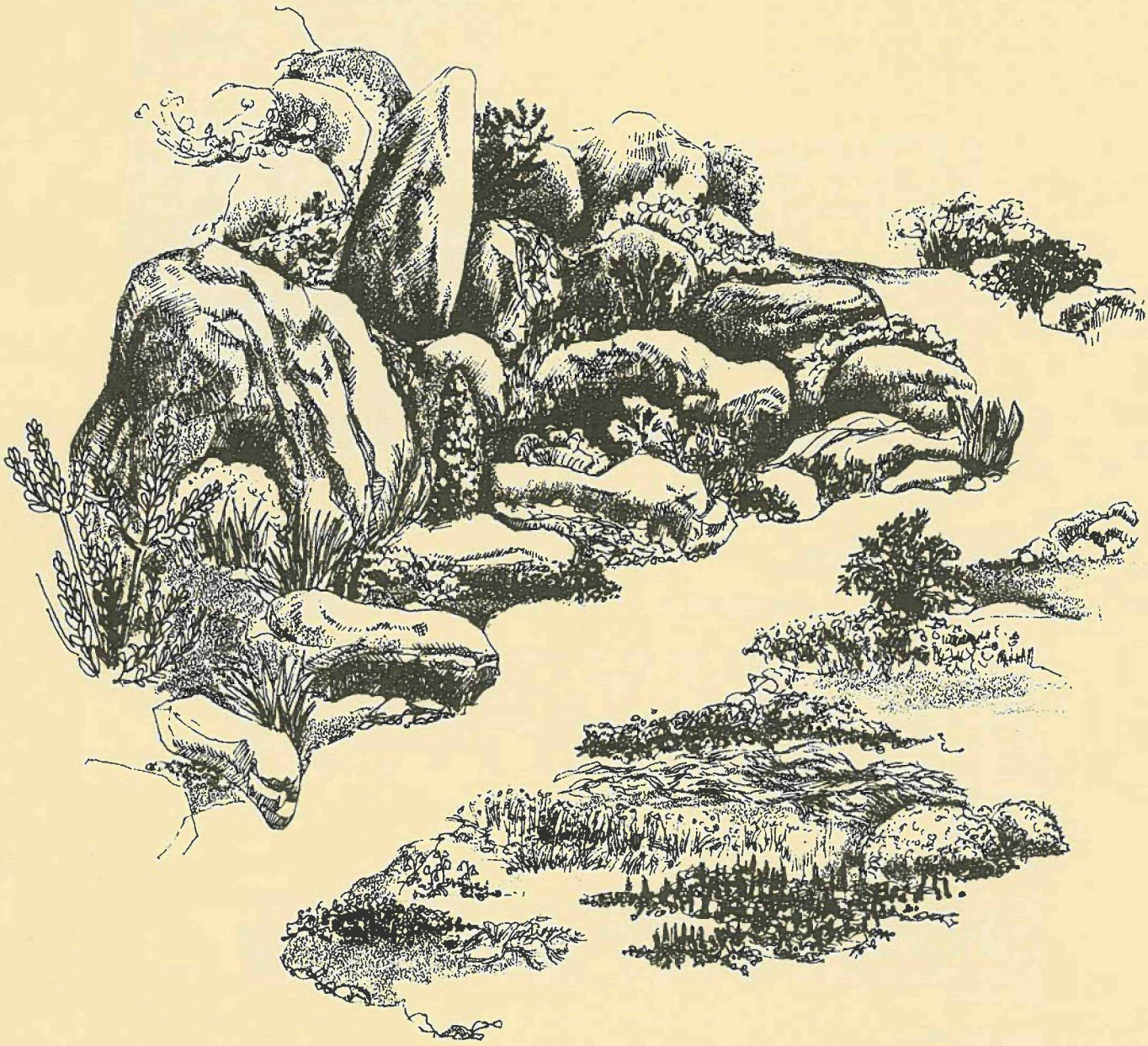
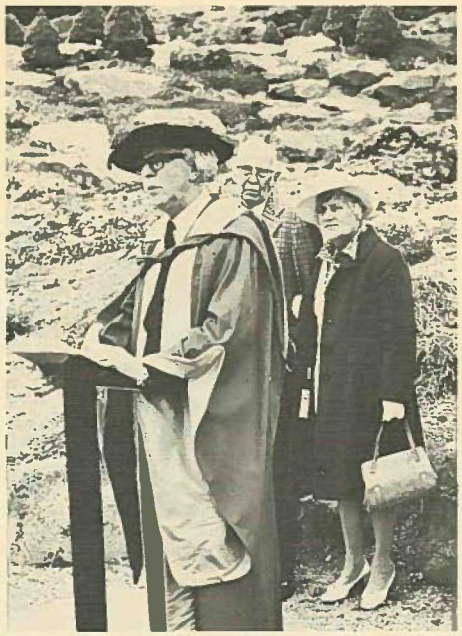
DAVIDSONIA

VOLUME 9 *NUMBER 3* *Fall 1978*



Cover:

General view in the European section of
The E. H. Lohbrunner Alpine Garden.



