The JOURNAL of THE SCOTTISH ROCK GARDEN CLUB

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SEPTEMBER 1979

Editor R. J. MITCHELL · University Botanic Garden · St. Andrews · KY16 8RT

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by LYNN and MICHAEL ALMOND

PART II

Travelling around Turkey by car is something of an adventure, both for driver and passenger. The major arterial roads are generally very good and high average speeds can be maintained. Unfortunately even the best roads are punctuated at irregular intervals by potholes which it is often impossible to avoid when travelling at speed and which put a considerable strain on both the vehicle and its occupants. The side roads are usually unmetalled and vary from passable to impassable —which is which depends partly on how adventurous the driver is and how nervous his passenger is. During the two and a half thousand miles we drove around Turkey we saw very few road accidents but a large number of mechanical breakdowns; we ourselves had six punctures during the two weeks, eventually needing a new tyre and a new inner tube. The wonderful scenery and flowers which we were able to see, however, made all the trials and tribulations worthwhile—in retrospect at any rate!

After our excursion to the high passes at the head of the Kocacay valley we pressed on eastward again along the coast. An unpromising area of open scrub in the hills to the north-west of Kalkan concealed a wealth of orchids; protected from the goats by natural barbed wire were innumerable *Ophrys fusca*, *Ophrys lutea* and an example of what appeared to be a hybrid between the two, with a brown lip and 'eyes' like *fusca* and a marked yellow margin like *lutea*. Here too we found another specimen of the saprophytic *Limodorum abortivum*, unfortunately not quite in full bloom. Also growing among the bushes was the Ground Pine, *Ajuga chamaepitys*. As we came down the hill to the west of Kalkan and in sight of this small fishing village, we could see the devastation caused to the leguminous crops at the side of the road by the parasitic *Orobanche crenata* which was present in great numbers. We stopped to examine these broomrapes and found also some magnificent *Arum dioscoridis*, with very dark red, almost black, spathes—typical of the Asiatic specimens—growing on the stony roadside verge.

North of Kas (a picturesque little port clinging to the cliffs opposite the Greek outpost of Castellorizo) before the junction with the road

to Kasaba, *Ornithogalum nutans* was growing in a field among the meadow grass and behind it masses of Purple Flag Irises formed a backdrop on the terraced hillside. At the Kasaba road junction itself there was a profusion of *Orchis quadripunctata* growing amongst the scrub to the south of the road. Here too were a few *Orchis simia* and a single specimen of *Orchis morio ssp. picta var. libani*, with a dusky pink hood and a white lip. Down by the coast, at Uc Agiz, more *Cistus salvifolius* and *Cistus albidus* were growing alongside the road (the drive down from the main road is a nightmare but the village and its surroundings are quite fascinating—it is impossible to know whether to recommend the excursion or not!). At the entrance to the village a solitary *Dracunculus* stood guard, with prominent white markings on the leaves and stem, like *Dracunculus vulgaris cretensis*, but with a cream-coloured spadix. Among the serried ranks of massive stone sarcophagi and their upturned-boat-shaped lids littered along the shore to the east of the village, we found a tall *Allium* with a pink head and long, broad leaves, and also a few red *Ranunculus asiaticus*. The hills in this area come right down to the sea and are covered in thick scrub, much of it evergreen Oak and *Arbutus* (some of which was in flower) under which grows *Cyclamen hederifolium* with strikingly marbled leaves.

Much of the southern slopes of the mountains north of Kasaba was heavily grazed beneath the pine trees but we did find some more small, white violets, a very deep purple *Aubrieta* and more of the small, white flowers we had found near Seki in the upper valley of the Kocacay. At the pass of Sinekcibeli (literally the 'fly-ridden pass'), which lies at a height of just over five thousand feet, there were masses of flowers among the woods of pine and cypress and below the melting snow: winter aconites (*Eranthis cilicia*), crocuses—mauve, yellow and white with mauve feathering—*Anemone blanda* in various shades and the small, deep blue *Chionodoxa*. Most striking of all, however, was the dazzling profusion of *Cyclamen alpinum*—flowers were peeping out from beneath almost every rock in some areas and some of the clumps had dozens closely packed together. Another cause of some excitement at Sinekcibeli was the discovery of freshly made bear's footprints in the snow in the woods above the pass. On the north-eastern slopes of these mountains, as we descended from the pass towards Elmali, we found more *Cyclamen* and also a reddish-purple *Corydalis*, similar to though more compact in habit than *Corydalis solida*. Further inland, around Elmali, the vegetation became more sparse; the only plant of

note we saw in the area was a small, spiny almond, with quite large silvery-pink flowers, growing on the hillside above the municipal rubbish tip just to the south of the town.

Returning to the coast, along the road to the east of Kumluca we found *Saponaria calabrica* forming large patches of pink on an otherwise bare, brown, sun-baked bank. At the top of the low pass over to the east-facing coast which stretches away northwards to Antalya, *Orchis anatolica*, *Ophrys fusca* and *Ophrys lutea* were growing amongst *Poterium* scrub beneath the pine trees and in the vicinity of some ancient remains, including a Lycian sarcophagus daubed with Turkish graffiti. About three miles further on, patches of *Silene colorata* were growing beside a small stream and on the banks above it a white *Astragalus*, forming a shrub some three or four feet high.

Among the ruins of Phaselis, which is situated on a small peninsula and very thickly overgrown with pine trees, strikingly marked leaves of *Cyclamen hederifolium*—the centres might almost have been sprayed with silver paint—nestled in the litter of pine needles. Further north, on the track leading up to Termessus, we found *Gagea lutea* (?), *Muscari pulchellum*, *Daphne sericea*, *Ornithogalum umbellatum* and a single plant of *Fritillaria acmopetala*—yellowish green in colour with small maroon blotches on the outside and delicate dark veining on the inside. The ruins of Termessus itself are perched on a rocky saddle overlooking the Pamphylian plain at about 3000 feet above sea level. Here we found *Muscari pulchellum* again and also *Muscarimia moschatum*, a stout looking plant with a six-inch-long spike of pale greeny yellow flowers. The undergrowth and ruins were enlivened here and there by patches of *Doronicum* and wallflower. Below Termessus, near the edge of the plain, lies the fourteenth century Seljuk caravanserai of Evdir Hani. Here, beside the ancient irrigation channels which have carried water down from the mountains to this area continuously for about two thousand years, were growing a rich pink composite (like a dwarf *Pyrethrum*) and several grey-blue *Anchusa*. In the courtyard of the ruined Han itself we found some exceptionally good specimens of *Anemone coronaria*, very pale lilac in colour with larger flowers than usual.

To the east of Antalya, on the cliff tops near the spectacular Duden falls, there were patches of delicate *Asphodelus fistulosus*, making an interesting change from the ubiquitous *Asphodelus microcarpus*; Huxley, in his book on the flowers of Greece, suggests that this must be the *Asphodel* which grew in the Elysian Fields, as the other types which

occur in Greece and Asia Minor are far too coarse and common! In the theatre at Perge, north-east of Antalya, *Hyocyamus aureus* was growing between the stones of the seats. In the fields on the plain a little further east there was an abundance of *Serapias parviflorum* and *Cistus albidus* together with some *Asphodelus albus* and what appeared identical to the *Phlomis fruticosa* we knew so well from Crete and the Aegean islands, except that the leaves were a dark, fairly glossy green instead of light green and almost fluffy. Here too we found some *Muscari comosum*, which had a large pyramidal head of sterile flowers and a thick, mottled grey, pulpy stem.

The beginning of the last lap of our journey lay north from Manavgat, through Akseki and over the Taurus mountains. In the mountains above Akseki in various places near the road were growing mauve, yellow and a few white crocuses, *Anemone blanda* in various shades, *Gagea*, purple *Corydalis* and leaves of orchids yet to flower. Exploring a small side valley, we found a few aconites amongst the crocuses and then, on turning a corner in the valley, we were amazed by the mass of aconites covering the valley floor and colouring it a bright yellow; it was like a meadow full of buttercups and blended into white at the edges as the aconites struggled to push their way through the snow. In another place we found, in addition to the plants already mentioned, the pure blue *Muscari pulchellum*, and the ground was carpeted with leaves of *Cyclamen cilicium*. On a hillside, above some cultivated fields at the side of a small mountain plain and among the familiar crocuses and anemones. there was an *Ornithogalum* like a wide-petalled *Ornithogalum umbellatum* and also a beautiful little *Colchicum catacuzenium* just like those we had seen in the mountains at the head of the Kocacay valley except that both its petals and its leaves were slightly more rounded at the ends—in fact the flower looked rather like a tulip.

Our last opportunity to look for flowers before the long haul back across the plateau to Istanbul was on the Sultan Daglari, south of Aksehir. From the pass across these mountains we could look back down towards the lake of Beysehir, with its deep turquoise blue, and across to the snow-covered peaks beyond rising majestically out of the haze. The most striking flowers we found here, however, in this bare, almost lunar landscape, were masses of primroses, growing at about 5000 feet. Perhaps a fitting reminder that we should soon be winging our way homewards towards the rigours of a British spring.

Angus Group Seed Exchange

I SEE that seed capsules are forming on the early plants in my garden, so it is time for me to write the reminders for the September *Journal.* The exchange is expanding every year and it will make our job easier if those wishing to use it will try and keep to our schedules.

Seed must reach me by the end of **October,** but as there are many desirable plants with late ripening seed a list of seed to come should be sent by that date. The printers require the typed copy just after the middle of November and we cannot keep revising it, so please make a note of the last day for posting seed or list, **24th October** for overseas members, and **29th October** for home members.

All overseas members receive a list; so do home donors. Home members who wish a list and are not donors should send me a stamped addressed envelope ($8\frac{1}{2} \times 5\frac{1}{2}$) or a sticky label to:—

Miss JOYCE HALLEY, 16 Abercrombie Street, Barnhill, Dundee DD5 2NX, Scotland.

We can supply envelopes for seed which can be obtained from:—

Dr. ISOBEL SMITH,36 Seafield Road, Broughty Ferry, Dundee, Scotland.

There are three sizes: 4 in. $\times$ $2\frac{1}{2}$ in., $4\frac{3}{4}$ in. $\times$ $2\frac{3}{4}$ in., and 5 in. $\times$ $3\frac{1}{2}$ in. at 44p, 50p and 55p per 100 respectively, plus a 12p stamp for the first two sizes and a 15p stamp for the largest one. Twenty of each size would cost you 30p plus a 12p stamp.

There is always a demand for Androsaces, Cyclamen, Gentians, Lewisias, Primulas and particularly small bulbs. We had enough seed of *Galanthus nivalis* and some of the easier Tulips, but all others were finished by the middle of February. Please send in cleaned seed; I know it is a nuisance and a bore, but think of my packeters with a couple of boxes of seed to packet, probably about 200 to 250 species, being confronted with several that have to be cleaned first! We have a leaflet on cleaning seed that can be obtained from Dr. Smith or myself by sending a stamped addressed envelope.

We had a lot of rare seed last year, but of course in small quantities. A few seeds of the rarer species are very welcome—we count them!

The gardens in Scotland are looking lovely just now. I hope that state is universal and you all have a good harvest.

JOYCE HALLEY

Fig. 41 A typical arctic marsh with non-periodic vegetation that is still actively growing in late August. The dominant vegetation is *Eriophorum scheuchzeri*.
Photo R. M. M. Crawford

Survival Strategies in Arctic Vegetation

by R. M. M. CRAWFORD.*

THERE is an undoubted fascination in exploring the physical limits of endurance of plants and animals. Part of the attraction of the arctic flora for botanists and gardeners probably comes from the astonishing ability of these plants not only to endure extremes of cold and long periods of enforced dormancy but also from their ability to grow, flower and reproduce in growing seasons that are short, cool and often extremely unpredictable. The present cooling trend in the northern hemisphere (Lamb, 1977) and the possible threat of a new 'little ice age', gives an additional motive for increasing our understanding of how plants adapt to short and cool growing seasons.

It is a remarkable testimony to the hardiness of plants that no matter how meagre the annual supply of energy some species will be able to grow, provided they can obtain a niche with some soil and shelter from the abrasive damage of wind and driving snow. Plant communities made up of different combinations of eight species of higher plants have been found within 200 m of the summit of 2180 m (7070 ft.) nunataks on Greenland (Gribbon, 1968). Among these plants the Arctic Poppy (*Papaver radicatum*) holds the record for the flowering plant to be found at the highest altitude and nearest to the North Pole. In the Himayalas two species of higher plant share the record for high altitude occurrence in growing at over 20,000 ft. (6100 m). *Stellaria decumbens* has been found at 20,130 ft. (6136 m) and the first Everest expedition discovered *Arenaria musciformis* growing at 20,410 ft. (6222 m—Billings, 1974).

The low temperature tolerances of arctic and montane plants are not so exceptional as they might at first appear, for in absolute terms the average temperature of the Earth's biosphere is extremely low. The chemical reactions that support life involve the making and breaking of chemical bonds between carbon, hydrogen, oxygen and nitrogen and do not take place spontaneously at the temperatures normally encountered in the Earth's biosphere (0°- 27°C). Thus biologically, the Earth is a cold place and the Arctic is just the cooler end of a totally

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unpromising thermal environment. The process of the evolution of life on this Earth can be viewed as an attempt to accelerate chemical reactions so that life may proceed at an adequate pace in a cold climate. It is therefore a curious feature in plants that in spite of having evolved to function in a cold climate (fig. 42) nearly all species are very sensitive to even minor changes in this low absolute temperature. A climatic deterioration sufficient to reduce the annual mean temperature by 1°C would move the northern boundary for the cultivation of the vine south by 450 Km (Lamb, 1967) and depress the tree-line by between 100 and 200 m (Firbas and Losert, 1949). It has even been suggested that a sudden lowering or raising of the temperature of the Earth by as little as 20°C would be sufficient to exterminate most higher plants (Johnson *et al.*, 1954).

In examining the adaptations of arctic plants to their environment, the first question that arises is whether or not there are any specific characters which make these plants more suited to the Arctic than any other habitat (fig. 49). If such specialised features did not exist then it would be possible to dismiss the arctic flora as merely that section of the plant world that is not able to compete with temperate vegetation. Although this statement is partly true it is misleading, as it neglects the specific nature of adaptation that is to be found in many arctic species. If we examine the coastal species that extend southwards from the shores of the Arctic to the British Isles, we can see that they often reach a limit of distribution that can be linked to one of the summer isotherms. Scots Lovage (*Ligusticum scoticum*) does not grow south of the 15°C July isotherm in Britain. The southern distribution of the Oyster Plant (*Mertensia maritima*) stops somewhat north of that of lovage. Thus the southern extension of species such as *Ligusticum scoticum* and *Mertensia maritima* appears to be limited by an upper degree of summer warmth that these plants can endure. Similarly the Dwarf Birch (*Betula nana*) does not extend as far south in east Greenland as would be expected from its distribution in Europe. The coastal habitat of the previous two species is continuous and therefore the plants are not restricted in their range through a lack of suitable sites. In Greenland vacant sites certainly exist further south for the dwarf birch and we can conclude that the forms of dwarf birch that exist in north-east Greenland must be more restricted in their tolerance of summer warmth than those that occur in Europe.

Thus from the geographical limits of arctic plants we can expect to find adaptive features in these plants which although they make life

possible in short cold growing seasons are nevertheless so specialised that they prevent these species from spreading further south.

Habitat Availability

Plants evolve to exploit their habitat and if we are to understand the varying strategies that are available to arctic plants we have to examine the degree of habitat choice that is open to them. In the warmer parts of the Earth, plants are able to alter their habitat by accumulating litter and humus as well as accelerating soil development and raising the level of the leaf canopy to produce shade and shelter. In the normal course of events in vegetation succession, plants begin by invading a dry (xeric) habitat or else a wet (hydric) habitat (fig. 41) and by the accumulation of organic matter over generations succeed in modifying these habitats so that they are no longer extremely wet or dry. Lakes are filled with mud (fig. 47) and then become marshes, and eventually the soil rises far enough above the water table for woodland to develop. Rocks, sand and gravel with passing generations of plants also accumulate organic matter and soil particles until these habitats too can support trees. There is therefore a convergent evolution from opposing extremes of wetness and dryness to an intermediate (mesic) type of habitat. The existence of these intermediate conditions in so much of the warmer parts of the Earth is entirely due to the thousands of years of plant growth that have taken place. In the Arctic, however, due to the slow rate of accumulation of biological matter, this mesic condition is absent and the habitats that are available to plants are polarised to the two extremes either of wetness or else of drought (fig. 43). As much of the Arctic lies under a well established high pressure zone during the summer the difference between these two habitat types increases as the growing season advances. In east Greenland (Mesters Vig, see Raup 1969) the total precipitation is only 5 inches per annum and plant growth is largely dependent on snow melt for its moisture supply. The bogs remain wet all summer as the cool climate does little to dry out their surfaces. Meanwhile the hillsides, sand banks and gravel screes become progressively drier after the disappearance of the winter snow. Each habitat carries its own advantages and disadvantages for their plant communities. On the well-drained hillsides, particularly those with a southern exposure, snow cover disappears promptly and as a result there develops the curious arctic phenomenon of the flowering season being further forward higher up a mountain-side than in the valley below (fig. 46). The

shortest arctic growing seasons are to be found in the coastal plains adjacent to the sea where cold currents and freezing sea fogs all serve to delay the melting of the snow. By way of compensation for the late arrival of spring the wet valley sites offer a greater degree of protection for over-wintering plants than the exposed hillsides. The wet and frozen mud with its covering of snow buries the perennating rhizomes and roots and offers the best possible protection against the greatest of all dangers to plant life in the Arctic, namely winter desiccation.

This wide divergence between wetland and dryland habitats is responsible for one of the most striking differences in behaviour in arctic plants, their reaction to day-length (photoperiod). To understand this we have to examine the different ways in which arctic plants protect their over-wintering buds. As already mentioned, the wetland plants bury their over-wintering buds in the mud. This is not possible for the hill-side vegetation where frost-desiccation of the exposed bud is probably the greatest environmental hazard. These dry-habitat plants, in order to survive, have to cover their resting buds in protective-wax-thickened bud scales. These scales can only develop after the bud has ceased to grow. Thus soon after the days begin to shorten it is noticeable that the resting buds have begun to form. By mid-August the inactivity of the buds has led to the hormone changes which induce the growth of the abscission layer in deciduous species such as *Arctous alpinus* and *Betula nana*, with the result that these species have already taken on their autumn tints. Meanwhile, in the valley below the wetland vegetation remains green and actively growing. The hillside vegetation is therefore photoperiodic (sensitive to changes in day-length) and can as a result organise its developmental sequences in anticipation of winter. The valley vegetation does not need to prepare for winter. The site itself affords protection for the wintering buds. The vegetation here is therefore not photoperiodic and growth continues until frost and snow make further photosynthesis impossible.

