known—and the rare *Petrocosmea kerrii*. The Cyclamen was also awarded a Certificate of Merit. Mr. and Mrs. Stone, Fort Augustus, won the Peel Trophy for

three pans of Gentians. The Logan Home Trophy for a miniature garden was won by Mr. and Mrs. Taylor, Invergowrie, who also won the Mary Bowe Memorial Trophy, having gained most points in Section I. Dr. and Mrs. Good's arrangement of cut flowers was awarded the Wellstanlaw Cup.

There was a good entry in the class for a rock plant grown from seed by the exhibitor. It was won by J. D. Crosland with the unusual *Celmisia philocremea*. David Livingstone's beautiful *Shortia illicifolia soldanelloides* won the class for Autumn-coloured foliage. Another well supported class was for Silver Foliage plants, which was won by Dr. D. M. Stead, Glasgow, with a fine plant of *Euryops acraeus*. J. Brownless, Middlesbrough, won a first in the class for two dwarf conifers with *Cupressus macrocarpa pygmaea* and *Tsuga canadensis* 'Cole's Prostrate'. Another popular class was for a dwarf shrub and this was won by Harold Esslemont, Aberdeen, with the dainty *Daphne jasminea*. Mrs. Isobel Simpson won the class for two Calluna or Erica. *Calluna humilis compacta* was well flowered and a very attractive prostrate growth. The class for Cyclamen was quite outstanding with five beautiful entries, including the Forrest Medal winner. Classes for Sempervivums were well supported, as was the class for a plant not eligible for other classes and this was won by Mr. and Mrs. Taylor with *Pyrola asarifolia incarnata*.

Section II was, unfortunately, poorly supported, but contained some plants of very high quality. The East Lothian Cup for the best plant in Section II was won by Mrs. Graham with a perfect *Dionysia* sp. shown as a cushion plant. J. Brownless, having gained the required number of points, was awarded the Club Bronze Medal. His well-grown *Tsuga canadensis* 'Minuta' won the Dwarf Conifer class, and his *Sedum oaxacanum*, from Mexico, also won a first. A beautiful plant of *Veronica bombycina*, shown by T. Hodgson, Stoksley, won the class for Silver Foliage.

St. Andrews University Botanic Garden staged a very interesting display of Primulaceae which included a large variety of Cyclamen. Dionysia and Primula were shown together to demonstrate their close botanical affinities. This display was awarded a Certificate of Merit. Also in the non-competitive section, Charles Graham, Giggleswick, showed a twenty-five-year-old *Cryptomeria japonica* var. *knaptonensis*, which he kindly donated to the Plant Auction.

Trade was represented by Ponton's Nursery and Inshriach Nursery. The latter was awarded a Gold Medal.

The Plant Auction and Raffle, organised by Mrs. Jill Sleigh, was most successful, thanks to the many very generous donations and to James Aitken for his lively conduct of the Auction. "Pandora's Box", anonymously donated, contained many rare treasures, including *Orphanidesia gaultherioides*, *Trillium grandiflorum* and *Orchis elata*. And our thanks to Roderick Milne and John Sleigh, the young kilted persuasive sellers of Raffle tickets.

We are also grateful to all those whose help contributed to make the Show such a success.

S. MAULE
B. B. CORMACK

Book Review

The Alaska-Yukon Wild Flowers Guide, by Helen A. White and Maxcine Williams. Alaska Northwest Publishing Company, Box 4-EEE, Anchorage, Alaska, 99509 1974. $7.95.

Dryas octopetala, as well as being the emblem of the S.R.G.C., is also the official floral emblem of the Northwest Territories in Canada. This latter information is given in this recent issue of Alaska Geographic—a quarterly publication of the Alaska Geographic Society.

This particular volume contains excellent illustrations of 164 species of native flowers. These are clearly printed and makes identification of the plants very easy. Indices make it possible to locate each species by botanical and common names. Their family names are not, however, clearly defined.

Each species is covered by a small text which contains important items such as distribution, habitat, size, relative rarity, and whether the plant is poisonous or edible. Line drawings are included for all species to give further visual aids for identification. Should the reader wish to study the flora in more detail, a useful short bibliography is also given.