Dr. William T. Stearn dedicates The
E. H. Lohbrunner Alpine Garden.
Left to right:- Dr. Stearn, Mr. E. H. Lohbrunner,
and Mrs. Lohbrunner.

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Introduction

This special issue of Davidsonia is devoted to the newly dedicated garden component of The U.B.C. Botanical Garden now known as The E. H. Lohbrunner Alpine Garden.

The garden forms part of a series of gardens developed or being developed at U.B.C. as part of our overall theme 'Plants and Man'. The landscape design for all components has been the result of an intensive evaluation of the role of the garden to the University and to the community at large. The firm of Justice and Webb, Landscape Architects of Vancouver, B.C., have successfully translated our program objectives into visual concepts that have been transformed into reality by a dedicated staff. Mr. A. James MacPhail, Curator of The E. H. Lohbrunner Alpine Garden, and his able assistant Mrs. Bodil Leamy have provided the care and dedication necessary to achieve the remarkable results in this garden in the short time allocated to its development.

We were fortunate to be able to achieve almost immediate effect in the garden through the purchase of the foundation plants from Mr. E. H. Lohbrunner of Victoria with the assistance of a grant from the Stanley Smith Horticultural Trust. In addition, much support and cooperation from the many members of The Alpine Garden Club of British Columbia has provided for the acquisition of those rare and interesting alpine plants that help to round out our world-wide collection of alpines.

The dedication by Dr. William T. Stearn on April 24th, 1978 provided an appropriate and auspicious opening to this world-wide collection of plants. The academic procession with its bright colors and formality could hardly compete with the kaleidoscope of colors found in the garden, but it served to emphasize the importance of the academic service and role that this garden will play in the future.

We are proud to add an important garden of alpines to the international community of horticulture.

ROY L. TAYLOR
Director

Dedicatory Remarks at the Opening of The E. H. Lohbrunner Alpine Garden

W. T. STEARN*

Mr. Chancellor, Mr. President, Mr. Vice-President, Ladies and Gentlemen.

My second privilege this day is to dedicate *The E. H. Lohbrunner Alpine Garden* and to provide an historical background for this. The name 'Alpine Garden' is a modern expression, not to be found in the older horticultural writings; two centuries ago it would have had no meaning at all. In the long history of gardening the concept of a garden for alpine plants is a very modern concept indeed, on account of the relatively modern attitude towards the mountains on which they grow.

The adjective 'alpine', Latin *alpinus*, referred originally to the chain of high mountains, the European Alps, forming a barrier which separated Italy from France and central Europe, and it referred in particular to their upper pastures. For us today this is a picturesque and interesting region with many beautiful wild flowers, hospitably provided with good hotels, wonderful for holiday-making and winter sports. To our distant ancestors these and other mountains were nothing of the sort. They were regarded, admittedly with much justification, as dangerous, forbidding, inhospitable places, with terrifying scenery, haunted by dragons, as the scientific alpine traveller J. J. Scheuchzer of Zurich testified as late as 1723 (1), and by evil spirits, with their uncivilized inhabitants often repulsively disfigured by goitre. Moreover it was difficult to take elephants and armies across them. A Dutch and a Swiss farmer, so the story goes, once discussed the shortcoming of their respective countries. The Dutchman said regretfully, 'We have no mountains in our country'. 'Oh', exclaimed the Swiss, 'oh, what a wonderful country yours must be!' A medieval legend about the fate of Pontius Pilate's dead body illustrates the same attitude towards mountains. According to this, the former Roman governor of Judaea and Samaria committed suicide and his body was thrown into the Tiber, which caused such dreadful weather that it was pulled out and thrown into the Rhone. This river likewise rejected Pilate. A mountain lake seemed a bad enough or, if you like, a good enough resting place for him, so he was finally deposited in the lake on the Pilatusberg above Lucerne in Switzerland. Here his tormented spirit reposed quietly through the centuries unless provoked by stones thrown into the lake, which would make him cause thunder and lightning and possibly the flooding of Lucerne. To prevent such catastrophes, for centuries the burgomeister and council of Lucerne forbad anyone to go near the lake without their permission, which was rarely granted.

The abhorrence of mountains thus exemplified is very relevant to the history of alpine gardens because, until people went up mountains for interest and pleasure, they knew nothing of their wild flowers and could have no desire to cultivate them. The Pilate legend is also relevant because in 1555 the government of Lucerne gave the celebrated Swiss doctor, naturalist and man of all knowledge, Conrad Gessner (Conradus Gesnerus), permission to ascend the Pilatusberg and even provided a barrel of wine and a man to carry it! This journey resulted in Gessner's Descriptio Montis fracti sive Montis Pilati juxta Lucernam in Helvetia, published in 1555 together with his De raris et admirandis Herbia, which gives a first account of alpine vegetation; the generic name *Trollius* had its origin here in Gessner's latinization of the local Swiss-German vernacular name 'Trollblume' (rounded flower) as *trollius flos* (2). In Gessner's writings we find expressed for the first time the modern and then revolutionary attitude towards mountains and their flowers, even though Petrarch in 1336 had recorded the dazzling sweep of view, with the clouds beneath him and the rugged snow-capped Alps in the distance, which rewarded his ascent of the peak of Mont Ventoux, Vaucluse, in France.