Shoot Form and Function in Arctic Plants

Irrespective of the habitat in which their roots are anchored, arctic plants all have to solve the same problem of making a net gain in sugar over the year so that a surplus can gradually be accumulated in order to sustain the extra activity that is required when the plants are ready to flower. Most arctic plants are either evergreen shrubs or perennial herbs. In such species photosynthesis can begin in the spring

even under a covering of snow. Arctic plants when deprived of light do not bleach as readily as temperate plants and are therefore in a condition to recommence photosynthesis in early spring using the light that penetrates the last few inches of their winter snow covering.

The persistence of foliage from one year to another in evergreen plants is also considered to be an important economy in the use of resources and in particular mineral nutrients. The skeletal soils of the Arctic are very nutrient deficient, particularly in nitrogen. So acute is this shortage of nitrogen that even during the lifetime of an individual leaf there may be a recycling of the minerals that were used in its development. In the leaves of *Ledum groenlandicum* there is a collapse of the mesophyll tissue producing lysigenous air-spaces as the leaves mature in just the same way that air-spaces develop in the roots of many bog plants. In the latter the air-spaces are presumed to assist the ventilation of the root growing in a flooded soil, but this can hardly be a satisfactory explanation in the case of leaves. It has been suggested (Sifton, 1940) that the breakdown of the internal leaf tissues in *Ledum groenlandicum* allows a recycling of nutrients for the production of new leaves. Once it is fully expanded the mature leaf can still function with a reduced amount of mesophyll tissue and its mineral content can be put to better use in the synthesis of new materials for growing leaves.

Evergreen leaves can also serve as a carbohydrate store from one season to the next. Fats are the richest source of energy and thus the most efficient means of conserving energy from one season to the next. Itis therefore interesting to note that arctic plants just like many arctic animals can accumulate considerable quantities of lipids in their tissues. The Arctic Azalea (*Loiseleuria procumbens*) can have as much as 11 per cent dry weight of lipids in its leaves at the end of the growing season (Larcher *et al.*, 1973).

Some of the clearest demonstrations of the properties that are necessary for the survival of arctic plants are best seen in studying those plants that can extend their range of distribution beyond the fringes of the Arctic. There are several grass species that have just this degree of ubiquity. However, the plants that exist in the north belong to populations that are genetically isolated and therefore in many ways different from their southern counterparts. It is by looking for these interspecific differences between populations of the same species that we can see just what adaptations are called for by the arctic environment.

A recent study of the metabolism of northern and southern populations of some European grass species (Crawford and Schneider—in preparation) has shown that the northern populations under conditions of low light intensity can always accumulate sugars more rapidly than their southern counterparts (table 3). The advantage of this behaviour in short growing seasons is obvious. The leaves of these northern grasses also appear to be better adapted to conserve their carbohydrate supplies once they have earned them. If the grasses are transferred from a cool to a warm temperature (from 12° to 20°C) the increase in temperature causes the respiration rate of the leaves of the southern populations to rise. What is most remarkable in comparing the northern and southern populations is that in the northern plants this temperature induced rise of respiration does not occur. These northern plants have a property which we can describe as temperature compensation. That is they can adjust their metabolic rates so that they are not adversely affected by changes in temperature. A rise in temperature will not cause them to burn up their sugars in the leaf before they can be translocated and stored. Temperature compensation effects can also be observed in arctic fish.

Root Form and Function in Arctic Plants

Like the leaf the root can either persist from one season to another or else it can be renewed annually. These are opposing strategies and each has its own advantages and disadvantages. The root that persists from one year to another—the perennating root—serves the very useful function of being a food store that can be added to over the years until the plant has accumulated sufficient reserves to support flowering and fruiting. The accumulation of carbohydrates in a swollen tap root or underground stem does, however, carry a number of risks. Should the ground remain wet in the spring, these roots can suffer from the dangers of waterlogging. Flooded soils can induce an oxygen deficiency in the root which can give rise to the production of metabolic toxins such as ethyl alcohol and acetaldehyde. These substances can cause damage to the cell membranes and cause the accumulated sugars to leak out into the surrounding soil where they will attract the micro-flora and the root can then suffer from bacterial or fungal attack. Thus swollen roots and rhizomes are more usually confined to plants that grow in well-drained sites rather than in lowland valley habitats where soils waterlogging is a constant hazard (Crawford, 1978).

When northern plants accumulate sugars in their roots it is interesting to note that the response of the roots to temperature is very different

Table 3. A diagram showing the greater rate of carbohydrate accumulation that takes place in northern grass populations than those originating from tne south. The only exception to this behaviour so far noted is *Poa pratensis*, using a northern population from Orkney.

FIGURE LEGENDS

Fig. 42 Kong Oscars Fjord looking N.W. to Trail Island at a distance of 18 miles. The pack ice usually departs from this Fjord in mid-July and returns again by the end of August, thus illustrating the extreme shortness of the growing season at sea level in this region of N.E. Greenland.
Photo R. M. M. Crawford

Fig. 43 A typical site in Mesters Vig showing the separation of plant habitats into sites that are either characteristically wet or dry. The foreground is colonised by *Dryas octopetala* x *D. integrifolia* with hummocks of *Cassiope tetragona* on the right.
Photo R. M. M. Crawford

Fig. 44 Vegetative regeneration in an undisturbed habitat. The dark circles are colonies of *Cassiope tetragona* interspersed with clumps of *Dryas*.
Photo R. M. M. Crawford

Fig. 45 *Salix arctica* in fruit. Stems of this species have been recorded with an age of up to 263 years.
Photo R. M. M. Crawford

Fig. 46 *Dryas octopetala* x *D. integrifolia* in fruit on a dry south facing hillside at Mesters Vig. Note the sea fog in the fjord below which contributes to the lateness and short growing season of the lowland vegetation.
Photo R. M. M. Crawford

Fig. 47 *Eriophorum scheuchzeri*; a colony of plants showing their characteristic habit of growing close to open water. The species has a disjunct distribution occurring in the European Alps as well as in Greenland.
Photo R. M. M. Crawford

Fig. 48 *Pyrola grandiflora*. This species is a typical example of the length of life cycles in the Arctic, as 6-8 years would have been necessary for the development of the tissues that have produced this inflorescence.
Photo R. M. M. Crawford

Fig. 49 *Luzula spicata*, an example of a wide ranging species that occurs not only in the Arctic but also in the British Isles, the mountains of S. Europe, Corsica, the Atlas Mountains, the Himalayas and N. America, south to California and New England.
Photo R. M. M. Crawford

Fig. 42

Fig. 43

Fig. 44

Fig. 45

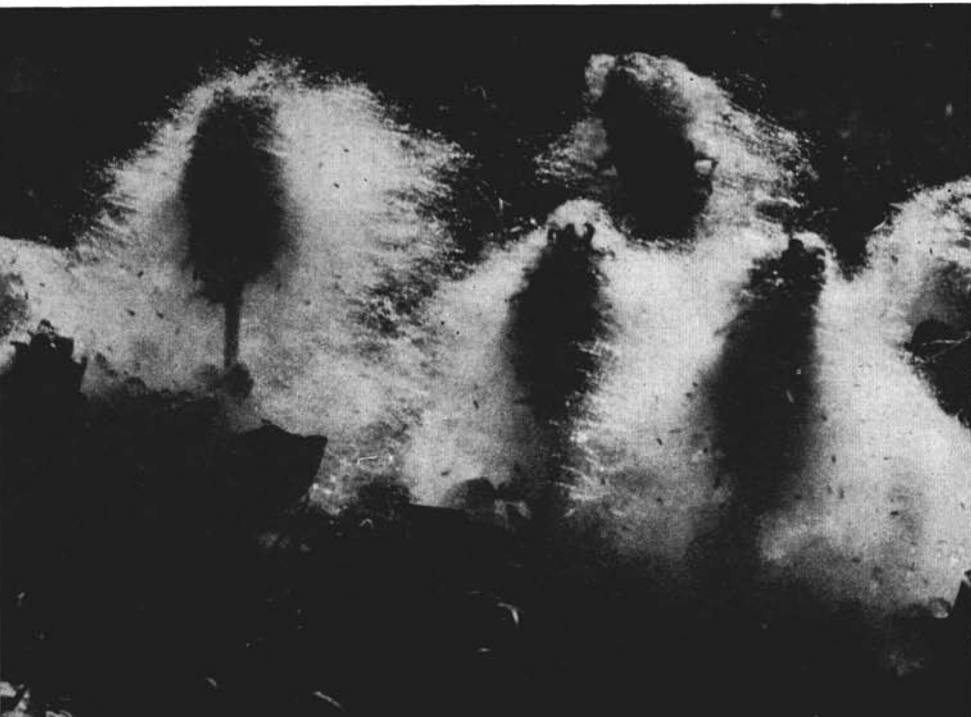

Fig. 46

Fig. 47

Fig. 48

Fig. 49

from that of southern plants. The roots of Scots Lovage (*Ligusticum scoticum*) and the Oyster Plant (*Mertensia maritima*), both of which can be found in Greenland as well as Scotland, have high respiration rates which accelerate rapidly with increase in temperature. This contrasts with coastal plants of southern distribution where root respiration rates are low and where an increase in temperature does not bring about a rapid increase in metabolic activity. The rapid response in the roots of northern species presumably allows them to resume rapid growth with the arrival of spring. However, it also means that if the winter temperatures are warm these plants will not be able to conserve their carbohydrate supplies efficiently. In southern coastal species, such as *Crithmum maritimum* and *Limonium binervosum*, warm weather will not accelerate the respiration rate unduly and therefore during mild spells the plants will not deplete their winter reserves of carbohydrate. Thus in the case of *Mertensia maritima* and *Ligusticum scoticum* the very adaptation that helps them to make the most of a short growing season prevents them from being successful further south and probably accounts for their limitation to northern regions.

Where plant roots are adventitious and perennation is dependent on swollen stem bases, bulbils or stolons, the plant avoids some of the dangers of anoxia (deprivation of oxygen) that can easily occur in more massive root structures when the soil is flooded. In these species the perennating tissues are nearer the surface and are therefore better aerated. The roots are also renewed annually and the plant does not depend on preserving a healthy root structure from one season to the next. In spring, as the shoots resume their upward growth and thus can channel oxygen down to the root, the wet-land plant renews its adventitious roots aided by this source of ventilation from above. From an energy point of view this may be more costly to the plant, but it is the price that has to be paid for the privilege of being able to colonise a wetland site and enjoy the protection it affords from winter desiccation.

Regeneration in the Arctic

A consequence of the low temperature regimes of the Arctic is a great lengthening of plant life cycles. In the plant communities that have been aged by sectioning of woody stems and ring counting some remarkable records of longevity have been recorded. In a study of the growth of *Salix arctica* (Raup, 1969, 1971) in the Mesters Vig area

of north east Greenland the maximum age that was recorded on a single woody stem was 263 years (fig. 45). When this is compared with the trunks of large temperate trees, where 150 years can be considered an advanced age, the longevity of the arctic willow appears all the more remarkable. Even more outstanding, however, is the length of time that it takes many species to flower and produce seed. In a study of the developmental time sequences (phenology) of arctic plants Sorensen (1941) showed that in *Pyrola grandiflora, Pedicularis hirsuta* and several other species it could take up to 7 or 8 years from the initial formation of a shoot until flowering and fruiting took place (fig. 48).

Sexual reproduction, although probably functioning at a level which allows an adequate level of genetic exchange in plant populations, in the Arctic is not the principal means of plant regeneration. In the Arctic, probably more than anywhere else, the plant cover is dependent for its spread and rejuvenation on vegetative reproduction. In these undisturbed sites (fig. 44) where competition is minimal and predation negligible, plants do not always have to be seeking new sites for survival. Vegetative regeneration *in situ* is therefore a very suitable means of perpetuation. This lack of disturbance is illustrated in photos where the circular patches of *Dryas octopetala* and *Cassiope tetragona* are clearly visible. As these plants only extend the radii of their colonies by a few millimetres each year, these round patches must represent centuries of undisturbed regeneration. These clonal patches are of course only the most obvious of vegetative strategies. The arctic flora abounds in other vegetative reproduction. The viviparous plantlet production of *Festuca vivipara* and the bulbil production of *Saxifraga cernua* and *Polygonum viviparum* are examples that can be seen in Scotland as well as in the Arctic.

In the structure and reproduction of arctic plant communities there is one very important feature which is conspicuous by its absence and that is the buried seed bank (Harper, 1977). In most temperate habitats, for every plant that occupies a site there may be as many as 6,000 other plants in seed form lying buried in the soil below. These dormant embryo plants represent an enormous reserve in genetic variability from which the best adapted individuals can eventually be selected. The longevity of this buried seed can easily be in excess of 60 to 70 years. Thus, whenever an individual plant occupying a site dies and the soil is disturbed or eroded there can germinate a whole population of seedlings that have been lying in a state of dormancy for decades.

As climatic conditions change, different selection pressures can operate to sift out of this seed bank the individuals best suited for the changed conditions. This seed bank does not exist in the Arctic. This lack of genetic reserves may be a contributing factor in limiting the distribution of some arctic species and may account for the strange phenomenon noted in the introduction that the Dwarf Birch (*Betula nana*) is much more restricted in its distribution in Greenland than would be expected from its occurrence in Europe. It may be that the severe conditions in Greenland with the absence of a reserve of genetic material have limited the range of ecotypes available and which are necessary for the species to extend its range. The only substitute that appears to take the place of the seed bank in the Arctic is the large number of suppressed seedlings and juvenile plants that occur in most sites. The length of time needed for the development of flowers already discussed above means that in any one population only a few individuals are producing seeds at any one time. The non-flowering plants are, however, a genetic reserve for the species that can contribute their share of genes to the population at a later date, in the same way that the genes of buried seeds lie buried in a soil bank waiting for an environmental disturbance to bring them again into circulation.

Present Day Stresses on the Arctic Flora in Relation to Climate

The flora of the Arctic is obviously resistant to climatic adversity, otherwise it would not exist where it does. The present cooling trend of the northern hemisphere is having its greatest effect in the more northerly latitudes and will be exerting some changes on this resistant flora. An examination of the average temperature decline in the northern hemisphere shows that in certain regions of the Arctic the average annual temperature decline has been as much as 4°C compared with changes of less than 1°C elsewhere (Lamb, 1977). For botanists interested in the reaction of plants to climatic change the current situation in the Arctic represents a unique opportunity to be in the right place at the right time to study a phenomenon that has only been examined by inference in the past. We are fortunate now to have excellent climactic and plant records for most parts of the Arctic and for Greenland in particular. There is no sign as yet that the present day deterioration in northern climates is coming to an end. There are constant reports of new records of arctic birds in the British Isles, of the southward migration of many marine animals as well as

the increasingly delayed and shortening blooms of marine phytoplankton (Lamb, 1977). A study of the reactions of the higher flowering plants in the Arctic to these changing conditions would surely reveal information that would not only be biologically informative, but might also indicate ways in which plant science could prepare for a new ice age which may yet arrive to add to the problems of the present energy crisis.

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Germination of Primula Seed

by A. D. McKELVIE

MANY species of *Primula* are short-lived and therefore it is necessary to raise them from seed. So much has been said, much of it contradictory, about the germination of *Primula* seed that it is often difficult for gardeners to reach any definite conclusions. There are obviously differences between species but the age of the seed and the period for which it has been stored may be equally important. On the other hand the ease with which many species and cultivars seed themselves in gardens suggests that *Primula* seeds are normally capable of good germination provided the correct conditions are found.

Any compost which has proved suitable for the germination of alpines will suffice for primulas, provided it is kept moist. With such small seed there is always a risk of drying-out, which can be fatal. There is no doubt that exceptionally good results can be obtained by germinating under mist, removing the seedlings once they have germinated. Seeds should be sown on the surface of the compost and covered with a light dressing of fine grit or alternatively seed can be sown on to fine gravel chips and watered in. Seed should never be covered with any depth of soil, since many species definitely need light to germinate. There are no species which are known to prefer dark so that it is sensible to allow all seeds access to light. On no account should a layer of brown paper be placed over the pots.

Alternatively seed can be sown on the surface of moist sphagnum and this has given good germination of *Primula* seed for many growers.

The recommendations made in this article on the germination requirements of individual species are based on my own experience and that of other growers as well as on information gleaned from various journals.

It is generally recommended that *Primula* seed should be sown as soon as ripe, but except for "petiolarids" this does not really seem necessary and in fact may be damaging to good germination. Often storing seed dry until December or even April will lead to better results.

"Petiolarid" seed should be sown when it is pale brown, which is as soon as the capsules begin to split. This is about June-July for many species. Dried seed will often fail even when stratified at low temperature or treated with dormancy-breaking chemicals.

Most *Primula* seeds germinate best at temperatures below 25° C so that care should be taken to keep below this level. At temperatures greater than 25° C almost all *Primula* species need light to germinate. Although it may not give the best germination for all species there is no doubt that a fluctuating temperature of between 10 and 20° C will give good germination of almost all primulas and should be the norm to aim at. In practice this may be achieved by sowing fresh seed in July and keeping in a cool shaded frame. Alternatively the same conditions can be achieved by sowing stored seed in April and keeping in a cool greenhouse. At this fluctuating temperature many species do not need light, but it is always wise to allow light access just in case it is needed. Another temperature requirement of many species is the need for stratification which is storage of moist seed at around 5° C. Many seeds need this period of cold in order to break dormancy. The optimum time is around 4 weeks; much longer than this may cause the seed to become dormant again. There is no evidence that dormant seeds germinate better after being exposed to longer periods of cold than to 4 weeks at 5° C. The obvious answer is to keep moist seed in your fridge for 4 weeks before sowing. Seed is best moistened by sowing on to moist compost. The pot should then be wrapped in a polythene bag and put in a fridge. Seed can be kept in moist sand in small containers but is then often difficult to sow. On the other hand, if *Primula* seed does not germinate within 6 months of sowing it should be put in the corner of a frame and exposed to all the elements. Don't despair until 3 years are up, but keep looking occasionally for signs of germination.