This is a high quality paperback available in standard $5\frac{1}{2}$ in. $\times$ $8\frac{1}{2}$ in. format and for anyone interested in the wild flowers of Alaska and the Yukon it is a useful book to start with. The price is high, but then pictorial books in colour are always more expensive. R. J. M.

ERRATA

In the *Journal* for April 1975 the acknowledgement to the photographs of Figs. 47 and 48 were transposed. *Crocus scardicus* was photographed by H. Esslemont and *Dionysia michauxii* was photographed by J. & J. Archibald.

On p. 300 in the *Journal* for September 1975 it was stated that the Forrest Medal awarded to Mr. Eric Watson was the first time that this medal had crossed the Border. This is incorrect. Forrest Medals have been won by Miss Pape and by the late Mr. R. B. Cooke.

Summer Holidays 1976

with

FAIRWAYS & SWINFORD

AG. 29: ST. LUC (Val D'Anniviers) 20 June to 3 July
One of the finest areas for wild flowers in all Switzerland, St. Luc at 5,400 ft. is sunny, south-facing and particularly well endowed with lovely walks of all kinds. Superb views of the Valaisan peaks can be seen from the village and include the great giants—the Weisshorn, the Zinal Rothorn, the Matterhorn and the Dent Blanche among others. This year, we stay at the *Bella Tola*, a charming and beautifully appointed mountain hotel of which we cannot speak too highly: *Miss Theresa Atkins leads the tour and prices are from £195 to £220.*

SB. 51 WENGEN (Bernese Oberland) 25 June to 8 July
Situated at 4,163 ft. in flowery alpine meadows below the Tschuggen, this pleasant village commands splendid views towards the Lauterbrunnen Valley and the Jungfrau and is an excellent centre for excursions into other parts of the Bernese Oberland. The 'Hotel Alpenrose' has been a favourite with our gardeners and botanists for many years and is well placed both for walks and for chairlifts:Mrs. Ebba Fordham leads the tour and prices are from £186 to £214.

AG. 30: PLAN DE GRALBA (Val Gardena) 30 June to 13 July
This centre which lies above Selva Gardena at 6,000 ft. in the heart of the Dolomites is known for the wealth and profusion of its flowers and is one we have visited many times. The *Hotel Plan de Gralba*, the only hotel, is simple and unpretentious and lies in a perfect situation for plant-hunting and collecting: *Mr. Fred Buglass leads the tour and prices are from £161 to £175.*

AG. 31: BETTMERALP (Valais) 5 to 17 July
This vlilage is part of a community of other small villages which lie high above the Rhone Valley to which they are linked by cable car—for there are no roads. The area faces due south and the small, comfortable *Hotel Waldhaus*, where we stay, is two minutes walk from the upper terminal of the Bettmeralp cableway. It has a sun terrace with a magnificent view and a cosy sitting room with a log fire for cool evenings. Owing to the great variety of habitats in the area, there is a wide range of alpine flora, thus providing very interesting plant-hunting and those wishing to go up to the higher reaches can take a chairlift to a ridge from which there is an amazing downwards view of the Aletsch Glacier: *Mr. Terry Underhill leads the tour and prices are from £187 to £199.*

FURTHER AFIELD, we can offer mountain holidays for wild flower enthusiasts to Kenya, Turkey and South Africa, besides a new, exciting walking and camping tour of BHYUNDER—VALLEY OF FLOWERS immortalised by F. S. Smythe. (This lies in India in the Garhwal Himalayas.) For full details apply to

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SRGC PUBLICATIONS

PAST *Journals* provide a compendium of information on almost every aspect of rock garden plants and their cultivation. To encourage members, especially new members, to build up their libraries of *Journals*, SPECIAL DISCOUNTS are being offered for large orders:—

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Postage contribution 3p (8ct) per *Journal* up to a maximum of 45p ($1.20).

Waiting lists are kept for *Journals* 1-6 (list long) and 14-17 (list short) and the Club will be glad to receive or consider purchase of these and other scarce *Journals*.

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Stocks of *Journals* 9, 39, 42, 44, 48 and 52 are high and they are being offered at the very low prices of: 2 for 45p, 3 for 60p, 6 for £1.10, all post free to members.

All correspondence about past publications should be addressed to the Hon. Publications Manager: Dr. D. M. Stead, Esk Hause, Bishop's Park, Thorntonhall, Glasgow G74 5AF.

*** but see leaflet in this Journal**