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*Former Senior Principal Scientific Officer, Department of Botany, British Museum (Natural History), London, England.

FIGURE 1. The participants in the Dedication Ceremony on April 24th 1978. Left to right: Dr. Roy L. Taylor, Director of The Botanical Garden; Mr. Donovan F. Miller, Chancellor of The University of British Columbia; Dr. William T. Stearn; Dr. Douglas T. Kenny, President of the University; and Dr. Michael Shaw, Vice-President for Academic Development at the University.

Gessner saw the glory of the mountains and their flora with fresh eyes; in an open letter in 1541 on the admiration of mountains to the Swiss scholar Jacob Vogel (Jacobus Avienus, d. 1564) of Linthal, Glarus, he declared his delight:

> *"I am resolved henceforth, most learned Avienus, that, so long as life is granted me by divine providence, every year to ascend several mountains or at least one, when the plants are in full growth, partly for knowledge of them, partly for noble exercise of body and gladdening of mind. How great indeed are the enjoyment and the delights of the spirit as it is affected by contemplating in wonder the vastness of the mountains and raising one's head as it were among the clouds"* (3).

There, coming to us over four centuries, is a statement of the aesthetic pleasure and scientific interest that alpine plants and their mountains still hold for us today. Various of Gessner's friends and successors shared the same new interest in the mountain flora, notably Thomas Penny, Joachim Burser, the Bauhin brothers, Johann and Caspar, and Charles de l'Ecluse (Carolus Clusius).

The cultivation of alpine plants naturally began later. Clusius in 1583 recorded *Primula auricula* and the hybrid *P.* x *pubescens,* parent of the garden auriculas, from the Austrian Alps as being in cultivation, and other plants followed.

The concept of the modern alpine garden unites two horticultural procedures, which early in the 19th century were hardly associated: the growing of alpine plants, which was usually in pots, and the construction of rockeries, which were conglomerations of stones and rocks often fatal for all but the most vigorous and tolerant low-growing plants. Interest in such plants, however, grew. Thus Anton Kerner von Marilaun, then a professor at the mountain-surrounded University of Innsbruck, published in 1864 the first of the many books about rock garden plants. He based his Die Cultur der Alpenpflanzen scientifically on his ecological study of these plants in the wild and his experience in growing them at Innsbruck. However, only late in the 19th century and early in the 20th did the two procedures effectively combine to create the rock garden as a home and not a graveyard for plants from the mountains.

Thus Dr. E. H. Lohbrunner, to whom the University of British Columbia's alpine garden is now dedicated, has become, through his many years of devotion to the cultivation of alpine plants in British Columbia, both an exponent of an old European tradition and a pioneer of a new Canadian interest, being a developer and distributor of alpine plant material for cultivation in western Canada. Many of the plants grown here came originally from his celebrated nursery on Lohbrunner Road, Victoria, B.C. He recently received an honorary doctorate from the University of Victoria for his outstanding services to the community and his international reputation as a grower of plants, a most praiseworthy and unusual example of academic enterprise, since universities, playing for safety, usually confer honorary doctorates on persons who have a doctorate already.

Gessner, as already quoted, referred to studying alpine plants and to enjoying them. An alpine garden open to the public and richly stocked provides opportunities for both. It is thus most fitting that this garden should now be dedicated to the public as The E. H. Lohbrunner Alpine Garden.

BIBLIOGRAPHIC NOTES

Professor Stearn has supplied the following notes in amplification of his address:

1. Johann Jacob Scheuchzer (1672-1733), a professor at Zurich, Switzerland, made important alpine journeys of investigation as a mineralogist and botanist between 1702 and 1711, in the course of which he heard reports, from apparently trustworthy persons, of dragons seen in the Swiss mountains and he published a catalogue of these, with dramatic illustrations, in his Itinera Alpina (1723). Linnaeus dedicated the genus *Scheuchzeria* to him and his brother Johann Scheuchzer (1684-1738), author of Agrostographia (1719) and other works on Gramineae: "*Scheuchzeria* is grassy and alpine, being called after the famous pair of brothers Scheuchzer, of whom the one was eminent for his knowledge of grasses the other for his knowledge of alpine plants" (Linnaeus, Critica botanica, cap. 238;1737). For further information, see E. Furrer, 'Die Ausstellung Johann Jakob Scheuchzer', Vierteljahrsschr. Naturf. Ges. Zürich 118: 363-387 (1973) and Gavin de Beer, Early Travellers in the Alps, chapter 7 (1930).