If pots of seeds are kept moist there is a real problem with moss. This should be removed as soon as it is noticed as it definitely slows down growth. Moss is less likely under mist. Damping-off can be controlled quite well with "Benlate".

One reason for failure to germinate is the lack of a viable embryo. Apparently-good seeds will never germinate if there is no embryo inside. This can be caused by self-incompatibility barriers which prevent a flower fertilising itself. Primulas are dimorphic, consisting of two types of flowers: pin-eyed (with the stigma held up clear of the anthers) and thrum-eyed (with the anthers above the stigma). Fertilisation can only normally occur between the two types of flowers and should be encouraged artificially if thought necessary. Problems can arise with rare species such as *P. aureata* where only one form is available. In this case pollen from a *Primula* in another group of the

Petiolares section could be used for cross-pollination. While this cross would not take, the pollen might induce the *P. aureata* to set seed on its own without fertilisation.

In conclusion most *Primula* seeds are easy, provided they are:

1. Not sown too fresh (apart from "Petiolarids").
2. Sown on the surface of the compost with light grit.
3. Stratified at 5° C for 4 weeks.
4. Kept moist under mist.
5. Given light. This should be indirect or diffused rather than bright sunlight which can scorch.
6. Kept at 10-20° C.

GERMINATION OF SPECIES

In general only species reasonably common in cultivation are included, but a few rare species are mentioned where some special requirements are known.

SECTION *Cortusoides*

This section grows naturally in woodland at around 3000 m in Asia from Japan down to the eastern Himalayas and does not need cold to germinate. Light is useful, fluctuating temperatures help and seed should not be sown fresh.

P. cortusoides	generally easy species.
P. mollis	often only fair germination taking up to two months. Cold doubtfully helpful.
P. polyneura	easy but requires light. Do not sow fresh. Should germinate in a month.
P. saxatilis	produces large quantities of seed which usually germinate easily in spring.
P. sieboldii	easy in spring but often poor germination rate. Will germinate in a month if it is going to germinate at all. May seed itself freely in gardens.
P. geraniifolia	generally easy in spring.
P. heucherifolia	slow germination, taking about two months. Cold of no value.
P. jesoana	poor germination. Cold of no value. Will normally germinate in a month.

SECTION *Vernales*

A generally easy section with a vast range of sub-species and cultivars. They do not need stratification but should not be germinated above 20° C.

Light is not necessary but seed should be kept uncovered or at most a light covering of grit. Water stress is fatal.

P. elatior	variable results. Do not sow too fresh. May take up to three months.
P. juliae	Often poor germination, perhaps due to genetic instability.
P. veris	As for *P. elatior* but usually up within a month.
P. vulgaris	As for *P. veris*.
Polyanthus	Keep moist. Seed viable for seven years.

SECTION *Petiolares*

These species tend to be confined to the alpine and sub-alpine regions of the Himalayas and western China. As a general rule all seed should be sown fresh in June-July for best results and pricked out in August. Some growers suggest seed should be harvested green, but it is probably better to wait until the capsules just begin to split. In this condition seeds are pale brown. The best way is to tie a paper bag over the seed head just before dehiscence in order to catch the seed. Of the 50 or so species which have been in cultivation only about 10 are at all common. Species which germinate fairly freely when sown fresh are *Pp. gracilipes, petiolaris, sessilis, bracteosa, scapigera, edgeworthii, sonchifolia, vernicosa, whitei, bhutanica,* Fig. 50 *calderiana* and *griffithii.* Old seed usually fails to germinate at all except in the case of *P. calderiana* which will germinate after cold. If fresh seed fails to germinate, keep in a shaded frame for up to 3 years just in case.

P. aureata will often not germinate even when fresh and this may be due to lack of correct fertilisation. Four weeks at 5° C does help it to germinate. More commonly it does not set viable seed. Like many primulas, "petiolarids" should not be germinated above 20° C and some growers say not above 7° C.

SECTION *Bullatae*

Of this section only *P. forrestii* is commonly grown. It rarely sets seed and even when it does its germination can be slow and erratic. Little is known of its requirements, but cold does not seem to help.

SECTION *Farinosae*

This, the largest section in the genus, has around 80 species of which about 20 are common in cultivation. They are mainly Asiatic, but a number of species occur in northern Europe, North America and also the extreme south of South America. They contain almost the easiest species to germinate in the whole genus, having no particular

requirements. On the other hand the general requirements for *Primula* should still be borne in mind. In particular, pots should be kept for at least two years. Species tend not to hybridise with each other and sometimes viable seed is difficult to obtain.

Some of the species found at higher altitudes, such as *Pp. capitellata, involucrata* Fig. 51 and *gemmifera*, do perhaps appreciate stratification.

P. algida	reasonable germination, particularly from imported seed.
P. auriculata	reasonable germination.
P. capitellata	slow. Perhaps needs cold. Not much seed set.
P. clarkei	sets little seed. May delay until year two. Fresh seed is reported to germinate well.
P. fauriae	good quick germination.
P. farinosa	variable. Cold does not help in first year, but keep over-winter until year two when seeds often germinate.
P. frondosa	good quick germination.
P. gemmifera	poor germination. Cold may help.
P. inayatii	variable but not much known.
P. involucrata	quite quick germination, but often poor rate.
P. luteola	fairly slow, up to three months.
P. modesta	good quick germination, but over-winter into year two if necessary.
P. rosea	good germination in one or two months from seed sown as soon as ripe. Old seed is often poor and may not germinate until the second year.
P. scotica	poor percentage often, but quite speedy.
P. sibirica	good quick germination.
P. warshenewskiana	often poor seed set and slow germination. Fresh seed is reported to germinate well.

SECTION *Denticulata*

The only species in this section which is found commonly in gardens is *P. denticulata*. It germinates readily but prefers light, especially at temperatures above 25° C. It does best, however, at alternating temperatures between 10 and 15° C or even as high as 20-30° C. Cold is not necessary, nor need the seed be fresh. A smaller version of *P. denticulata* is *P. erosa* which also germinates readily.

SECTION *Capitatae*

The only cultivated species is *P. capitata*, from light shaded areas at around 5000 m, which germinates quickly and well with no special requirements. It tolerates freezing or even heating to 40° C without any impairment of germination. This ease of germination often seems to be found in species which grow in moist shady conditions.

SECTION *Muscarioides*

Of the 17 species in this section from eastern Himalayas and western China only four are commonly grown in gardens. None of these four are long-lived, so that it is important to keep fresh stocks coming on from seed. Luckily they all produce abundant seed which is fairly easy to germinate. These four species all come from moist slopes or wet meadows in the eastern Himalayas and Tibet.

P. bellidifolia seed germinates freely with no particular requirement.

P. concholoba good germination, especially when kept under mist.

P. muscarioides similar to *P. concholoba*. Usually germinates within a month.

P. viali can be difficult to germinate and is best sown fresh. If this fails, seed will respond to chilling followed by a warm temperature of around 25° C. Alternatively seed can be stored cool over winter and sown in March. Pots of seed should always be kept for at least two years before being discarded.

SECTION *Soldanelloideae*

Only about four species of this beautiful but difficult Section are grown much nowadays. They are confined to the high rocky ranges of the Himalayas and seem to appreciate cold to break dormancy unless the seed is sown fairly fresh. Plants are often short-lived and seed should therefore be sown to ensure survival. However, much seed is frequently infertile or aborted. Imported wild seed often seems to be better than home-saved seed.

P. cawdoriana germination often poor. Cold definitely helps.

P. flaccida (*nutans*) Fig. 52 sets copious seed which germinates well when fresh, but may take up to three months to appear. Older seed seems to need cold.

P. reidii (including *P. reidii* var. *williamsii*) fresh seed gives reasonable germination. Otherwise cold is needed and germination may not occur until the second year.

P. sherriffae only fair germination. Cold seems to help.

SECTION *Rotundifolia*

Only two species in this section are grown, but even they are very rare. Both *P. gambeliana* and *P. rotundifolia* set seed in this country, but germination is often poor and the exact requirements are not known. Seed can sometimes be obtained from India and according to some reports gives better germination. Occasionally both species germinate quickly and well, producing flowering plants in two years from seed. Frost treatment over-winter has been recommended for *P. rotundifolia.*

SECTION *Nivales*

This section contains around 50 species which have been in cultivation at one time or another, but nowadays there are only about five species commonly grown. They extend across the mountains of western China and Himalayas and are the most difficult group of species to grow. Happily if seed is available it germinates quite well, but the seedlings often die at an early stage. The five species listed below are, however, quite amenable to cultivation and can be raised from seed. They do not need to be sown fresh and in fact it seems that they benefit from six months dry storage before sowing. Light does seem to be important.

P. chionantha	variable germination often taking about two months. Cold or storage or both are helpful.
P. macrophylla	germination often poor. Cold helps.
P. melanops	reasonable germination within one month. Cold of doubtful value.
P. sinopurpurea	good germination of stored seed within one month of sowing. Cold of no benefit, but light seems essential.
P. sinoplantaginea	probably similar requirements to *P. sinopurpurea.*

SECTION *Parryi*

The three species of this North American section in cultivation are only rarely found in our gardens. They do not set much seed and germination is often poor. Little is known about their requirements, but neither *P. ellisiae*, *P. parryi* or *P. rusbyi* appear to need cold for germination. On the other hand they sometimes give almost 100% germination for no apparent reason.

SECTION *Sikkimensis*

This section of moisture-loving primulas is distributed throughout the Himalayan regions at altitudes between 3500 and 5000 metres.

They set copious seed which germinates freely with a minimum of particular requirements. Both fresh and stored seed appear to germinate well.

P. alpicola — good quick germination. No cold needed. They appreciate mist.

P. chumbiensis — as for *P. alpicola.*

P. florindae — both fresh and stored seed germinate well. Cold can help in difficult cases.

P. ioessa — good quick germination in about one month, but cold is sometimes necessary.

P. secundiflora — both fresh and stored seed germinate well. Cold and light are also beneficial.

P. sikkimensis — as for *P. secundiflora.*

P. waltonii — easy germination but may take up to two months. Seems to like warm temperatures around 25° C. The true species may not be in cultivation. Plants offered may be hybrids.

SECTION *Candelabra*

Of this large section only 12 species are commonly found in gardens. From south-west China, they are mainly large plants requiring moist conditions. While fairly easy to germinate, they have certain requirements which must be understood. In general, seed should be stored for a few months before sowing and they often need cold and light. Alternating temperatures between 10 and 20° C seem better than constant high temperatures.

P. anisodora — germination only fair but no cold needed. May take two months to germinate.

P. aurantiaca — fresh seed gives poor germination. Cold is not needed but light helps. Stored seed germinates quite well in about two months.

P. beesiana — good germination even at constant temperatures as high as 25° C.

P. bulleyana — good germination under most conditions.

P. burmanica — as for *P. bulleyana.*

P. chungensis — fresh seed gives poor germination. Needs cold and light, but even under good conditions may take up to three months.

P. cockburniana — as for *P. chungensis.* Soaking in water for 24 hours has been recommended. Light helps.

P. helodoxa germination best with stored seed. Sowing in April in warmth seems to be successful.

P. japonica seed should be at least 6 months old before sowing. Needs stratification and should not be germinated at temperatures above 15° C.

P. poissonii readily sets seed which germinates well. Self-sown seedlings common.

P. pulverulenta easy, provided temperatures are kept below 20° C. Alternating temperatures best.

P. serratifolia reasonable germination under most conditions, but seed is not set very readily. Fig. 53

P. smithiana germinates well even when fresh. At temperatures of above 20° C it appears to need light. As with most primulas, alternating temperatures obviate the need for light.

SECTION *Grandis*

In this monotypic Caucasian section, *P. grandis*, the sole species, germinates readily under most conditions.

SECTION *Auricula*

In this vast section from the European Alps there is a lot of confusion in naming, but they are all fairly consistent in their germination requirement, so that the species listed below are typical of the Section. Most of them do better with cold, as might be expected from plants which grow on cold exposed rocks.

P. allionii fresh seed usually germinates well.

P. auricula fresh seed germinates well without cold. Seed which fails to germinate should then be given cold treatment.

P. clusiana
P. glutinosa
P. hirsuta
P. integrifolia
P. marginata
P. minima
P. x *pubescens*
P. villosa
P. viscosa

only fair germination. Cold is generally needed unless the seed is fresh, when it may germinate immediately.

CONCLUSIONS:

Much of this information on germination of species has come from personal experience, some from other growers and some from literature. It is obvious that data for some of the species is incomplete and the author would be glad to hear from anyone who can assist with further information. Grateful acknowledgement is made to J. D. Crosland, A. Duguid, H. Esslemont, D. G. Hardy, R. S. Masterton and R. J. Mitchell for giving me valuable information about germination and for making suggestions in the text.

Notholirion

by R. S. MASTERTON

THIS is a group of five species allied to *Lilium* in some characters and to *Fritillaria* in others. Three species grow well in Perthshire, *Nn. bulbuliferum, campanulatum,* and *macrophyllum.* I have found *N. thomsonianum* impossible. The fifth species, *N. koeiei,* is not in cultivation to my knowledge.

The *Notholirion* bulbs consist of a few white scales covered by several thin longitudinally ribbed brown scales forming a tunic like an onion. Round the bulbs are produced many little bulbils. These are about one-third the size of a grain of corn and for one or more years do not produce leaves. As they are pointed at both ends and never have roots when lifted, I find it is difficult to know which end is top or bottom. As the plants are all monocarpic the bulb dies after flowering, but a good stock is soon established by the cultivation of the bulbils. Care must be taken with the stems after flowering when collecting seed, as the small bulbils are packed round the old bulb and must be detached and planted elsewhere in the garden or in boxes. As they produce so many bulbils, overcrowding must be prevented.

Seed is set freely, particularly in *N. bulbuliferum.* Bulbs will flower in four to five years from seed.

In nature *Notholirions* grow in alpine meadows where there is plenty of moisture and humus. In my garden I give them similar conditions, with plenty of leaf mould and peat and moisture at their roots. They can grow in some shade. The rainfall here in the Highland district of Perthshire is about 40 inches per annum. The three species that grow here have withstood winter frosts of thirty Fahrenheit degrees and also severe spring frosts without damage.

Notholirion bulbuliferum. This species used to be called *N. hyacinthinum* and comes from a wide area covering western China, southern Tibet, northern Assam, Bhutan, Sikkim and Nepal. It was first introduced in 1878.

N. bulbuliferum grows up to six feet in height, the stem carrying up to two dozen leaves and up to thirty wide open horizontal flowers of pale lavender blue. Each petal is tipped with green. The stem is covered with a beautiful bloom. It flowers in July. The leaves are reduced in size as they ascend the stem, making it a plant of great architectural beauty.

Notholirion campanulatum comes from south-west China, Upper Burma and Tibet. It was first introduced by Cox and Farrer in 1919 from Upper Burma. It is distinguished from *N. bulbuliferum* by its pendant almost bell-shaped flowers, the segments of which do not open out as in *N. bulbuliferum* and by their deep crimson or rose crimson colour, with green tips. It grows to four feet with a dozen leaves and up to 20 flowers per stem.

Notholirion macrophyllum has been known for a very long time, having been collected by Wallich in 1819 in Nepal, but has only been in cultivation since 1928. It is also found in Sikkim, Tibet and Bhutan.

This is a much smaller plant growing to twelve to eighteen inches in height. It has a slender stem with three to five leaves and up to ten, but usually three to five bell-shaped flowers of pale mauve or lavender. They do not have the green spots at the tip of the flowers characteristic of *N. campanulatum, bulbuliferum* and *thomsonianum.*

Notholirion thomsonianum. I have planted this bulb in my garden a number of times without success. It is described as growing to three feet with a delicious scent, and bears eight to twelve stem leaves and ten to twenty horizontal funnel-shaped pale rose flowers. It belongs to the drier western Himalaya, extending from Kumaon through Kashmir to Afghanistan.

It may be that because it comes from a drier area it will not grow here, but it also has the habit of starting into growth in October and might be killed by our hard winters.

There is one reference to another species *Notholirion koeiei* described by Paul Furse in the *Lily Year Book of* 1971, No. 34. It was found in west Iran, in 1959 by Dr. Koei in a very dry area. It is described as being near to *N. macrophylla,* growing to two or more feet with twelve leaves to the stem and with a dense inflorescence of from twenty to thirty violet flowers.

Recent Acquisitions from the Seed Exchange, Part III

M. A. and P. J. STONE

Chiogenes hispidula

Before writing these notes we always "read up" the subjects beforehand to try and ensure that we really are growing the correct plant. As the years pass, we find we are using gardening books less and less, and consulting Floras instead. In this we are following the advice we were given a few years ago by Roy Elliott, the editor of a sister publication, the *AGS Bulletin*, when the subject of books came up during a visit to his garden. Sometimes, however, one runs into a conflict of opinion: some floras list the present subject as *Gaultheria hispidula* and Barry Starling concurs in his article on "The Smaller Gaultherias" (*AGS Bulletin* Vol. 45). We feel that if *Pernettya* is allowed to stand as a separate genus on the grounds that its fruit is a true berry, then so must *Chiogenes*, whose fruit is also a berry. *Gaultheria* proper has a dry capsule surrounded by a swollen fleshy calyx. *Pernettya* frequently interbreeds with *Gaultheria*; but does *Chiogenes*? The label on the plants grown at the RBG in Edinburgh said "*Chiogenes hispidula*" and our past President has it in his book "The Peat Garden" under this name, so we are in good company.

The plant occurs widely in northern USA and adjacent parts of Canada; wild seed collected in New Brunswick being contributed to the 1974-5 Exchange. As is our standard practice for Ericaceae, it was sown on the surface of a 50 : 50 mixture of dried, sieved sphagnum and coarse river sand; not covered but watered in well to wash the small seed into the tiny cracks in the compost. Germination followed in June 1975 and, after a careful thinning to allow room for growth, they were "fixed" by a thin top-dressing of more coarse sand and left to grow for a year. Potting up individually in our usual 2 peat : 1 gritty sand compost (plus the recommended rates of Enmag and trace element frit) was in May 1976; and exactly one year later three were planted out. As the plant is said to grow on mossy logs in the wild, we put them in our peat-wall where they will certainly have plenty of moss for company! There they have spread into an absolutely prostrate carpet of fine interlacing stems bearing tiny, almost round, leaves

Fig. 50—*Primula bhutanica* See page 264 Photo—A. Evans

Fig. 51—*Primula involucrata* See page 265 Photo—A. Evans

Fig. 52—*Primula flaccida* (*nutans*) See page 266 Photo—A. Evans

Fig. 53—*Primula serratifolia* See page 269 Photo—A. Evans

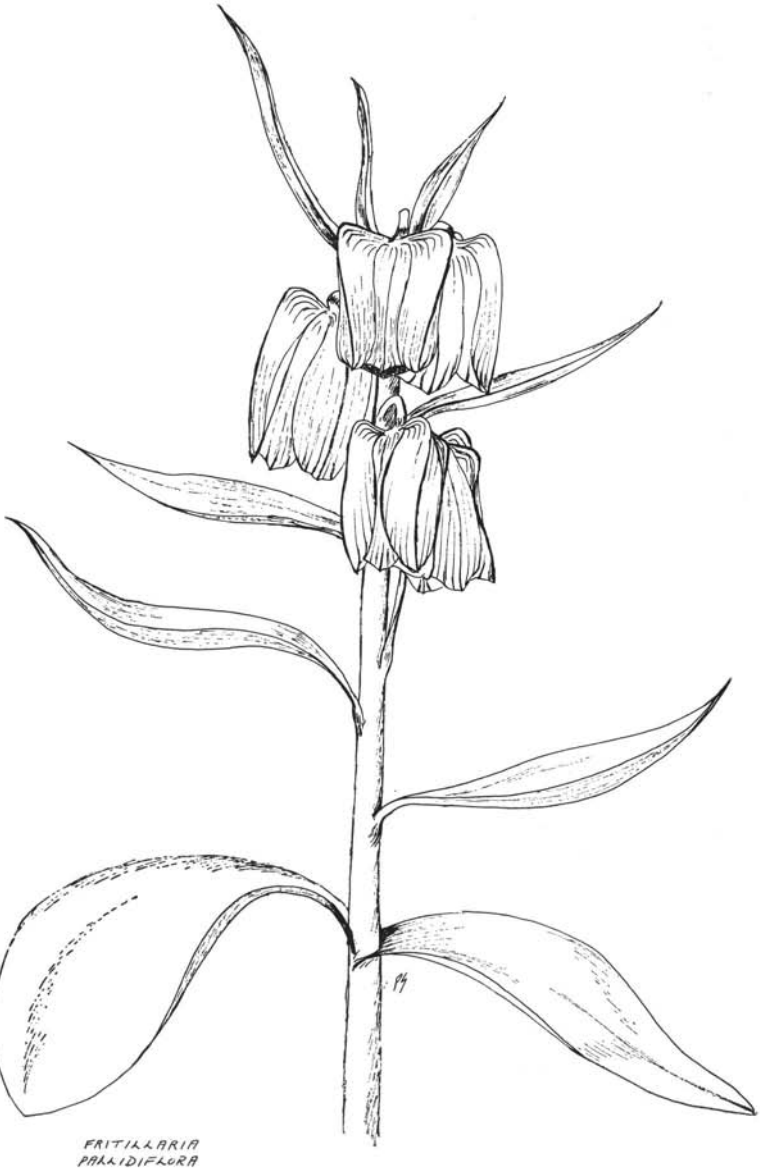

Fig. 54—*Fritillaria pallidiflora* See page 274 Polly Stone

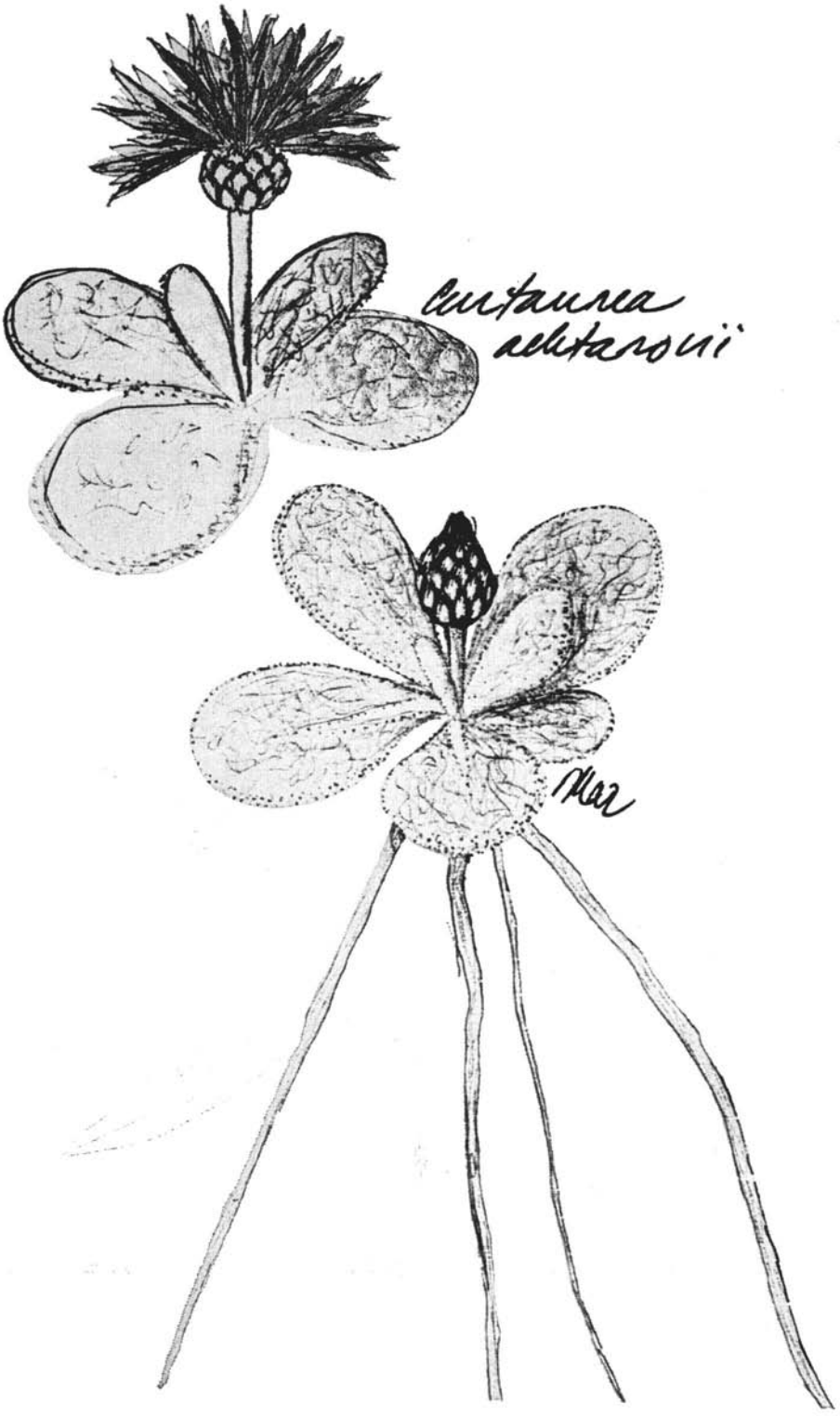

Fig. 55—*Centaurea achtarovii* See page 305 Jaroslav Kazbal

about 7mm across on petioles of less than 1 mm. Even the flowers do not add height; they are tiny 2 mm white bells in the leaf axils. The fruit is the main glory of the species: a shining white egg-shaped berry about 1 cm long. So far our plants have only produced the odd fruit, but a well-fruited specimen must be quite spectacular, and well deserving of the popular American name of 'Creeping Snowberry'.

Epigaea asiatica

Although this is only "Part III", it is not as easy as might at first appear to select species for inclusion in these notes. Two self-imposed rules are that the plant chosen was raised from SRGC seed, and must have flowered prior to the time of writing. One also likes to include a reasonable variety; quite a number of primulas fulfil the above requirements and we could easily fill our quota of six species from this genus alone! Having been out to the cold-frame a few days ago (early May 1979) and discovering a beautiful pink flower on a young seedling plant of *Epigaea asiatica*, we make no apologies for including a second creeping ericaceous plant, be it one completely different in scale from *Chiogenes*.

Most people who are interested in Ericaceae will, sooner or later, want to grow the three *Epigaea* species, although at first glance it may be a little difficult to explain the attraction of two of the species. The third one, *E.* (*Orphanidesia*) *gaultherioides*, has the advantage of large pink saucer-shaped flowers over 3 cm across, but in our experience is not 100% hardy. We have lost plants in the open ground and in pots in a cold frame. Having seen the healthy specimen planted out in the frame on the shady side of the new Alpine house at the RBG Edinburgh, we planted one out in a shady corner of our Petiolarid Primula frame. This plant survived the eight-week freeze-up of early 1979 protected only by a plastic light. This prevented the worst dehydrating effects of the incessant N.E. wind which scorched so many evergreens in the open garden. A plant in solidly frozen ground may as well be in a desert; its roots can take up no water.

The other two species, *Ee. asiatica* and *repens*, differ from the above in possessing tubular flowers about 1.5 cm long, with only the tips of the corolla lobes reflexed. *E. asiatica* does tend to have deeper pink flowers, whereas *E. repens* is paler, often white as in our bought-in plant. So-called "red" forms of *E. repens* are grown in the USA, but we have been told that "red" is a slight exaggeration. The only sure way to tell these two species apart was pointed out to us by Alf Evans:

the anthers of *E. repens* dehisce by slits, those of *E. asiatica* have a pair of terminal pores. All three species are prostrate creeping shrubs, occasionally layering themselves if conditions are suitable. The evergreen foliage is oblong to slightly ovate, sparsely hairy like the young shoots, and varies a great deal in size with environment, sometimes almost 15 cm (6 ins.) long, but usually rather less. Often the foliage has a rather wrinkled appearance; don't worry, this is quite normal! They are frequently said to grow as ground cover under taller shrubs in the wild, but can hardly be described as "ground-cover" in the usual gardening sense as their growth is too slow. Writing on "Farrer and the Flora of Japan" in the *AGS Bulletin* vol. 36, Marjorie Brough mentions that in her experience *E. asiatica* is not a plant of deep shade as Farrer suggests, but was common on "steep open banks and path sides". The Flora of Japan says "open woods in mountains". In the Flora of the Carolinas, the habitat of *E. repens* is given as "Xeric (i.e. dry) woodlands". All this would seem to suggest that damp-shade is not the ideal situation in Scotland and a moderate exposure to sun should be allowed.

To return to the biographical details: we received seed of *E. asiatica* in early 1976. Germination, following the same treatment described above for *Chiogenes*, was poor and erratic starting in June, and only about half a dozen plants survived the infamous 1976 summer, to grow on undisturbed in their pan through the following winter. They were potted individually in July 1977 and the first one put out in September of 1978. In view of the above considerations we chose a fairly open position on a raised bed of peaty leaf soil, where it was undamaged by the severe winter which followed.

It is said that the Pilgrim Fathers had no doubts as to the merits of *Epigaea*, calling the American species "Mayflower".

Fritillaria pallidiflora

Like the *Cyclamen* described in Part II, the genus *Fritillaria* is "in" at the moment. We well remember the Saturday evening session at our first SRGC Discussion Weekend: the conversation turned round "Frit. this" and "Frit. that". To the ordinary gardener "Fritillary" means the native *F. meleagris* and perhaps the "Crown Imperial" *F. imperialis*, and it must be admitted straight away that the number of other good garden plants for Scotland in the genus is severely limited, probably less than a dozen. *F. pallidiflora* is undoubtedly one of these; we have found it easy and vigorous in well-drained peaty soil in half

shade. When describing a colour, the term "pallid" is usually used in horticulture in a pejorative sense, but one must remember that when Schrenk named this fritillary, he was probably working from a dried specimen, what E. A. Bowles called a "mummy". The Blue heath, *Phyllodoce caerulea*, is a good example;, the flowers in life are anything but blue; one must be charitable and suppose they turned blue when pressed.

The flowers of our *F. pallidiflora* are basically a good cream with a slight hint of green. The late E. B. Anderson, an authority on bulbous plants, was of the opinion that, by careful selection of seedlings, a primrose-yellow strain could be obtained. Thanks to the unknown donor of the seed, our plants are nearly this colour already. As can be seen in fig. 54 the bells are more or less parallel-sided, with rather a "forties" look to the shoulders caused by the nectaries. Their finest feature is only revealed by peering into the bell: red spotting at the base. It is as well to plant in such a position as to render this manoeuvre feasible. The plant has attractive glaucous leaves which are fairly broad for a fritillary.

Our seed came from the surplus exchange of 1973 and, being sown rather late, did not germinate until the early spring of 1974. As recommended in the leaflet "Bulbs from Seed", they were fed and grown on *in situ* for two seasons. They were planted out in 1976, just as growth was restarting, without going through the intermediate "pricked out individually" stage. One plant flowered in 1977, a single flower on a 15 cm (6 in.) stem; the remainder following suit in 1978. This year some have really gone to town with 40 cm stems and up to six flowers in the upper leaf axils, well worth waiting for; six years isn't really a long time in a garden! If you are in a hurry, you will find that *F. pallidiflora* in common with most fritillaries is an expensive bulb in catalogues.

Mahonia nervosa

The genus *Mahonia* would seem to have nothing in common with the preceding *Fritillaria*; the latter are bulbous "monocot" herbs, while mahonias are evergreen shrubby "dicots". They do, however, have one thing in common from the gardener's point of view: not all the species are good garden plants, although a much higher proportion of mahonias would probably be satisfactory over most of Scotland. A few species like *Mm. acanthifolia, lomariifolia* and *napaulensis* come from relatively low altitudes in the Himalaya or China and are not usually hardy outwith the extreme west, while others from south west

North America or Mexico, *M. fremontii* and its allies, need more sun than we can provide. Plants seen in Scottish gardens are normally either the winter-flowering *M. japonica* and its hybrids, or one of a small group of suckering shrubs from western North America. *M. aquifolium*, the "Oregon grape", is the most common of these, but its flowers are too small and its habit too invasively vigorous for us to recommend it for any purpose rather than ground cover in a large garden, perhaps in a problem area of dry shade. Fortunately, there are choicer species of which we have tried two: *M. repens* from (ssh) AGS seed, and *M. nervosa.*

Mahonias were at one timei ncluded in *Berberis*, from which they are now separated on the grounds that they lack spines and have true pinnate leaves. We believe that the apparently simple leaves of *Berberis* proper are in fact degenerate pinnate leaves, the lateral pinnae being suppressed. This suggests to us, as pure amateurs, that *Berberis* is an evolutionary offshoot of *Mahonia* rather than the reverse. Perhaps a botanist member could confirm or otherwise. Mahonias certainly have many features in common with *Berberis*, particularly the evergreen species: yellow flowers in racemes followed by blue-black "bloomy" fruits.

Mahonia nervosa was another of the good things we obtained from the 1972-3 surplus seed, through our local group in Inverness. We didn't take part in the main exchange until the 1973-4 season; in fact we only became interested in gardening in 1971, and were given a subscription to the SRGC as a present the following year. We were soon hooked! Large-scale seed raising has been one of the main factors in the rapid build-up of our collection; around 2000 taxa are grown at present. The older-established members have been incredibly generous in giving plants; one likes to have something to offer in return, and the seed exchange provides the means. Back to mahonias: the seed was sown in March 1973 and did not germinate until April 1974, only two seedlings appearing. These were potted up after a few weeks and soon produced in miniature the characteristic upright woody stem topped by a "ruff" of pinnate leaves. Their first winter, the leaves turned a deep purple-red; we feared for the plants until we discovered that they always do so, and are worthy of consideration for this attractive feature alone. *M. repens* differs in having less elegant leaves with far fewer pinnae per leaf, only 5 or 7, and these are individually rather broader. They have a matt surface and do not turn red here in winter.

The two young plants were put out in a terraced bed built up under larch trees, where we are hoping competition from tree-roots will curb the enthusiasm of the more rampant gaultherias and similar plants. The soil infill used was a mixture of rotted turves (real loam) and local moorland peat. Single racemes of yellow flowers appeared in 1976, but no fruit was set. The following year, at about 40 cm high they had three racemes each, and these were followed by spikes of dusky blue-black fruits. We sowed some of the seed from these, which is rather fortunate in retrospect, as both parents were severely damaged by the arctic winds of early 1979, there being insufficient snow to protect upright-growing evergreens. *M. nervosa* does, when well established, tend to spread by suckering, so we have every hope that our plants will regenerate from their rootstocks.

Primula reidii var. *williamsii*

There are two sections of the genus which predominate in any collection of choice Asiatic primulas: the Petiolarids and the Soldanelloides. This is not to belittle the contributions made by the robust Candelabras, the elegant Sikkimenses or the tricky Nivalids; the last contains some outstandingly beautiful species like *P. elizabethae* which have yet to be tamed. After the articles on Petiolarids by John Richards and David Livingstone, we would not dare enter the lists, and so have selected a Soldanelloides primula as the subject of this plant note. It is worth pointing out, however, that Petiolarids are not as difficult to raise from seed as some sources maintain. We have a number of species from wild-collected and dried (!) Himalayan seed.

A packet containing less than half a dozen seeds of *P. reidii* var. *williamsii* was included in our allocation from the 1975-6 exchange. Germination was rapid, although we use no heat and put all our seed-pans in cold frames protected only from excessive winter wet. The light-weight plastic lights, so much easier for a lady to handle, are removed and stored in the loft for the summer. The framework which secures them against winter gales then serves to support shade-nets on hot days. These nets were certainly required in 1976 and, as the few seedlings were well spaced in their pan, we decided not to risk disturbance. They were eventually repotted into a single 6 in. pot of leafy compost (we find all Asiatic primulas love our own beech leafmould) in April 1977 and flowered the following month. The many-flowered heads were white, with a tinge of ice-blue, on 15 cm scapes and extremely fragrant. The individual flowers, borne on sufficiently long pedicles to

avoid too cramped an inflorescence, have a short parallel-sided tube which suddenly flares into a bell, rather like a Victorian crinoline. The leaves lack farina, but make up for this by being quite hairy. They are especially attractive when wet and, unlike many hairy plants, actually prefer to be moist while in growth.

We divided the plants in March 1978 just as growth was starting, taking great care not to damage the tiny green growth-bud at the centre of each root-mass. The process was repeated in 1979, only this time they were planted out into our new *Primula* frame. This was specially built for Asiatic primulas requiring a dry dormancy in winter, but which are not really happy in pots. In addition to division we have taken the normal advice regarding the short-lived nature of this section and sown seed to maintain a succession of younger plants. Incidentally, we once grew a single clone of *P. nutans* for five years, dividing it several times, so Soldanelloides primulas are by no means as short-lived as is sometimes stated.