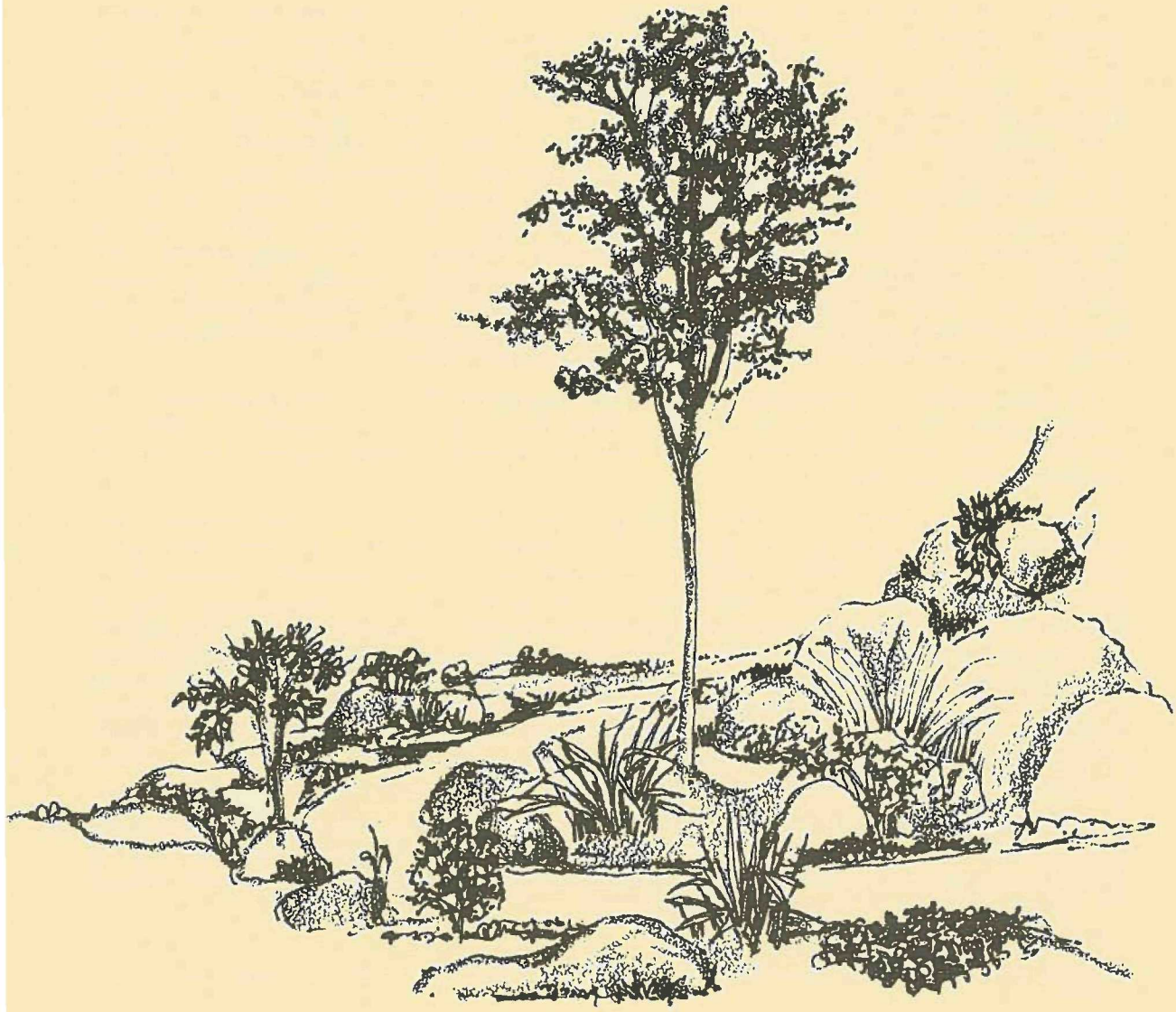
2. For the history of the generic name *Trollius,* first used as such by Rivinus in 1690, see W. T. Stearn, 'A note on *Trollius*', Journ. Bot. (London): 189-191 (1941). Gessner stated *'Trollius flos, ut nostri vulgus appelat, et in hortis etiam transfert, coronarius est'*. It evidently comes from the old Teutonic 'trollen' (to roll); another vernacular name is 'Roleblume'.

3. This quotation comes from a very rare little book on milk and its products entitled Libellus de Lacte, et Operibus lactariis, philologus pariter ac medicus. Cum Epistola ad Jacobum Avenienum de Montium Admiratione. Authore Conrado Gesnero Medico xxx Tiguri apud Christophorum Forschoverum (Zürich, 1541). The original text reads: *Clarissimo viro D. Jacobo Avieno Conradus Gesnerus S.D.P. Constitui posthac, Aviene doctissime, quam diu mihi vita divinitus concessa fuerit, quotannis montes aliquos, aut saltem unum conscendere, cum in suo vigore plantae sunt, partim earum cognitionis, partins honesti corporis exercitii, animaque delectationis, gratia. Quanta enim voluptas, quantae sunt putas animi, ut par est affecti, deliciae, montium moles immensa spectando admirari, et caput tan quam inter nubes attolere'.*

The literature relating to Gessner is immense. Translations by H. B. D. Soule from Latin into English of part of De Lacte and De raris et admirandis Herbis are provided in Conrad Gesner, On the Admiration of Mountains (Grabhorne Press, San Francisco, 1937). Twenty-seven of the numerous watercolour drawings of plants prepared for Gessner but unpublished on account of his death from plague are included in H. Zoller, M. Steinmann and K. Schmid, Conradi Gesneri Historia Plantarum (Urs Graf Verlag, Zürich, 1972).