Farrer is quite right, *P. reidii* is one of the loveliest jewels in the world. We certainly regard it as one of our most beautiful plants, but must admit that if your garden is hot and dry it's not really for you; grow European primulas instead.

Thalictrum diffusiflorum

It is not our intention to enter into the "what is an alpine" type of argument by including a potentially tall plant in these notes. Most members of the SRGC will grow *Meconopsis* although these can grow to more than 2m, and *Thalictrum diffusiflorum* has the same kind of appeal: a certain style which raises it above the general run of herbaceous border plants. Drake's catalogue says quite simply "the finest *Thalictrum*", but adds a note of caution in that the species has a reputation for difficulty. In such a case, we like to raise from seed; with luck this gives one more material for trial, and a certain amount of natural selection occurs among the seedlings. Those most suited to the local environment survive.

We requested seed in 1976 and this germinated in May of that year. We found no difficulty, either following pricking out in August 1976 (after the drought had broken) or in the subsequent growing on. We like to retain young plants in pots until their roots fill the 4 in. or 4½ in. size. We feel that such a plant has more chance of surviving the hazards of the open garden than the usual nurseryman's 3 in. pot-plant. Our thalictrums did not attain this size until the end of their second growing

season (1977) and, as we always try to spring-plant up here in the north, they were not planted out until April 1978. They flowered the same year at a height of about 30 cm (12 ins.). The position chosen was a bed of leafy-peaty soil (we keep writing this; there is little natural soil on our glacial moraine, all beds are made up by the addition of Land-rover loads of local moorland peat augmented by our own leaf-mould and compost) at the foot of one of our dry-stone retaining walls where it never dries out. Although the bed faces north, the plants are well out from the wall and receive a fair amount of sun.

The individual flowers are large for a *Thalictrum*, over 4 cm across, and of a lovely deep lilac with cream anthers. The long drooping pedicels carry the flowers well above the finely divided glaucous foliage, giving the whole plant a light and graceful feel. The colours combine to repeat, on a larger scale, something of the beauty which makes *Paraquilegia* such a sought after plant. Botanists may argue as to whether the flowers are composed of true petals or petaloid sepals (as in *Clematis*, another member of the Ranunculaceae). We gardeners can enjoy their superb colour and texture.

Like so many other choice plants, *T. diffusiflorum* is a native of south east Tibet and probably has acquired its reputation for difficulty through a dislike of hot, dry conditions. There is no doubt as to its hardiness; our plants are coming up strongly after the appalling winter of 1978-79.

Cyclamen Deep Down

by EDITH DUSEK

GARDENERS have a way of never being content to let things remain as they are, so I suppose it was inevitable that a decision was made to raise the bed containing a colony of *Cyclamen hederifolium* (*neapolitanum*). Since the bed was to be raised approximately 18 ins. and it is recommended that *Cyclamen* corms be placed quite close to the surface, I went about dutifully lifting plants. One unfortunate had become so lodged in the roots of a native red alder that it was impossible to free it, so I mentally wrote it off as a loss.

Some of the rescued plants thanked me for my efforts on their behalf by turning to mush, but the "lost cause" sent up elephant ear sized leaves on schedule the following year. A guilty conscience dictated that I attempt to rescue the poor thing. The results of my

grubbing was a fistful of footloose leaves. The corm reposed where it was. Mentally kicking myself for surely having killed the plant with good intentions, I filled in the hole and once more wrote the plant off as a loss.

Nothing further was seen of the plant until the following year, when it dutifully sent up a few more elephant ear leaves but no flowers. This time I was smart enough to let matters take their own course.

The following year we had a record-breaking drought. Usually the *Cyclamen* appear in July and then flower continuously for months. There was no water to spare for them that year. No flowers either. Towards the end of August, the "lost cause" must have got tired of waiting, for it sent up the biggest bouquet of flowers ever. They quite took everyone's eye. By actual count the plant had in excess of 200 blossoms with some already spent and more buds coming. They were so closely packed that it was impossible to get a flattering photograph of them. Returning rains finally triggered the remaining plants into a sparse bloom.

Since the deep burial seemed to do the one corm no harm, it was decided to raise the bed which was home to a batch of *C. coum.* These corms are not so large, so only about a foot of loose compost type material was added to the top. It seemed probable that larger corms would have no problems but I was doubtful of the survival of small self-sown seedlings. As it turned out, I need not have fretted, for they popped up like grass.

This past winter was an exceptionally rough one with harsh freezing conditions from November well into January. The usual New Year flower count was ????. When the weather finally moderated, it was evident that quite a number of *Cyclamen* corms on (or near) the surface had frozen. Deeper ones put forth a reasonable show of blossoms.

It would seem that at least some of the *Cyclamen* do not object to quite deep planting. In times of drought the added depth probably ensures a modest amount of moisture. When Old Man Winter gets overly impressed with himself, the deeper corms undoubtedly stand a better chance of surviving. Perhaps those who live in areas where *Cyclamen* are a bit miffy might do better by planting their corms deeper. When in doubt one can always use a not too choice corm as a guinea pig. After all, not every plant is expected to space its flowers out properly so that it makes a suitable target for a fussy photographer! A plant which can be counted on to put forth a few hundred blossoms has certainly earned its keep.

Show Reports

EDINBURGH AND MIDLOTHIAN ROCK PLANT AND DWARF BULB SHOW

THIS SHOW was held in Cowan House, Pollock Halls of Residence, University of Edinburgh, on 24th March 1979. Because of a very late season caused by a long and most severe winter and the absence of several well-known competitors, some of whom were prevented from coming by snow-blocked roads, entries were somewhat down on recent years, but nevertheless the benches were gay with colour and the many visitors expressed themselves as delighted with the quality of the Show. Dwarf bulbs, saxifrages and Petiolarid primulas made a particularly good impression.

The coveted George Forrest Memorial Medal for the most meritorious plant was awarded to *Epigaea* (*Orphanidesia*) *gaultherioides* shown by Dr. Denis Graham, Edinburgh. This is not an easy shrub, requiring a peaty or leaf-mould compost, shade and shelter from searing winds. Dr. Graham's plant was in perfect condition with its large pale pink bells fresh and attractive, many buds still to open, and scarcely any of its leaves showing browning on the edges, which is difficult to avoid.

Mr. and Mrs. R. J. Bezzant, Bearsden, won the K. C. Corsar Challenge Trophy for 3 Primulas with three Asiatics, *P. whitei* (which is *whitei* and which *bhutanica*?), *P. bracteosa*, or was it the hybrid *P.* x *scapeosa*, and a pale pink form of *P. gracilipes* collected by a Club member, Mr. Ian Donald, Old Kilpatrick, at Phalut, Nepal, at 9000 ft. in 1977. All three plants were well grown and well flowered. The best of the three, *P. bracteosa*, was awarded a Certificate of Merit. The same high standard of cultivation was evident elsewhere in the Show where the Bezzants were awarded first prizes for *Primula bracteosa* and Saxifrages *grisebachii* Wisley var., *chrystalae* and *burseriana* 'Gloria'.

Mr. Harold Esslemont, Aberdeen, demonstrated again his wonderful skill as a cultivator in winning the Elsie Harvey Memorial Trophy for 3 pans rock plants new, rare or difficult in cultivation with a well-flowered *Dionysia curviflora*, which is often shy in showing its little pink blossoms, the bi-generic *Raoulia* x *loganii* grown for its foliage, and the very rare *Fritillaria alburyana* collected in Iran in 1966 by the late Syd Albury. The latter had one pale pink slightly mottled flower and two buds. Mr. Esslemont had provided a note on this *Fritillaria* which, he said, had proved very difficult as the flower buds tended to damp off before opening. He thought that the late season had helped

on this occasion. After eleven years he had had one flower reach maturity and set viable seed. The plant was grown in gritty mixture over good drainage and was given a little liquid feed after flowering. The A. O. Curle Memorial Trophy for 3 pans of rock plants raised from seed by the exhibitor was also won by Mr. Esslemont with the rare and still expensive dwarf yellow *Iris winogradowii* raised from his own seed in 1971, *Raoulia eximea* grown from seed supplied by Canterbury (New Zealand) R.G.C. in 1973, and *Dionysia freitagii*, not so well-flowered as previously, sown in 1971. In scoring a hat-trick of first prizes Mr. Esslemont showed a fine pan of *Pleione forrestii* with nine pale yellow flowers open and several more buds still to open.

Dr. A. J. Richards, Newcastle, showed how well some rock garden plants can be grown to Show standard in the open ground without protection by winning the Henry Tod Carnethy Quaich with three good specimens, *Galanthus* 'Hexham Double', *Primula marginata* and *Saxifraga* x *apiculata*. Dr. Richards also won two first prizes in Section II with very good pans of *Galanthus* 'Straffan' and the European hybrid *Primula* 'Freedom'.

Once again we welcomed Mr. A. J. Holman, Milnthorpe, who had brought a fine collection of first prize exhibits from across the border despite treacherous road conditions. His *Cyclamen* were particularly good, the most striking being a large-flowered, good colour form of *C. pseudibericum* and *C. persicum* with a few flowers out and many buds to come. The plants of *C. pseudibericum* on the benches showed once more how variable this species is in size of flower, shape and colour. Doubts have been expressed about its hardiness: it is therefore worth recording that the writer's plants survived this past winter in an unheated alpine house with the outside temperature down to —17° C (1° F) on one occasion. Mr. Holman had two good plants of the North African *Narcissus bulbocodium romeuxii* which by shortening its summer resting period can be had in flower in October. This species too is variable in colour, ranging from near white to deep yellow. Other plants gaining first for Mr. Holman were *Anemone biflora*, *Ranunculus calandrinioides* and the fine dwarf conifer *Chamaecyparis obtusa* 'Caespitosa'.

Mr. Harley Milne and Mrs. Jill Sleigh, who have done so much excellent work for the Edinburgh Group and who are now involved in the preparation for the International Conference and Show in 1981, both made their mark in this Show. Mr. Milne gained first prizes with very creditable pans of *Iris* 'Joyce, 'Pauline' and 'Clairette' and

Tulipa pulchella var. *humilis*. Not to be outdone by her colleague, in the dwarf bulb classes Mrs. Sleigh took first prize in the two pan class for *Crocus* in which there were ten entries, a reflection no doubt on the late season, with *Crocus biflora weldenii* 'Fairy' and *korolkowii*. She also gained red tickets with *Sempervivum* 'Sir William Lawrence', *Ilex crenata* var. *mariesii*, and a very well-flowered plant of *Draba polytricha*.

Dr. Denis Hardy, Aberdeen, showed throughout the Show some fine winning examples of Petiolarid Primulas with which he is beginning to excel. Among them in his naming were *Pp. whitei, bhutanica, bhutanica* x *whitei, edgeworthii* and its white form. Against one pan of some ten well grown *P. bhutanica* he indicated that his compost consisted of, by parts, 1 loam, 2 sphagnum peat, 1 part sand and a dash of VitaxQ4.

Dr. and Mrs. Gosden, Eskbank, were awarded the Midlothian Vase for the best *Rhododendron* in the Show. This was a fine example of *R. moupinense* which, although it had been grown unprotected in the open garden, was covered with many unspoilt flowers. Bulbs were a feature of the Gosdens' exhibits and noted among their first prize winners were *Iris* 'Katherine Hodgkin', a still rare and expensive hybrid; *I. histrioides* 'Major', a very late appearance for this handsome plant; *Iris danfordiae*, *I. histrioides* 'Angel's Eye', a name not known to this writer; and the old but still best of its colour, buttercup yellow, *Crocus chrysanthus* 'E. A. Bowles'.

Mr. Malcolm Adair, Glasgow, also had fine pans of bulbs, his best being *Crocus chrysanthus* 'Snow Bunting', its pure white flowers contrasting vividly with orange-red stamens. His *Cyclamen* were also very good, some species again being in better condition than is usual at this Show because of the late season. This was very apparent in Mr. Adair's winning pan of *C.* x *atkinsii* 'Roseum'.

The President of the Club and her husband, Dr. and Mrs. I. Simson Hall, again supported the Show and worthily gained prizes with the very dwarf *Fritillaria armena*, *Cyclamen coum* and *C. pseudibericum*, *Primula allionii* 'Apple Blossom', distinguished by its crimped petals, a well coned example of the procumbent *Microcachrys tetragona*, and a fern, *Blechnum penna-marina*.

The Boonslie Cup for a miniature garden planted with rock garden plants to provide flower and/or foliage interest throughout all seasons was won by Mrs. Jean Wylie, Dunblane, with a nicely arranged exhibit featuring *Draba, Primula*, conifers and *Salix*. Mrs. Wylie also won the two pan Tulip class with *Tt. pulchella* and *turkestanica*.

Among other prize-winning entries particularly noted in Section I were *Draba mollissima*, *Saxifraga burseriana* 'Crenata' and *Androsace ciliata* (Dr. Peter Semple, Glasgow), *Eranthis cilicia*, *Primula bracteosa* and *P. gracilipes* (Dr. Don Stead, Thorntonhall), *Soldanella alpina* (Mr. David Herkis, Bonnyrigg), *Primula bhutanica* and *Saxifraga burseriana* 'Faldonside' (Mr. Charles Simpson, Bearsden), Sempervivums *triste* and *arachnoideum* (Mrs. Betty Cormack, Edinburgh), *Ranunculus calandrinioides*, a particularly good form both in leaf and flower collected by the exhibitor, and *Synthyris pinnatifida* var. *lanuginosa*, a handsome grey-leaved plant with small spikes of dark blue flowers (Mrs. Sheila Maule, Balerno). Mention should also be made of a number of cacti shown by Mr. Ian Lawrie, Edinburgh, which have their native habitat in the high valleys of Mendoza, western Argentina, and had been grown in a cool greenhouse. As one would expect from this specialist in cacti and succulents—he and his wife have an amazing collection of these plants—they were in very good condition, but the judges placed rock garden plants in flower before them. This raises the question whether there ought to be a class or two for hardy or near hardy cacti. After all, we accept Pleiones and other near hardy subjects.

To round off Section I, the Kilbryde Cup for an arrangement of cut flowers and foliage rock plants was awarded to an attractive exhibit by Mrs. Jane Martin, Scotlandwell, who made good use of hellebores, heather and snowdrops.

The principal winner in Section II was Mr. W. F. Murray, Edinburgh, who not only won the Bronze Medal for most points but also the Henry Archibald Rose Bowl for 3 pans rock plants of easy cultivation and grown in the open ground. Among his exhibits were Sedums *spathulifolium purpureum* and 'Capa Blanca', Sempervivums 'Commander Hay' and *arachnoideum*, *Primula denticulata alba*, *Juniperus communis* 'Compressa', *Saxifraga callosa* 'Superba' and a prostrate form of *Calluna vulgaris* from St. Kilda.

The Midlothian Bowl for the best plant in Section II was awarded to Miss Vere Russell, Edinburgh, for a large well-grown and flowered specimen of *Saxifraga* x *jenkinsae*.

Both Primula classes in this Section were won by Mrs. Edith Armistead, Edinburgh, with the Asiatic *P. warshenenskiana* and the European *P.* 'Freedom'. Miss Karen Wylie, Dunblane, a junior member, won the Iris class with *I. reticulata*, while her sister Susan scored with a *Crocus* and a *Draba* in the Junior Section. Good luck to these very young girls.

A splendid feature of the Show was a very fine exhibit put up by the Royal Botanic Garden, Edinburgh, by courtesy of the Regius Keeper, Mr. Douglas Henderson, the Club's Honorary Vice-President. *Primula allionii* 'Elliott's form' in a large pan completely covered by its very large flowers of an unusual shade of pink, was awarded the R. E. Cooper Bhutan Drinking Cup as the best Primula species in the Show. Other *P. allionii* forms on display here were *alba*, 'Crowsley' with small dark red flowers, and a very large-flowered satin-pink form which did not have a varietal name. The latter was very striking and drew many favourable comments. As one would expect, Asiatic Primulas were featured too, among them being huge plants of the blue hybrid, *bhutanica* x *sonchifolia*, named 'Soup Plate' by Dr. A. J. Richards, and a pink species of fine quality, perhaps *irregularis*, under the Rankin number 161. It certainly has the irregular dentate calyx lobes of that species and at the fruiting stage the flowering scape elongates to several inches. Forms of *Crocus chrysanthus* and some species such as *corsicus* made a brilliant splash of colour as the flowers opened in the warmth of the hall. Various named varieties or hybrids of *Iris reticulata* added to the gaiety of the display. The dwarf *Narcissus hedraeanthus*, not often seen at Shows, created much interest. Kabschia saxifrages, among them forms of *burseriana*, *wendelboi* and *kellereri*, one of the earliest to flower but held back by the severe winter, also drew admiring comments. Last but by no means least amongst the many outstanding plants on display, all of which are not mentioned here, were several 4- or 5-year-old plants in full flower of *Epigaea gaultherioides*. (See the note earlier on this species which won the Forrest Medal for Dr. Graham) which drew many envious comments. Who remembers the tenth Commandment at a Flower Show when such distinguished plants are on view? Our warmest thanks are due to the Regius Keeper and his expert staff for making this display possible.

The Nursery Trade again supported the Show, providing a mutual service for themselves and for members who were able to buy plants on the spot, thus saving on the high charges for postage and packing. All three nurserymen reported good business.

Mr. John R. Ponton, Old Cottage Gardens, Legerwood, Earlston, Berwickshire, had a comprehensive collection of rhododendrons and European primulas as well as other rock garden plants for which he is well known. Mr. Ponton will supply a list of his available plants on receipt of a stamped addressed envelope. It is sufficient here to mention that he had on his stand his plum-purple form of *Rhododendron*

campylogynum and the popular pink primulas 'Beatrice Wooster' and 'Barbara Barker'.

We welcomed Mr. Jim Jermyn who has taken over Edrom Nurseries, Coldingham, Berwickshire, from our old friend Alex. Duguid and who will no doubt be glad to hear from Alex's former customers and from other prospective buyers. He had on his stand such things as the rare *Iris* 'Katherine Hodgkin', *Hepatica triloba* 'Rubra Plena', saxifrages 'Faldonside' and *oppositifolia*, and *Leucojum vernum* in two varieties, *carpathicum* and *wagneri*.