For further information, see Hans Fischer, 'Conrad Gessner (26 Marz 1516 - 13 Dezember 1565), Leben und Werk', Neujahrsbl. Naturf. Ges. Zürich 168 (1966), 152 pages.

4. See Carolus Clusius, Rariorum aliquot Stirpium per Pannoniam, Austriam, et vicinas quasdem Provincias observatarum Historia (Antwerp, 1583). Pages 343-353 deal with alpine primulas under the generic name *Auricula ursi* (i.e. 'little ear of a bear'). *Auricula ursi I* is *Primula auricula* L.; *Auricula ursi II* is *P.* × *pubescens* Jacquin.



The E. H. Lohbrunner Alpine Garden

A. JAMES MacPHAIL*

An alpine garden is, of course, a garden in which are grown alpine plants, or simply "alpines". But just what is an alpine plant? To the purist, it is a plant that grows above the tree-line in the arctic-alpine life zone. But, an alpine garden planted in strict compliance with that definition would be a dull place for a good part of the year. For one thing there would be no dwarf trees, for trees do not grow above the tree-line. A more liberal definition of the word "alpine" is as a synonym for mountain plant. Here again we are in trouble, for not a few plants grown in the alpine garden originate at sea level in temperate regions, and the arctic-alpine life zone descends to sea level in arctic regions.

In fact there is no universally accepted definition of an "alpine". The members of the various societies devoted to this form of gardening are inclined either to adroitly sidestep the question, or else to flounder about in a sea of good-natured but inevitably unresolved controversy. There are, however, certain characteristics common to the run of plants considered suitable for growing in the alpine garden. Most of them are indeed plants of the mountains, and a good many of them are "true" alpines from above the tree-line. They are, moreover, either perennials or biennials. The short growing season at the high elevations does not permit annuals to germinate and complete their life cycles. A further consequence of the short growing season is the fact that many alpines, especially the small cushion or mat-forming plants, produce a great abundance of flowers as a means of ensuring pollination and thus their very survival, with the result that often not even the foliage is visible. These exquisite mountain wildlings, the epitome of the popular conception of the alpine plant, are without doubt the most coveted plants for the garden. Of the remaining plants considered worthy, all, or almost all, are dwarf plants of considerable beauty whose mien of patrician distinction qualifies them for at least associate status in company with their high-alpine betters.

The alpine garden is intended as far as possible to imitate nature. Thus, most of the plants grown in it are true species or naturally-occurring hybrids. This is not to say that selected forms or cultivars are not grown. Man-made hybrids, on the other hand, are generally shunned, although they may be tolerated as temporary fillers.

There is much yet to be learned about growing alpine plants in gardens at lower elevations. One simply cannot wrench a plant from its high mountain domain and expect it to survive when transplanted to a lower level. The differences in atmospheric pressure and ultra-violet radiation at the lower levels are incompletely understood factors that, in any case, cannot be easily altered to suit the plant. It has been theorized that some alpines are so physiologically adapted to the short cold growing season at the higher elevations that they are limited to it, unable to thrive at a lower altitude because their intrinsically high metabolic rate (the rate at which they burn the products of photosynthesis with oxygen for plant growth) quickly depletes the plant in the higher temperatures of lower elevations. This is comparable to the runner who runs the hundred yard dash in a brief burst of concerted effort versus the mile runner who must measure himself over the course, and who could not hope to complete the race if he tried to sustain the pace possible for the shorter distance.

As is the case with the other components of The Botanical Garden at UBC, The E. H. Lohbrunner Alpine Garden has been designed to fulfill a variety of functions. Primarily it provides a living collection of plants of a specialized nature for educational and research purposes to meet the needs of the University community and of the public at large.

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*Curator, The E. H. Lohbrunner Alpine Garden, Botanical Garden, The University of British Columbia, Vancouver, B.C. V6T 1W5

The garden consists of the following units:-

a) Rock Garden
b) Alpine House
c) Bulb Frame
d) Trough Garden Courtyard
e) Dwarf Pinetum

a] Rock Garden

If the only purpose of the plant collection was to cater for academic requirements, the plants could be laid out in straight lines in nursery beds, provided that their individual cultural needs (drainage, soil type, and exposure) were met. Such an arrangement would be totally adequate for the purposes stated. It would also be totally dull and monotonous.

If, however, we arrange the plants in a more aesthetically pleasing manner, we create a garden. And a garden, especially if it is one that imitates the ways of nature, engenders a love and respect for nature through the encouragement of the enjoyment of plants in a naturalistic, albeit contrived, setting.