Hartside Nursery Garden, Low Gill House, Alston, Cumbria, owned by Messrs. A. R. Huntly and M. J. P. Huntly, had a varied selection of plants for the rock garden. They too have a comprehensive catalogue which will be sent on request. A few of the plants on offer were *Androsace albana*, *Lewisia* 'Sunset Strain', *Saxifraga oppositifolia* 'Ruth Draper' and *Primula allionii* 'Crowsley' var.

DAVID LIVINGSTONE

PERTH—21st April 1979

AFTER a long dreary winter when snow covered the countryside for many weeks and air temperature at night dropped very low and reached zero degrees Fahrenheit in some gardens, it was a pleasant surprise and a great delight for visitors to enter the sun-lit hall of Kinnoull Church and see such an extensive array of colourful plants. Naturally the main subject of talk was winter losses as members met and exchanged greetings. Snow cover had limited frost damage in the case of smaller plants, but shrubs had suffered badly. Fortunately spring had made a belated arrival just nine days before the Show and many plants in alpine houses and cold frames had been quick to respond so that in the end the number of entries was up to normal, but of course the distribution between classes was different. *Primula* entries were particularly numerous and some of the earlier flowering Asiatic species which are normally past flowering by this date were more in evidence than is usual at Perth. On the other hand cassiopes, lewisias and gentians were conspicuous by their absence.

The Alexander Caird Cup for the Six-pan Class was won by Mr. John B. Duff with an entry consisting of *Paraquilegia grandiflora*, *Kalmiopsis leachiana*, *Primula sonchifolia*, *P. edgeworthii alba*, *Pleione pricei* and *Saxifraga grisebachii*. The *Paraquilegia* was awarded the Major-General D. M. Murray-Lyon Trophy for the best plant exhibited by a member residing in the Tayside Region.

The winner of the Three-pan Class and therefore the Dundas Quaich was Dr. Peter Semple with *Dionysia aretioides*, *Primula allionii* and *Androsace carnea* x *pyrenaica*. The *Dionysia*, a perfect circular cushion of yellow flowers completely hiding the foliage, was a worthy winner of the George Forrest Memorial Medal for the most meritorious plant in the Show.

The L. C. Middleton Challenge Trophy for the most points in Section I, obtained from First Prizes, was won by Mr. and Mrs. Henry Taylor with their usual comprehensive entry of interesting plants which included *Senecio leucophyllus*, *Pulsatilla halleri slavica*, *Sanguinaria canadensis* 'Flore Pleno', *Primula marginata*, *P. hirsuta alba*, *P. pedemontana*, *P.* x *dinyana*, *P. auricula albo-cincta*, *Androsace alpina*, *A. muscoidea*, *Adiantum pedatum aleuticum*, *Celmisia ramulosa*, *Ptilotrichum purpureum*, *Ranunculus bilobus*, *Aciphylla simplex*, *Viola zoysii* and *Orchis morio*.

Prize-winners in the new, rare or difficult class were *Dionysia viscidula*, *Kelseya uniflora*, a small but charming plant with dainty blossom, and *Primula* x *dinyana* (*integrifolia* x *latifolia*).

The class for plants grown from seed by the exhibitor was won comfortably by the Angus Seed Exchange Manager, Miss Joyce Halley, the subject being a large and wonderfully well-flowered plant of *Draba polytricha* filling a twelve-inch pot.

First in the class for Scottish native plants was one of the outstanding plants in the Show, Mr. and Mrs. V. Chambers' *Saxifraga oppositifolia*, bearing a profusion of deeply coloured purple-red flowers totally concealing the leaves.

The best cushion plant was *Gypsophila aretioides caucasica*, a firm nine-inch mound of intense green.

An exhibit to remember was a pan of the exquisite miniature sweet-scented white jonquil, *Narcissus watieri*, shown at its very best.

There was very keen competition in the *Primula* classes. Prize-winning Asiatic primulas were *P. gracilipes*, *P. macrophylla*, *P. rosea* and *P. sonchifolia*. Unplaced but nevertheless eye-catching was *Primula petiolaris*, small but bearing flowers of an unusual depth of purple.

A *Saxifraga* not seen at Perth before was *S. marginata karadzicensis*, which won first place for the Club President in a keenly contested class. Mrs. K. S. Hall also staged the best Dwarf Conifer, *Microcachrys tetragona*, a rare Tasmanian plant which we in Perth were interested to see.

There were many entries in the Liliaceae class, the winners being *Fritillaria* species, *Trillium ovatum* f. *hibbersonii* and *Fritillaria citrina.*

First place in the *Pleione* class went to a well-flowered pan of *P. humilis* entered by Mr. J. Crosland, who also won the Papaveraceae class with *Corydalis ambigua.*

Jeffersonia dubia is a plant which has generally finished flowering by the date of the Perth Show, but this year an exceptionally well-flowered plant was seen.

As usual the entries for a Container of various Rock Plants arranged for effect attracted much attention, the winners being Mr. and Mrs. Taylor with their home-made stone trough full of miniature treasures.

Like last year, competition was keen in Section II. The Bronze Medal for most points was won by the Club's Treasurer, Mr. L. Bilton. We welcomed to this section a first time competitor, Mr. D. Martin, who not only did well in Section II but won three prizes in Section I, while Mrs. Martin staged a winning entry for a posy of cut flowers in Section III.

During the Show the Club was honoured to receive a new Trophy in memory of the late Mr. E. H. M. Cox of Glendoick, who was so well known throughout the country as an authority on Rhododendrons. The handsome and unique Trophy, showing a bush of *Rhododendron calostrotum* engraved on silver, was gifted by the family and presented by Mrs. E. H. M. Cox. The Trophy will be awarded annually to the exhibitor of the best Dwarf Rhododendron in the Show. The first winners were Mr. and Mrs. V. Chambers with a fine specimen of *Rhododendron* 'Ptarmigan' which, fittingly, is one of Glendoick Nursery's introductions.

The Show was well supported by (*a*) Mr. Lawrence Greenwood's Exhibition of sixteen superb Flower Paintings; (*b*) a collection of ten alpine plants brought along by Mr. Jim Archibald; (*c*) three plants exhibited by the Royal Botanic Garden, Edinburgh, viz. the Juno iris, *Iris bucharica* and the rare in cultivation Primulas, *P. griffithii* and *P. brachycarpa*; (d) hand sketches of rock plants by Mr. Andrew Duncan; (*e*) a photographic study of a Chinese *Paeonia* by Mr. James Sutherland; (*f*) miniature gardens and a large collection of hand-made posters by the children of Primary Class 7 of Caledonian Road School, and (*g*) a Trade Stand by Orchardbank Nursery. We owe our thanks to all the foregoing, also to the various helpers, and particularly to the ladies who provided and served the delightful teas. We must also extend our thanks to the Show Judges—Mr. J. R. Aitken, Perth, Mr.

J. T. Aitken, Edinburgh, and Mr. R. J. D. McBeath, R.B.G., Edinburgh.

J. B. DUFF

GLASGOW

AFTER the atrocious weather, which has bedevilled gardens and gardeners for the first four months of 1979, the Glasgow Show, held at Knightswood Community Centre on May 5th, was a sight to restore faith in any gardener's heart. Never mind that many of the plants would normally have appeared on the show bench at Perth, a fortnight previously; they were there in all their glory, and in immaculate show condition—a fine tribute to the skill of our exhibitors.

The Dr. Buchanan Rose Bowl, for the winning 6 pan entry, was again awarded to Dr. Peter Semple, whose entry included a fine pan of *Andromeda polifolia* 'Macrophylla'; this received a Certificate of Merit.

The winner of the very well filled 3 pan class, and the Henry Archibald Rose Bowl, was Mr. Harold Esslemont; his large pan of *Shortia galacifolia*, beautifully flowered, must have come very near to consideration for the premier award.

The Wm. C. Buchanan Cup (3 pans, rare, new or difficult) was won by Mrs. Joan Stead. This entry included the unpronouncable *Tchihatchewea isatidia*, a hairy, lavender-flowered crucifer which hails from Turkey.

The Edward Darling Salver, for 3 rock garden Rhododendrons, once again went to Mr. Malcolm Adair, as did the Crawford Cup for the winner of most first prizes in Section I. This latter was an exciting competition for the "record keepers", as several competitors were running neck and neck and the winner was in doubt until the judging of the section was complete.

Section II was well supported this year, and the winners of the Bronze Medal and Wilson Trophy were Mr. and Mrs. Martin Bremner.

Mr. Jack Crosland seems to have solved the problem of flowering that recalcitrant beauty, *Primula minima*, and his well-flowered pan of the white form was awarded the Forrest Medal, as the most meritorious plant in the Show.

Apart from Dr. Semple's *Andromeda polifolia* 'Macrophylla', Certificates of Merit were also awarded to *Androsace vandellii* (evenly covered with its white flowers, and raised from seed by the exhibitor,

Mrs. E. Ivey) and to Mr. and Mrs. V. Chambers' *Rhododendron* 'Ptarmigan', which was just as well-flowered as their plant which had received the new Cox award at Perth.

Mention must also be made of the paintings of Mrs. Anne Chambers (*Cypripedium pubescens*) and Miss Shona Taylor (*Iris reticulata* 'Joyce') which were awarded equal 1st prizes in Class 116.

We do not normally, at Glasgow, see well-filled *Androsace* classes, but this backward season enabled several to be shown. Apart from Mrs. Ivey's *A. vandellii*, I was particularly charmed by Mrs. Jill Sleigh's *A. arachnoidea* 'Superba', and finally, in Section I, the classic beauty and modelling of Mr. and Mrs. H. Taylor's Ranunculi—*R. parnassifolius* in its pink form and the white *R. bilobus*—as ever, from these exhibitors, in immaculate show condition.

Section II showed us a beautifully flowered *Rhododendron pemakoense* (Mr. and Mrs. Bremner). What a lovely thing it is, when it manages to escape the frosts. Mrs. Kissen showed the rarely seen *Viola* (*Erpetion*) *hederacea*, a delightful little running violet which, despite its Australian origin, will often survive our winters in a sheltered, peaty corner. Mr. Stephen Benham's exhibits included the sombre *Ophiopogon planiscapus nigra*, whose charm lies in the satin sheen of its black leaves. I must also mention three entries of the incomparable but inappropriately named British native—*Primula vulgaris*, which can hold its own in any company, when well grown.

One could hardly believe, after the devastating frost of the Thursday, that there could possibly be any rhododendrons to show, but *mirabile dictu*, there they were, in bright array, filling the benches in the Rhododendron room.

It was a pleasure to welcome back Mr. Gunn as a competitor in the Rhododendron Show.

Those staunch supporters of the Show, Mr. and Mrs. Neil Rutherford, were awarded the Urie Trophy for the S.R.G.C. members with most points in the Rhododendron Section, and Mr. A. P. Cumming the Rhododendron Challenge Cup, for achieving most points overall in the Rhododendron Section. The Sir John Stirling Maxwell Trophy for the best individual truss or spray of a species was awarded to a perfect spray of *Rhododendron lindleyi*, part of the non-competitive display by the National Trust for Scotland, Brodick Castle.

It is many years since the daffodil classes in Section IV were so well filled—something we can thank the late season for!

A Show would be a poor thing without some plants to spend prize

money on, and Mr. John Ponton, of Old Cottage Gardens, Legerwood, and Dr. J. Taggart, of the Linn Nursery, Cove, supplied that need.

We were all so very sorry about our Show Secretary's emergency trip to hospital, and I am happy to report that he is now on the road to recovery. Our good wishes to him.

Finally, may I thank all those who rallied round so nobly, with the hard work of setting up, running and dismantling the Show so expeditiously; to the exhibitors who, in spite of the excesses of the climate, made the Show; to the judges who gave of their time and skill in judgement; and to the Warden and staff of the Community Centre whose co-operation helped with the smooth running of it.

JOAN STEAD

ABERDEEN—28th April 1979

COMPARISONS are inevitable and invariably instructive, and it is interesting to recall the introduction to last year's Show report which referred to the persistent wintry conditions and one of the latest seasons on record. The Show date, 1978, was 29th April, so that comparison by date is valid enough, but variable factors which markedly influence the growth cycle after winter dormancy distinctly affect performance in any given year.

This year the Show rose like a phoenix out of the ashes of one of the most stern and testing of winters, during which widespread loss of plants has been reported by amateur and professional gardeners alike. In these circumstances it is most gratifying to report that the number of exhibits and of exhibitors eclipsed all previous Show records, and the general quality of cultivation and presentation compared favourably with any previous year. It is particularly encouraging to record the number and high quality of plants in Section II, reflecting the growing skill and enthusiasm of our newer recruits to the progressive arts of cultivating alpine and rock garden plants. It is confidently anticipated these new members will make increasingly valuable contributions to future Shows.

The Open Section I attracts the attention of experienced growers who have had some years to build up a collection of mature plants, and Class 1, the Six Pans Class, represents perhaps the most formidable challenge. Mr. H. Esslemont's display of *Dionysia freitagii*, *Dionysia aretioides*, *Androsace vandellii*, *Sanguinaria canadensis* 'Flore Pleno', *Shortia galacifolia* and *Soldanella carpatica*, not only took first place

but also gained three Certificates of Merit for individual specimens. Mr. Crosland's entry took second place with *Primula sonchifolia, Epigaea gaultherioides, Fritillaria davisii, Fritillaria erhartii, Cyclamen creticum* collected on the Lassithi Plateau, Crete, 1972, and *Orchis longicornu* collected on the Island of Sardinia, 1973. The third entry by Mr. A. McKelvie, Aberdeen, staged *Iris bucharica, Primula* 'Linda Pope', *Sanguinaria canadensis, Narcissus rupicola, Primula gracilipes,* and *Draba rigida.* A really competitive section!

Perhaps the easiest task of the judges was to select the best plant in the Show to qualify for the Forrest Memorial Medal, which on this occasion was awarded to a visiting member's plant. Mrs. Sheila Maule of Balerno, Edinburgh, brought an outstanding specimen of the rare *Paraquilegia grandiflora* bearing sixty-three open flowers plus several buds. A beautiful plant in perfect condition, representing some years of skilled cultivation, and the undoubted claimant of the Premier Award. Congratulations to Group Convener, Dr. D. G. Hardy, Aberdeen, whose range of exhibits made a major contribution to the Show. His many well grown plants gained the highest aggregate of points in the Open Section to win the Walker of Portlethen Trophy. From his entries, all the following gained first prizes: *Salix reticulata, Raoulia eximea* (in the Class Rare, New or Difficult), *Draba bryoides, Primula aureata* and *Primula sonchifolia* (Two Pans Class), *Primula rosea, Primula marginata* 'Inshriach', *Lewisia brachycalyx* and *Lewisia pygmaea* Hort. (two Pans Class), *Lewisia tweedyi,* and *Claytonia nivalis.*

Having won this trophy annually during the previous four years, Mr. A. D. McKelvie relinquished the honour by a few points only on this occasion. Like Dr. Hardy, his entries were many and notable, including the following first places: *Arcterica nana* and *Cassiope* 'Muirhead' (Two Pans Class), *Cassiope lycopodioides, Pleione forrestii*—as yet one of the rarest pleiones in cultivation, *Anemone* 'White Splendour' and *Saxifraga sempervivum.*

Seven entries in the Two Pans Class, grown from seed, raised the standard of competition to a record new level. The skill of propagators is well illustrated by the first three places: (1) *Dionysia tapetodes* and *Androsace pyrenaica,* (2) *Fritillaria bucharica* and *Dionysia tapetodes,* (3) *Diapensia lapponica* and *Veronica pulvinaris.*

Other highlights from Section I—*Primula aureata*—still a plant for the specialist grower; the smallest of the trilliums in cultivation—*Trillium rivale* and *Trillium ovatum* f. *hibbersonii*; *Fritillaria pallidiflora,* hardy and reliable for cultivation without protection in the north

east of Scotland; *Shortia soldanelloides* var. *ilicifolia*; *Lewisia tweedyi* and its *rosea* form; *Douglasia vitaliana* var. *praetutiana.*

We are always happy to welcome visiting members to Aberdeen Show, and especially if they bring a selection of their plants for exhibition. As already reported, it was Mrs. Maule of Balerno, Edinburgh, whose *Paraquilegia* took the Premier Award. In addition we were delighted to have the following Edinburgh members with us for the occasion, their exhibits all gaining first places: Mrs. Jill Sleigh showing *Androsace vandellii*; Mr. Harley Milne showing *Ilex crenata* var. *mariesii* supported by his enthusiastic son Roderick exhibiting *Sedum middendorfianum* and *Sedum spathulifolium* 'Capa Blanca' in the Two Pans Class.

In Section II this year we were hard put to find enough space for all the exhibits. We have a group of members who are very enthusiastic and plants of a high standard were there to prove it so.

Mr. H. Pascoe of Cults, Aberdeen, scooped the board winning the Aberdeen Quaich for the Best Plant in the Section, with a well flowered specimen of *Soldanella montana*, the Club Bronze Medal for the highest aggregate of points in the Section, and the Special Prize for the Best Two Pans Distinct in Class No. 49 with *Primula rosea* and a second good plant of *Soldanella montana.*

There were many good primulas on the benches, including *P. calycina*, *P. minima*, a dainty *P. scotica*, *P. pubescens* 'Rubra', and several huge plants of *P. denticulata* in shades of blue, pink and white.

Rhododendrons were not so plentiful this year due to the harsh winter and late spring frosts, but some notable plants included *Rh.* 'Chikor'—raised by Cox of Glendoick, Perthshire, full of its lovely lemon flowers, and the shaded pink- and white-flowered *Rh. ciliatum.*

Having reaped some growing hints from our more experienced *Pleione* cultivators in Section I, the novices showed some commendably well flowered pans of *Pleione limprichtii* and *Pleione formosana.*

In the bulbous classes a pan of the dainty Hoop petticoat *Narcissus* proved attractive to the judges, as well as *Erythronium dens-canis*, a lovely *Chionodoxa gigantea*, and some tight spikes of *Muscari*, in a dark shade of indigo-blue.

The saxifrages were well represented, noticeably a fine plant of *Saxifraga* x *jenkinsae*, and the lewisias brought a cheerful glow of colour to the benches. These were a perfect foil to the virgin white flowers of *Sanguinaria canadensis* 'Flore Pleno', of which there were several pans on display.

The containers of growing plants were particularly attractive, showing that much time and care had been taken in choosing the plants, and planting up in such an artistic manner.

Once again appreciation is recorded for the support given by The Aberdeen University Cruickshank Botanic Garden Supervisor, Mr. R. Rutherford; The Aberdeen City Department of Leisure and Recreation, Alpines Section, Victoria Park, Aberdeen, in the care of Mr. G. Birse, for their comprehensive displays of a wide range of subjects suitable for the rock garden, scree and peat border. Both were awarded Gold Medal Certificates for their creative displays. Typical specimens from the former stand were *Rhododendron fletcheranum*, *Rh.* 'Chikor' and *Rh. pemakoense*, *Adonis vernalis*, *Ramonda myconi*, *Narcissus bulbocodium*, *Rhodohypoxis bauri*, *Gentiana acaulis*, *Glaucidium palmatum*, the rare *Weldenia candida*, assembled in a composite setting. On the latter stand a fine specimen of *Rhododendron cephalanthum crebreflorum* attracted a Certificate of Merit. *Rhododendron* 'Treasure' and a framework of dwarf conifers, including the well-known *Chamaecyparis pisifera* 'Boulevard', enclosed an attractive display of *Narcissus*, *Primula* species and hybrids, *Fritillaria meleagris*, *Cassiope*, and the albino form of *Muscari botryoides*, not so often seen as the blue form.

Much admired was the display of lewisias and *Primula auricula* hybrids staged by Mr. J. N. Aitken of Dyce—Aberdeenshire—a hundred plants and more—in a broad spectrum of colour forms.

A compact display of miniature gardens and water colour paintings of native wild flowers added charm to the occasion, presented by Mrs. Mary McMurtrie of Balbithan House, Aberdeenshire, whose artistry it has been our privilege to enjoy over the years at our annual Show.

Mr. Jack Drake, Inshriach Alpine Plant Nursery, Aviemore, provided a comprehensive range of plants for sale from their large display, especially of their own selected strain of Lewisia cotyledon hybrids.

Glenbuchat Pottery of Donside, Aberdeenshire, made their debut, introducing a range of their hand-thrown clay pots, providing a convenient source of supply of pots and pans suitable for the alpine plant enthusiast.

Thanks are due to many people whose interest and enthusiasm ensured the success of the Show, primarily to the exhibitors, amateur and professional, whose plants were the "raison d'être" of the Show. To the judges, Mr. A. Evans, Mrs. S. Maule, Mr. R. S. Masterton, Mr. F. G. Sutherland and Dr. D. G. Hardy, for allocating the awards.

To the ladies whose untiring efforts provided refreshments throughout the day, with special mention of Mrs. Frances McKelvie. To all who gave cheerful service in a variety of different ways, at Reception, taking charge of Publicity, Seed Sales, or acting as Stewards.

Five members of the public were sufficiently impressed to pay initial subscriptions as new members of the Club, a decision, we hope, which will give them much pleasure in future years.

SYLVIA M. SIMPSON
JACK D. CROSLAND

The Joint Rock Garden Plant Committee

ST. ANDREWS—30th SEPTEMBER 1978

AWARDS TO PLANTS

AWARD OF MERIT

To *Acaena microphylla*, as a fruiting and foliage plant for the rock garden. Exhibited by J. D. Crosland, Esq., Treetops, Torphins, Aberdeenshire.

CERTIFICATE OF PRELIMINARY COMMENDATION

To *Gentiana* species, Beer No. 603, subject to verification of name. Identified tentatively as *G. prolifera* or *G. prolata*. Exhibited by A. D. McKelvie, Esq., 43 Rubislaw Park Crescent, Aberdeen.

AWARDS FOR EXHIBITS

CERTIFICATE OF CULTURAL COMMENDATION

To E. G. Watson, Esq., 1 Ewesley Gardens, Wideopen, Newcastle-upon-Tyne, for a well grown plant of *Haastia pulvinaris*.

To A. J. Holman, Esq., 34 Park Road, Milnthorpe, Cumbria, for a well grown plant of *Cyclamen hederifolium*.

To H. Esslemont, Esq., 9 Forest Road, Aberdeen, for a well grown plant of *Raoulia* x *loganii*.

PERTH—21st APRIL 1979

AWARDS TO PLANTS

FIRST CLASS CERTIFICATE

To *Dionysia aretioides*, as a flowering plant for the alpine house. Exhibited by Dr. Peter Semple, South Brae Drive, Glasgow.

AWARD OF MERIT

To *Corydalis ambigua*, as a flowering and foliage plant for the rock garden and alpine house. Exhibited by J. D. Crosland, Esq., Treetops, Torphins, Aberdeenshire.

To *Draba polytricha*, as a flowering plant for the alpine house. Exhibited by Miss J. Halley, 16 Abercrombie Street, Barnhill, Dundee.

CERTIFICATE OF CULTURAL COMMENDATION

To H. Esslemont, Esq., 9 Forest Road, Aberdeen, for a well grown plant of *Androsace pyrenaica*.

To Dr. Peter Semple, South Brae Drive, Glasgow, for *Dionysia aretioides*.

To Miss J. Halley, 16 Abercrombie Street, Barnhill, Dundee, for *Draba polytricha*.

The Joys of Rubbish-Heap Gardening

by DON STEAD

MOST OF US have a rubbish-heap, somewhere convenient to the potting shed or greenhouse. Here non-germinated seed pans are tipped in disgust, dead plants sadly thrown out and the labels consigned to the "These I have loved" collection.

In our clay garden the rubbish-heap, being largely made up of improved soil, provides a good basis for further composts, but before taking a shovelful the pile is scanned for treasure trove. Who knows what seed may have found there just those germination conditions we denied it in our carefully compounded seed compost? Or what resting bud, feigning death in the unnatural conditions of a pot, has been able to stretch itself and really grow in the unrestricted outdoors?

Such a case was *Nolana sp.* BCW4108 which had been reared from Andean seed and delighted us with its upturned, ultramarine blue, white-throated bells, rather sparingly provided in the alpine house. Our rubbish-heap is separated by a concrete slab path from a frame and one day we realised that a *Nolana* was growing there. When it

crept on to the path and got the sun's warmth reflected from the concrete, it seemed to say, in effect, "This is the life!" and almost exploded. At the height of its season it had spread over 6 sq. ft. of slabs and that end of the frame was all but impossible of access. Alas, its blue was of the type with which colour film will not cope satisfactorily and we were never able to record this event adequately.

At present a little group of young *Crocus* is guarded by a palisade of labels. Maybe *Crocus caspius* which didn't germinate? Maybe *Crocus scardicus* which we were told not to dry out and so kept too wet—perhaps some tiny offset bulbs escaped us in our fury at our incompetence? Who knows what the years will reveal?

Viola crassa, so free flowering for such a long season, but so impermanent, disappeared from the garden but happily re-appeared as seedlings on the rubbish-heap. We were too pleased to recover it to wonder how it came there.

Then there were the narrow, hairy-leaved seedlings which suddenly appeared in profusion. We had just lost *Calandrinia hispida*, BCW4798, the best, to our eye, of the Beckett, Cheese and Watson Calandrinias, which had just such leaves. Could this have been a second sowing which we'd thrown out when the first plants were flowering so blithely? We pored over those leaves and hoped. And then inspiration came to the Gardener. "What about the thingummybob that what-do-you-call-her gave you after that Show?" That exactly defined it as *Plantago nivalis*, a delightfully leaved plant but not accompanied by the vivid magenta cups of *Calandrinia hispida*. The parent plant lay protected from the rain a yard away in the frame and maybe a bird had scattered the seed.

Identification problems can be even more prolonged. Two extraordinarily long dicots appeared and then a leaf which suggested Ranunculaceae. This left the field still wide open, as the family contains 100% germinators like *Ranunculus repens*, but also many species which rarely succeed unless sown green, and many seed pots must have been dumped. Later leaves became very dissected and we speculated about Pulsatillas, but the Gardener was heard to murmur "Umbelliferae?" We reflected, aloud, that jealousy had never got anyone anywhere, and confidently, carefully potted up to await exciting developments. No trouble over surviving a hardish winter with that plant and it was soon into new growth in the spring. Without a word, we consigned *Anthriscus sylvestris*—Queen Anne's Lace to you—to the dustbin. Joys of rubbish-heap gardening indeed!

Alpines '81

International Conference Show

We are hoping, and expecting, that all exhibitors will do their utmost to enter as many plants as possible in the Show. The schedule that is currently being prepared is aimed to take account of all the vagaries of our climate, and to meet the needs of growers with large or small collections of alpine plants.

If you have never exhibited before there is no better place to start than at a Conference Show. Everybody's plants will be welcome, for the object is to make this Show the best that has ever been staged. We know you have the plants, so please let us see them at Nottingham in 1981.

Who knows but one of your plants could be judged the best in the Show and, for the first time ever, qualify for the Forrest and Farrer Medals, jointly awarded. There will be many other awards and prizes to be won. We look forward to seeing you and your plants at the Conference.

Appeal for Trophies

In 1971 the Conference Show was very much enhanced by extremely generous donations of awards, trophies and also money to purchase suitable awards. It is hoped that members will be just as generous for the 1981 International Conference.

Valuable gifts are always welcome, but with the upsurge of interest in some of the older handicrafts, it is possible that some may choose to make something suitable as a prize. We have already received a handsome woodcarving of a gentian and it would be appropriate to have a dryas to go with it. A piece of fine needlework, a painting or drawing would be equally acceptable, indeed anything that expresses the wealth of talent that abounds among alpine gardeners. If you don't think yourself talented enought to make something, cheques, large or small, are very acceptable gifts.

It would help the Show Secretary a great deal to know, as soon as possible, of any donation you plan to make.

Please send any information to: Mrs. K. N. Dryden, Alpines '81 Show Secretary, Berries, 30 Sheering Lower Road, Sawbridgeworth, Herts CM21 9LF, England.

K. N. Dryden

Five Days in the Cantabrian Mountains

by RONALD McBEATH

The Cantabrian Mountains extend for some 240 km in length, forming an east-west ridge along the north coast of Spain, parallel to the Bay of Biscay. At the western end they are low and rounded, but as one progresses east they get higher and more rugged, culminating in the area known as the Picos de Europa where the tops exceed

2600 m. In many eastern areas the rocks are acidic slates and quartzites, often covered with heaths of *Calluna* and *Erica*, or forests of oak and beech, where cultivation or grazing pressures are not too heavy. However, in the east at the Picos de Europa, limestone predominates, giving a rough and broken countryside with sharp rugged peaks, extensive screes, high alpine meadows and in the valleys, very often deep and rocky river gorges, cut out by the fast flowing rivers.

Unlike most of Spain the Cantabrians have a regular rainfall, spread throughout the year, due to the proximity of the sea and the prevailing westerly winds, giving a lush and green appearance even in summer, which is in marked contrast to many of the mountains in Spain which can be scorched and burnt up in the summer and autumn.

On this visit to the Cantabrians in search of plants, early July was chosen to coincide with the flowering time of the higher alpines, although by this time many of the meadow plants were past their best. We made our base at Potes, a small village with a good selection of shops and hotels and within easy reach of the Picos by car.

Probably our best day was spent on the south slopes of Pena Vieja, 2613 m; here the alpine meadows are easily reached by cablecar from the Parador at Fuente De. This drops you off at 1800 m at the top of a high cliff, where, amidst extensive snow patches, you step straight on to a rich and rocky limestone alpine meadow. One of the first plants to catch the eye was the common *Androsace villosa*, with clusters of white flowers often turning rose-red in the centre before withering. Equally common was *Saxifraga conifera*, a plant endemic to the Cantabrians, which has white flowers held on dark red stems and the peculiar habit of going dormant in summer to avoid desiccation, achieved by forming tight summer resting buds, made by the leaves incurving to form a tight cone, entwined in silver hairs. Its main growth period is late winter and early spring when the mossy leaves open out and show their green upper surface. Another attractive white-flowered plant was the compact cushion-forming *Draba dedeana*, a plant occasionally seen in gardens, and probably the most worthwhile of the white drabas.

A dwarf shrub related to the daphnes, *Thymelaea ruizii*, was uncommon, its almost prostrate stems being well covered with yellow Daphne-like flowers. This is a plant which could well make a fine alpine house subject, but of the several compact alpine species to be found in SW Europe, I have yet to see one in cultivation. Seed if available would be the best way to acquire it, as wild collected plants

would be extremely difficult to re-establish owing to the thick, fleshy tap roots, which like to delve deep in the limestone rocks.

Other plants in the rocky meadows included *Narcissus asturiensis*, the lilac-purple flowered *Matthiola fruticulosa* and *Anemone pavoniana* (not to be confused with *A. pavonina*) which looked like a dwarf *Pulsatilla alpina*, but easily distinguished from *Pulsatilla* as the seeds do not have the typical long feathery style.

Higher on the rock outcrops and screes the brilliant blue of *Lithodora* (*Lithospermum*) *diffusum* contrasted well with the white limestone rocks in which it grew, the flower size and colour intensity equalling any named garden cultivar. On the mountains nearby, with acid or peaty soils, we did not encounter this plant, despite its ability to grow so freely in peaty, acid garden soil. Also to be found in a fine shade of deep blue was the western form of *Gentiana acaulis*, *Gentiana occidentalis*, with much narrower leaves than the usual 'acaulis' of gardens.

On shaded rocks the yellow Kabschia, *Saxifraga aretioides*, formed iron-hard cushions up to 45 cm across, but producing few flowers. Nearby, *Saxifraga canaliculata* formed large ground-covering mats of mossy, dark green leaves. On more exposed rocks *Sempervivum cantabricum* had a range of unusual colours to its rosettes—red, brown and purple-pink—as well as several shades of green. Everywhere as in the Alps was *Gentiana verna* with its bright blue, white-centred flowers.

A second day was spent on a limestone mountain, the Alto de Valdeon, which was approached from the west. Unfortunately the rock was much harder and the ground drier, consequently the flora was not so rich. Many of the plants seen the previous day were encountered, but not in such abundance. However, two new plants of note were the well-known *Geranium cinereum* and the fine blue *Linum narbonense*.

The Puerto de San Glorio was the starting point to the ascent of the Pena Prieta, a large acidic mountain. At the pass at 1600 m the tree heaths, the white-flowered *Erica arborea* and the reddish-purple *E. australis* were in full bloom, and *Calluna* dominated much of the lower slopes. Amongst the gravel in the car park at the top of the pass the dying leaves revealed the bulbs of *Crocus nudiflorus* and *Merendera bulbocodium*, both autumn-flowering plants. Halfway up the mountain just above the heather, *Fritillaria pyrenaica* was found as solitary plants dotted around in the hard, wire-like grass. The soil here was of an acid nature, yet in the Pyrenees this *Fritillaria* is predominantly

a plant of limestone regions. Some shale outcrops at 1750 m were dominated by *Erodium daucoides* with quite large flowers, having a striking combination of pale mauve-pink petals streaked with deep crimson veins. The find of the day, if not of the week, was a superb form of *Ranunculus parnassifolius* with large white flowers flushed with red, nestling tight on rounded, slate green, hairy leaves which mimicked the surrounding stones admirably on an exposed ridge at 1900 m. Some of the other plants seen were *Tulipa australis*, *Androsace carnea* ssp. *laggeri*, *Vitaliana primuliflora*, *Pulsatilla vernalis*, *Ranunculus pyrenaeus* in abundance, and *Teesdaliopsis conferta*, a very fine crucifer, like a refined *Iberis* with glaucous leaves.

The exploration of a river gorge was a must, so we selected the one below Potes, the Desfiladero de la Hermida. The dry limestone cliffs rise many hundred feet, but by July many of the plants were past flowering. The unusual little evergreen oak, *Quercus rotundifolia*, was common and over it scrambled *Smilax* and *Clematis* fighting for light. In open rocky places *Cistus* and white and yellow *Helianthemum* flowered, and in rock fissures grew the little pink-flowered *Petrocoptis glaucifolia*, another Cantabrian endemic. Also with pink flowers, on 30 cm stems, was the very fine *Linum viscosum*. On shaded wet banks of tufa *Adiantum* hung like a green curtain, while nearby the insectiverous *Pinguicula grandiflora* was abundant wherever the soil was moist.

Our final day was spent in the lower alpine meadows and beech forest around the Parador at Fuente De. Here an interesting habitat was provided by the open ground along a dried-up stream. *Androsace villosa* was again common, as was the stemless purple thistle *Carduncellus mitissimus*. An *Antirrhinum* by the name *braun-blanquetii* looked every bit like one of the summer bedding out annuals, growing 30-45 cm high with yellow and white snapdragons, which contrasted nicely with the blue of *Aquilegia pyrenaica*. At the edge of the forest orchids abounded, including bee, frog, lizard, fly, man, and military all growing together. In rough grass the tall *Asphodelus albus* pushed up its strong spikes of pinkish-white flowers to nearly 2m, while in the cool shade of the beech *Paris quadrifolia*, *Hepatica nobilis* found in blue and white, *Helleborus foetidus* and *H. viridis*, and the refined Solomon's Seal *Polygonatum odoratum* were found.

Many other plants were seen, including a vast array of *Genista* and *Cytisus*, but they will require much more study to sort them all out. I can certainly recommend the Picos as a place for a plant hunting holiday, and I look forward to the day when I make my next visit.

Rhododendron williamsianum

by JAMES T. AITKEN

I'M the sort of mean philistine who expects a plant to justify itself on a strict flower by blooming time to foliage ratio that no truly aesthetic plantsman would tolerate, let alone share. No soul, no feeling for the rare, the delicate, the choice. And against this philosophy *Rhododendron williamsianum* was in a parlous state.

When you visit the Edinburgh Royal Botanic Garden, if you choose your time, you can see *Rhododendron williamsianum* covered with big pink cup flowers. It is wonderful—and all the other enthusiastic adjectives you can think of. Their plant is obviously no youngster, but it remains compact, a dome four feet or so high by as much across. That plant is a winner and has no need to pauchle the ratio.

So us ones, keen on rhododendrons, priding ourselves that we had some skill and had devised a happy environment for growing them, bought one. Now from what stable that *Rhododendron williamsianum* was derived I know not. If you say to a nurseryman that you want one whose parent is the plant that grows in the Royal Botanic Garden they just give you a leer from out of one eye, explain that no-one gets plants from the Royal Botanic Garden, but imply that they got a cutting when the parkie wasn't looking.

Anyhow this plant looked the true blue, real Mackoy. It had the round light green leaves of the species which you can spot anywhere. The bush developed compact and round. We gave it leafmould and peat with a wee touch of hoof and horn in the early spring to encourage it. And it grew so rewardingly. We don't get frost that bad, and such as we got did not damage it.