What, then, are the elements that work towards creating the illusion — and it is an illusion — of a naturalistic alpine plant garden situated effectively at sea level? One of the most obvious devices is to create the garden on a slope. The steeper the slope the better, within reason. Another device is to grow the plants in close proximity to rocks. Both the sloping ground and the rocky outcrops do, of course, imitate a mountain setting, furthering the illusion. They do, however, have an even more important function; they, together with the use of a suitably porous soil, establish the conditions of rapid and complete soil drainage in which alpine plants have evolved and without which they will not thrive.

The type of rock used throughout the garden is pyroxene andesite, a fine-grained slightly porous rock of volcanic origin. It is of a warm brownish-gray color that complements the plantings to good effect. About 2,200 tons of this rock were brought to this site from a location near Penticton in the southern Okanagan area. In certain parts of the garden there are also outcroppings of a rock-like material known as tufa. This is not, strictly speaking, rock as it is formed differently. It results as a precipitate of calcium carbonate and a small amount of magnesium salts from a saturated water solution. Tufa is quite soft and porous, and holes can easily be drilled or chiselled into it to form planting pockets ideal for certain lime-loving alpines. When newly unearthed it is a rather stark white color, but gradually darkens to a neutral light-gray after prolonged exposure to air.

A further enhancement of the naturalistic illusion in the Rock Garden is realized by the method of grouping the plants. Those plants which grow together in nature are grouped together in the garden, both as broad geographical groups and as specific ecological groups within the larger areas. This type of grouping makes sense from a cultural point of view as these groups, in general, have similar cultural requirements.

The unique advantage deriving from a geographical arrangement is that it imparts to the visitor a heightened awareness of the world-wide distribution of plants — an absorbing study in itself — and those characteristics peculiar to each area. Ever since the dawn of plant life on earth, factors such as seed dispersal by birds, animals, air and ocean currents, and the effects of continental drift have all played a part in the extension of plant life from its assumed centre (or centres) of origin. Through natural selection new forms evolved to cope with a changed environment and more radical changes resulted from mutation and hybridization. This on-going process of speciation, complicated by the influence of successive climatic changes and by the phenomenon of parallel evolution, has resulted in the astonishing diversity of form — or, indeed, the surprising similarity of form — between plant species separated by hundreds or even thousands of miles.

Sometimes in a natural habitat two or more species of a given genus will occur side by side, occupying the same ecological niche. One is hard put to explain this seemingly paradoxical circumstance, since the pressure of evolution would tend to produce the dominance of one or the other of them. This, of course, is exactly what happens. Each species has its own centre of distribution from which it progresses outward to the full extent that its current, yet always evolving, genetic makeup allows it to overcome changes in climate, edaphic factors, pollinating insects, and competition with other plants. Thus, it is not unlikely that the expanding populations of one species might eventually overlap the range of other also-expanding members of the genus. Where this occurs it is possible that natural hybrids will result. In alpine plants natural hybrids are relatively common between species of *Primula* and in the genus *Androsace* in the European Alps, for instance. In North America there are examples of natural hybrids between species of *Penstemon, Iris, Erythronium, Ceanothus* and *Phlox,* among others.

In some cases these hybrids are sterile, in other cases they can cross between themselves or with either of their parent species. Eventually they may stabilize and, being possessed of hybrid vigor, displace their antecedents from that particular ecological niche. Then begins their inexorable outward expansion as the nucleus of a new species. All of this, even though it takes place on an evolutionary time scale, furthers our awareness that the notion of "species" as a stable entity is a man-made concept, not a divine one.

It is hoped that many of the characteristic differences between the forms of alpines from different parts of the world will reveal themselves to the visitors as they stroll about the garden paths. Some of these differences are caused by different pollinating agencies. As an example, New Zealand has an inordinate number of alpines with white flowers. This is said to be due to the fact that these flowers are pollinated by nocturnal moths which are able to find white flowers more easily than colored at night. This leads to speculation on whether the flowers evolved their whiteness in response to the presence of the moths, or whether the moths developed their night flying proclivities because of the white flowers.

The Rock Garden is arranged according to the following geographical areas:-

1. Europe
2. North America
3. Asia
4. Asia Minor
5. Africa
6. South America
7. Australasia

1. *Europe*

The European section of the garden is one of the most colorful since the phenomenon of alpine gardening is of European origin, more particularly from the British Isles. The first rock garden in England was built at the Chelsea Physic Garden in 1772, when Sir Joseph Banks brought home some slabs of lava from Iceland. At the time, repairs were being made on the Tower of London and the old stones were dumped on the Garden. These, together with an assortment of flints, chalks and broken bricks, constituted the first English rock garden for the raising of alpine plants.

The continent of Europe has been thoroughly botanized, and there are, therefore, many European alpines well established in cultivation. The greatest number of these plants come from the two main mountain ranges: the Alps and the Pyrenees. The entire northern portion of the continent (roughly north of 50°N latitude) was covered with glaciers during the last Ice Age, 15,000 to 20,000 years ago. Consequently, the northern regions were repopulated with plant species migrating from south to north as the glaciers retreated, and this region does not support a significant number of endemic

plants, i.e., plants confined to a very narrow geographical area. Glaciers in the Alps and Pyrenees, however, were isolated formations, remnants of which are still extant. The result is that there are mountains which support a large number of endemics, such as species of *Primula, Gentiana* and *Saxifraga.* In general, those plants from northern, eastern and central Europe are perfectly hardy in the garden, while some of those from the more arid Mediterranean region, such as the Sierra Ranges of Spain, the Appenines of Italy, and the Pindus Mountains of Greece, present a much greater cultural challenge.

Any rock garden of any size should have a backbone planting of small trees and shrubs to provide it with what the current crop of progressive landscapers fondly refer to as an "architectonic" quality. Not only are these plants interesting in themselves, but they supply a sense of scale to the whole garden, something to which the smallness of the remaining plantings can be related. Dwarf conifers are used extensively throughout the garden for this purpose, each a species or cultivar derived from a species native to the geographical area in which it is placed. Prominent in the European section are several specimens of *Pinus mugo* var. *mughus,* Mountain Pine. It is planned to replace some of these at a later date as they will outgrow their allotted space, in the meantime their growth is restricted by an annual pinching of their new shoots. *Pinus sylvestris,* Scots Pine, provides us with some truly dwarf forms, on the other hand, of which the cv. Beauvronesis and cv. Compressa can be seen near the lower roadway. *Picea abies,* Norway Spruce, has given rise to numerous forms ranging from the tight bun-shaped habit of cv. Little Gem to the flowing rock-hugging habit of cv. Inversa. *Juniperus communis* gives us, besides the more usual prostrate forms, one of the most striking of dwarf conifers in *J. communis* cv. Compressa. It forms a perfect spire of congested gray-green needle-shaped foliage, and takes many years to reach a height of 60-90 cm.

A superbly architectonic shrub in the lower meadow area is a specimen of *Corylus avellana* cv. Contorta, Harry Lauder's Walking Stick, with its curiously twisted branches bedecked in late winter with dangling straw-yellow catkins. The upper meadow is dominated by twin specimens of *Euonymus europaeus,* Spindle Tree. Its easily overlooked greenish flowers are of little consequence but its red and orange lobed fruit capsules in fall are very ornamental and persist well into the winter, apparently not attractive to birds. It also provides a spectacular crimson blaze of foliage in the fall, a quality notably uncommon in the European flora.

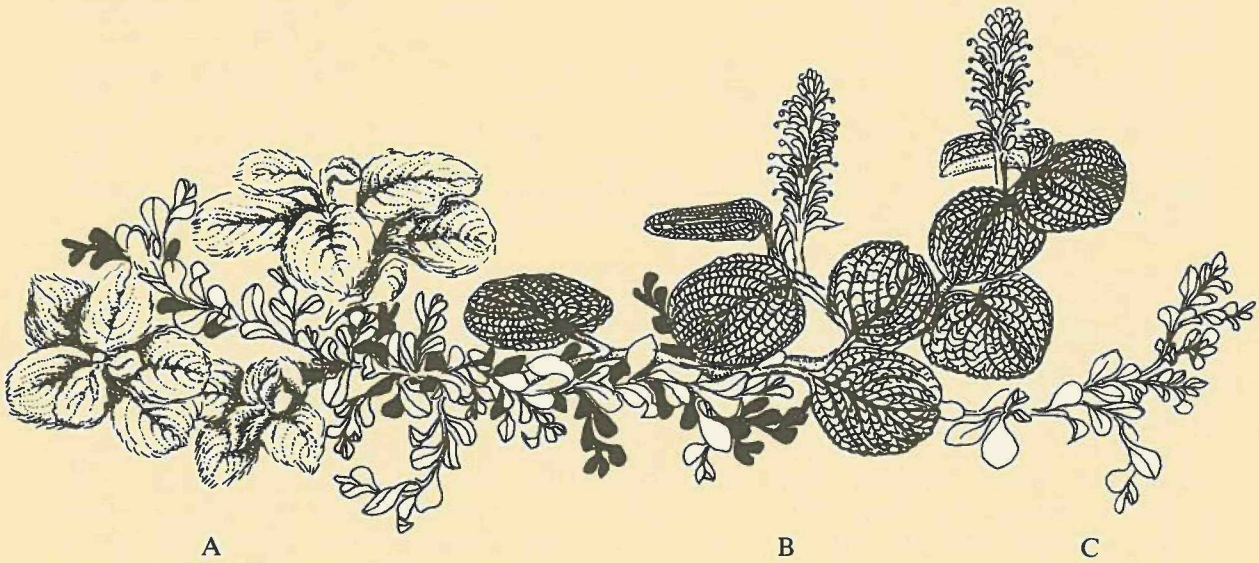


FIGURE 2. Three *Salix* species from Europe, all x 0.80. A. *Salix boydii,* B. *Salix retusa,* C. *Salix reticulata.*