Visitors about the end of June into July exclaimed with rapture at the chocolate brown young growth which covered the plant and lasted six or so weeks. Distinctive it was, and when other rhododendrons had gone out of flower and were dull. So you had to put that to the ratio.

But flowers it had none, or so few you didn't have to take the other hand out of your pocket to count. Well, people said, give it a chance. I was impatient, it was implied. You can't expect a tiny baby to do calculus. Trouble was the years were passing into a decade and a half and still it was as mean with flowers as an Aberdeen rabbi. You

felt if the guy couldn't do the two times table when he was fifteen, he was scarcely a mathematical prodigy. Still, the one in the Royal Botanic Garden flowered and better flowered. To start with I thought that the year in question might be a bad one for rhododendrons, or for *Rhododendron williamsianum.* But no; it was ours. Its neighbours in the garden did fine, some brilliantly. So it wasn't us. We had got a four o'clock Friday one. Left to me it was for the compost heap or the bonfire. I was restrained by threats of marital convulsions. After all, we had paid good money, etc.

Up to the south corner where my neighbour's compost heap is (on his ground) and where the cat jumps the fence and other cats threaten to, there came to be a space. Something gave up and left a gap. It wasn't a choice place and forby a kind of feline Passchendaele. To that location was transferred *Rhododendron williamsianum.*

And behold, next year it threw a dozen blooms—lovely big dark pink cup-shaped bells. By geometrical progression it increased its flowering and now, three years after the shift, it has passed the acceptance ratio. The flowers make it a winner on the tightest application of the ratio and the chocolate brown young growth in mid-summer is a great bonus.

What happened? You guess. Maybe maturity. Maybe the root pruning which any such move inevitably entails. Maybe a trifle, just a kennen, more shade. I reckon, but I'm no pundit, we should have moved it and, thereby root-pruned, sooner. But it seems a plant which is not early to flower. So you have to give it time.

If you want to fill in the record; it is from that treasure house of rhododendrons, Szechwan, China, where Ernest Henry Wilson, an English collector then working for the Arnold (Harvard, USA) Arboritum, found it in 1908 and introduced it. The name derives from J. C. Williams of Caerhays, a famous gardener and patron of plant collectors.

When he introduced it Wilson made much of the plant having been found growing in lime-stone mountains. But it was the common object of plant collectors of that era to try to introduce the lime-tolerant *Rhododendron.* In fact, like the generality of rhododendrons it is for acid soil and is not lime-tolerant. Our growing medium is right. It is from the 8,000/10,000 feet mark and completely hardy in Edinburgh. Like many dwarfs it suits the low rainfall of east Scotland and more moisture might make a less compact and therefore less attractive bush. But like all rhododendrons it relishes mild humidity.

Not unnaturally, it has been used for hybridisation and its progeny, of which there is a full page in the RHS Handbook, include 'Humming Bird', 'Temple Belle' and 'Cowslip'.

Without qualification now, it is excellent; it is distinctive and truly compact; the young growth is spectacular. But oh, you have to be patient. In the same year as you put your son down for Eton, buy him a *Rhododendron williamsianum.* It will be about ready to flower when he leaves.

Plant Notes

CENTAUREA ACHTAROVII Fig. 55

WHEN I went on a seed collecting mission in the Pirin Mountains last September, one of the plants I was looking for was *Centaurea achtarovii,* the prettiest of the genus I had so much admired three years before, seeing it in splendour of its summer growth, tidy and gorgeous. Now it was about to die down, with distorted leaves, and was difficult to be found in grown-up alpine turf. Many plants inspected yielded very limited number of seed.

Centaurea achtarovii is a beautiful foliage plant, with large solitary flowers. Obovate, blunt tipped leaves, arranged in symmetrical rosettes, are densely white-tomentose on both sides, felty on margins, and 7-8 cm long, with prominent white mid-rib. Delicate cobweb-like structure of long hairs gives their dull green basical colour a silvery-bluish effect.

The flowerhead is relatively large, about 4 cm in diameter, with long, blue-violet ray florets and vermilion-orange disc ones short, protruded by black pistils. Flowers are borne on short leafless stalk, which is 2-3 cm high in bud, and 4-5 cm in flowering stage. Seeds are scarce, oblong, 3-4 mm long and 2 mm wide, creamy, ivory or beige, and glossy.

The plant has few long simple cord-like roots (with fine fibrous rootlets on their lower part). It grows in rich soil pockets on sunny and dry, south exposed steep slopes in marble parts of the Pirin Mountains. (Vichren, Palašice) at about 2200 m elevation, in association with *Daphne kosanini, Viola grisebachiana, Genista subcapitata, Saxifraga ferdinandi-coburgi, S. porophylla,* various grasses, and even *Dianthus microlepis.*

Footnote: On finishing these few notes I happened to find out that Mr. Ingwersen had tried to introduce *Centaurea achtarovii* into cultivation in the British Isles as far back as in 1934, offering its seeds in his

catalogue. His hope about its "establishing in England", expressed in field notes of the time, published later (1942) in the A.G.S. *Bulletin*, seem to have faded. At least a long silence that has prevailed since testifies to it. What was the reason that such a plant, compared by Mr. Ingwersen in its unflowered stage with *Jankaea heldreichii*, has never found its place among awarded plants on Show benches? There must be an answer to it, and no doubt there is a reader of the *Journal* who grows this plant and can give the cultural requirements of this plant so that it will become a well-known plant.

Czechoslovakia — JAROSLAV KAZBAL

LEWISIA PURDYI

IN 1948 Major-General Murray-Lyon and I visited David Livingstone at Carluke. He gave me a plant of *Lewisia purdyi* which he had exhibited before the War but was no longer of a standard fit to show. Since then I have grown it outside in a 10 inch pot. I repot once every 10 years or so but top dress each year with a slow release fertilizer. It flowers every year.

It has withstood, without damage, our climatic conditions all those years of rain, snow, winter and spring frosts. It had three thick (2 in.) woody stems but lost one last year. It never sets seed.

As this plant must be at least 40 years old it would be interesting to record the ages of other alpines, some with a reputation of being short-lived.

Aberfeldy — R. S. MASTERTON

Reflections on Washing Pots

by DON STEAD

OR SHOULD it be "on Pot Washing"? The reader must decide.

Some years ago we visited a nurseryman in the West of Scotland. He was a most skilled propagator and grower and a very busy man, working all the hours of daylight and many more. We remarked that we'd just had a two hour session washing pots. "You wash POTS?" he said, rising to a crescendo of incredulity in three words. "You have time to WASH POTS?" He moved away, shaking his head sadly. We weren't sure whether this was disappointment because

people whom he'd hitherto (we hoped) respected had let him down, or whether it was sadness at the unfairness of time distribution which allowed some people to waste it, washing pots. Chastened, we slipped away to gather a boxful of plants, all grown so well in unwashed pots.

That brief conversation gave us food for thought. Pots after use contain traces of soil and more soil is to be put in. Why wash? But a plant could have died in that pot, maybe of a plant disease. Would it not be better to wash it, in case its successor were infected? Pot surfaces get covered with algal growth, perhaps fungi too. Good for those plants, e.g. Orchidaceae and Ericaceae, which seem to need some association with organisms not obvious to the naked eye? Or dangerously pathogenic? The particles of soil and crevices could harbour eggs and pupae of pests which washing would remove. But it would also remove embryo forms of life which could well be predators on just those pests. The argument went to and fro. We could suggest that it was settled by our (authorial plural!) innate sense of tidiness and orderliness, but those who know us would rebel at that amount of poetic licence. Suffice it to say that we still WASH POTS.

It is a chore, however one looks at it. We are 99% converts to plastic pots and in our damp, algae-growing climate it is not worth washing the few clay pots we have until just before use as we cannot spare them dry storage. Conversion, some years ago, to plastic disposable cups for seed growing was a major step forward in more than one way. If one is quick off the mark at the end of a group meeting one can get enough to cope with an average Seed Exchange allocation! One becomes a connoisseur in time. Cups with a highly glossy surface are to be shunned as they cannot be written on with an ordinary pencil, that most durable of horticultural writing implements. The tall variety of the 7 oz. size is not as convenient, or as stable in use, as the more dumpy form. Foam polystyrene cups, however nice to hold when full of scalding tea, are not durable and writing with a pencil is not easy either. One learns, in due course, to exert the right sort of pressure on the Group member responsible for buying Group cups. Drainage holes may be inserted with a variety of implements from a hot poker, or a knitting needle heated in a gas flame, to a 25 watt soldering iron.

But we digress. There is just no fun at all in washing ordinary plastic pots, but plastic cups are different—they can carry a whole ring of recollection-evoking labels, going back five or six years.

What have we here? *Caiophora coronata* BCW 4157 2/73. That really was an intriguing plant—stinging hairs on all parts. Not as bad

as nettles (with us) but one did sit up and take notice and planting out was an operation carried out with care. In 1974 there were flower buds among the very dark green hairy leaves and then sumptuous creamy white cups, 2 ins. across, appeared. It must be recorded that the cups were of a shape which led to the irreverend description of "Po Plant", but *Caiophora coronata*, now *Blumenbachia coronata*, was a worthwhile addition to the rock garden while it lasted. It rooted deeply, but did not survive a cold winter with us.

Further round that pot, *Ranunculus seguieri*. We fell for General Murray-Lyon's exhibit of that at Perth Show some years ago and have been trying ever since to grow it from seed. This must have been Failure 3 or even Failure 4. Fresh seed seems essential here, as is the case with so many of the genus. Would anyone care to exchange fresh *R. seguieri* seed for fresh *R. parnassifolius* seed?

The next pot cracks as we pick it up—it has done four tours of duty already and there is no labelling space left, but as we throw it away we see the "double sneeze" label, *Tchihatchewia isatidea* McW5780 3/78. That was one of the more spectacular early successes of John Watson's last Turkish trip. It germinated fairly well and there were soon beautifully hairy rosettes of spathulate leaves from which rose equally hairy stems carrying mounds of lilac and white crucifer flowers. Wonderful to see against the light, with every $\frac{1}{4}$ in. hair glistering in the sun. Monocarpic, so the flat capsules of embryo seeds are being watched anxiously.

This cup had, inter alia, *Anoiganthus brevifolius* from Club seed, a long desired member of the Amaryllidaceae from South Africa. Only one germination, but it grew quite rapidly with a fan of leaves which seemed rather irid-like. We potted it on and nurtured it, but it began to look increasingly familiar and finally we realised that we'd been cosseting that ever present pest, *Sisyrinchium brachypus*. Fury at the recollection resulted in another pot being confined to the dust-bin!

Sad recollections, too, from the next cup. *Werneria nubigena* M 40 8/76 was the only inscription. One of the exciting seeds from the Munn collection and we had great hopes of getting this fabled Andean composite. Though we kept the pot until this year, against all the odds for generally short-lived composite seed, nothing germinated other than the inevitable (in our garden) Hairy Bittercress, Pearlwort, Liverwort, Elm and Hawthorn.

On to a half-pint cream carton, excellent for deep-rooting bulbs and more robust than the plastic cups. *Alstroemeria aff. spathulata*

CW 5182A 3/73 was just visible. Only one germinated and it was slowest to flower of all the Cheese and Watson alstroemerias which came our way, but when it did flower in 1977 it had been worth waiting for. Greyish green spoon-shaped leaves, unlike the general run of *Alstroemeria* leaves, and a beautiful large pale pink flower with the upper petals richly speckled with red on a yellow base. No seed has yet been set and splitting has not proceeded far enough to risk a plant away from frame protection, but it could well be hardy in a slightly warmer area.

On the other side, *Triteleia ixioides splendens* AGS 4/75. Good germination and rapid growth. Most Tritelias and their cousins brodiaeas and bloomerias tend to be rather floppy and the leaves are often disreputable by the time the flowers open, but the yellow stars of *T. ixioides* are produced in such profusion on the umbels as to make them very welcome and in addition, they flower relatively late. This one flowered for the first Dalkeith Show in early June '77 (why no June Show these days?—the Show season would be better and less hectic if extended a little) and it was then planted out below an Arctic Birch to give the stems the support they call for. It survived the 77/78 winter but succumbed in 78/79, not altogether surprising with such a shallow-sitting bulb. On the other hand, *T. ixioides cookii* planted beneath the same shrub has survived. We cannot vouch for these names, but in behaviour there is clear evidence of marked variation.

Alas, we're not getting on very fast, but now a run of The Gardener's pots allows us to speed up since their labels, though interesting, are not so personally evocative. Then back to our own *Parnassia nubicola* B 474 2/76. We are fond of our own native Grass of Parnassus and another member of the genus was very welcome. First flowering was eagerly awaited but proved a little disappointing. The Himalayan species shows no significant flower difference from *Parnassia palustris* and has maybe not quite such a pleasant habit. It is, however, very wet and frost hardy, having come through two severe winters, so it may well be a better garden plant for a moist situation than the native.

Further round that pot *Hesperantha mossii* SR 1/73. A South African bulb which took a bit of tracking down, since "mossii" is a distortion of "moseri" which is a synonym of *H. baurii*, the preferred name. The generic name means "evening flower", but *H. baurii* is an exception which opens in the early part of the day. An irid, bearing pink starry flowers upon a 6 in. stem and a delightful later flowering (July/August) bulb. It has grown happily outside here

and at the time of writing (late June) it has just emerged after a hard winter. Flowers are readily obtained in one year from seed, so it is well worth looking for under any of its names.

Another cream carton and *Tristagma nivalis* BCW 4818 4/73 can just be deciphered with difficulty, since that was a period when we made the mistake of using a felt tip pen instead of pencil. One of the exciting BCW collection of bulb seed from the Andes, including members of the genera *Leucocoryne, Conanthera, Trichopetalum, Alophia, Cypella* and *Calydorea.* Almost all germinated and grew to around match-head size in 1973, but in 1974 all except the last three genera went dormant and they stayed dormant in 1975 and 1976, numbers dwindling sadly and steadily through accident and unsuitable cultivation in the frame which was all that was available. By the time a bulb house was acquired in late 1976 one small *Tristagma nivalis* remained and the summer baking stimulated it into growth the next year. Nothing so precipitate as flowering, though—we must be content after six years with just three leaves. But there's still HOPE!

What's this on a very old pot? . . . ortus . . . edii 73. Yes, that must have been *Calochortus weedii,* which was high on our list of desiderata after the '71 Conference. An ideal excuse for a break to re-examine that list to see how well we've done in eight years. . . . Hm, not as many as we'd like crossed off. More than enough left to keep us hunting until the '81 Conference provides the basis of an additional list. But it is the travelling hopefully that matters! That *Calochortus weedii* germinated all right but failed to reach its second year, a distressing habit with many *Calochortus* in our hands. Back to square one. There must be a *C. weedii* 74 pot somewhere. One survived from that germination and flowered in 1977, a beautiful flower, but *not C. weedii—C. venustus* instead. Now we have a germination from *C. weedii* ARGS 78. ARGS seed for an American plant *should* be all right!

Good Heavens, that's the last pot in the bucket. Do you know, I believe that thanks to plastic cups, I enjoyed that pot-washing—almost!

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TITLES IN CAPITALS

The American Rock Garden Society

Probably most members are aware of the existence in the U.S.A. of a Society comparable with our own. Some members may have wished to join this Society, but have been deterred by the apparent difficulty of transmitting their subscription. We understand that this difficulty is not insuperable. Permission has to be obtained from the Exchange Control in the first place, and evidence has to be supplied of the existence of the Society and its membership fees. Having secured sanction, the member obtains a draft from his Bank and forwards it to the Society. In practice it would probably be best first to consult one's Bank, which could supply advice and the appropriate forms.

The annual subscription is 5 dollars, and the Secretary, who will send further particulars, is William T. Hirsch, 3 Salisbury Lane, Malvern, Pa. 19355, U.S.A.

In addition to its *Quarterly Bulletin*, the American Society has a Seed Exchange scheme in operation.

W. C. HENDERSON AND SON LTD., ST. ANDREWS

1980 HOLIDAYS FOR FLOWER-LOVERS

Some of the holidays outlined below combine an interest in sites and flowers, while others are purely for alpine gardeners. Full details will be available during September, including prices and names of tour leaders. Please do write or telephone and you will receive the information immediately it is available.

SITES & FLOWERS ON CRETE—10 to 23 April
The itinerary of this tour combines some of Crete's most interesting sites with the spring flowers of its south and eastern shores and mountains; and a special feature is made of staying at relatively little-known, un-tourist-ridden centres. Starting from Heraklion by special coach, and visiting Knossos en route, we cross the island to Ayia Gallini for Ayia Triada and Phaestos where we can botanise locally. From thence we drive to Ieropetra for further flower-hunting in the Dikti mountains and nearby; then onwards and north-eastwards to Sitia, from which we visit the sites at Zacro and Paleocastron. Finally, we drive back to Heraklion by way of Lato and Kritsa, where we have lunch, and leave the following day for London. *To be repeated in October.*

SITES & FLOWERS IN AEGEAN TURKEY—17 to 30 April
This holiday begins with a few days in Istanbul before moving on to Kusadasi, where we spend five days and visit the historic sites at Ephesus Miletus, Didyma and Priene, all in lovely countryside and, in springtime, a riot of wild flowers. From Kusadasi, we drive by way of Aphrodisias to Pamukkale, with its fantastic limestone formations, and interesting botanical specimens. Here we stay for three nights before driving to Izmir, from which we visit the site of Pergamum and where our last two days are spent. *To be repeated in the Autumn.*

ITALY—PANZANO IN CHIANTI
This country holiday in a converted part 14th, part 17th century farmhouse in Tuscany is for ten people only in twin-bedded rooms on each departure. *Dates are on 24 April, 13 May, 3 June and 24 June: and then again on 18 September, 6 October and 23 October in periods of two weeks each.* The house lies at over 15,000 ft. in an area noted for its orchids and meadow flowers and also for its lovely walks in utterly unspoiled countryside. The house is not and is nothing like an hotel; but for those who enjoy unsophisticated comfort rather than luxury with the added opportunity of being within less than 20 miles from Florence to the north and Siena to the south, this is an ideal holiday.

HOLIDAYS FOR ALPINE GARDENERS in particular, include Bielsa in the Spanish Pyrenees from 29 May to 12 June; and at two centres in Switzerland, which will be notified, leaving on or about 27 June for 14 days. In addition to these, our tours going further afield include treks into Sikkim and in Kashmir, especially for the local flora in May and July respectively.

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