Other attractive deciduous shrubs are the Willows, ranging from small creeping alpine species to medium sized shrubs. *Salix schraderana* and *S. hastata* cv. Wehrhahnii are medium-sized shrubs, the former bearing red-anthered catkins (on staminate plants), the latter yellow-anthered ones. Much smaller in size is the natural hybrid *Salix* x *boydii,* a gnarled slow-growing willow of upright habit found on a single occasion in the wilds of Scotland almost a hundred years ago. All the plants presently in cultivation have been propagated from cuttings from that single plant. It is a female clone (*Salix* are dioecious, with male and female flowers on different plants) with small grey catkins seldom produced. Our plant has nonetheless spawned a few seedlings beneath it, the result, presumably, of pollination by one of the nearby species. Growing close by are the presumed parents of *Salix* x *boydii,* the prostrate mat-forming *Salix reticulata* and the somewhat larger *S. lapponum,* Lapland Willow. Perhaps the smallest of the Willows is *Salix retusa* which forms extensive mats closely hugging the contours of the rocks over which it flows its flexible branchlets clothed with very tiny polished green leaves.

While the Willows have a subtle appeal, some other European shrubs are much more flamboyant. The Rhododendrons, for example, of which there are really only three European species dwarf enough for the rock garden as contrasted with the enormous number from Asia. *Rhododendron ferrugineum,* with rust-colored scales on the lower leaf surface, and *R. hirsutum,* with fine hairs on the leaf margins, are both from the Alps where they set the mountain pastures ablaze with color as far as the eye can see. Both are referred to as the "Alpenrose". Both species bear clusters of pink flowers appearing in June, just when the main flush of spring flowers is over in the garden. *Rhododendron hirsutum,* incidentally, has the distinction of being the first Rhododendron introduced into cultivation in 1656. The other dwarf European species is *Rhododendron kotschyi,* a closely related species from the Carpathian Mountains of Eastern Europe which flowers even later, well into July.

There are quite a few European representatives of the genus *Daphne,* all of which are prized as much for their exquisite fragrance as for their beauty of flower. Some are tricky in cultivation being prone to expire for no accountable reason and are afforded the protection of the Alpine House. Some are thriving in the open garden and of these *Daphne cneorum,* Garland Flower, must be counted among the very best of all rock garden plants. It is a spreading shrub of 25 cm or so in height with innumerable clusters of rosy-lilac flowers in April and May, the buds are crimson, and so fragrant that the air is charged with their perfume. These are well-established on the large rocky cliff overlooking the lower meadow. Nearby, also nestling among the rocks, is *Daphne collina,* another first-rate rock garden shrub. It has handsome dark green glossy leaves that are all but hidden beneath the tight clusters of lilac flowers in May. *Daphne arbuscula,* in the peat bed at the foot of the rocky cliff, is one of the tricky ones, and cannot be said to have settled in happily there yet. It is a dwarf, rounded, evergreen shrub of frustratingly slow growth, and with flowers of a good shade of lilac-pink, very large for the size of the plant. *Daphne blagayana,* in the upper meadow area, is a low, sprawling shrub with creamy-white flowers that continue for several weeks in early spring.

Some members of the family Cistaceae are used extensively in this section of the garden. They are mostly natives of the Mediterranean region and are not all reliably hardy, but they do extend the flowering season well into the summer months. The genus *Cistus,* Sun Rose, is represented by at least half a dozen species or hybrids. They are very densely foliaged plants reaching about 1 m in height, and are valuable as visual barriers in certain areas. *Halimium ocymoides* is a charming, dwarf gray-leaved shrub bearing bright yellow flowers with contrasting brownish markings in their centres. It has crossed with *Cistus salviifolius* to produce the interesting bigeneric hybrid x *Halimiocistus wintonensis* with its beautifully white, maroon-centred flowers. Another bigeneric hybrid of this group is x *Halimiocistus sahucii* (*Halimium umbellatum* x *Cistus salviifolius*) which has pure white flowers extending from May well into September. The really dwarf members of the family are the Helianthemums or "Rock Roses", more or less prostrate shrubs under 15 cm or so. More than a dozen cultivars or hybrids of *Helianthemum nummularium* are represented, with flowers in shades of pink, orange, copper and yellow.

FIGURE 3. x *Halimiocistus wintonensis,* x 0.80.

The lower meadow has been planted with many species of mat-forming plants which in time will weave an intermingling tapestry of color and of fragrance, which will also be interesting and attractive throughout the year. Some of the plants used in this alpine meadow are species of *Arenaria, Campanula, Dianthus, Gentiana, Herniaria, Iberis, Lithospermum, Thymus* and *Veronica.* Bulbous plants are dotted about here and there — *Crocus, Narcissus, Galanthus* and *Cyclamen* — and in a place where a little light shade is cast by the *Corylus avellana* cv. Contorta there is an extensive planting of some of the European terrestrial orchids. These plants, species of *Orchis, Dactylorhiza, Ophrys* and *Aceras,* produce most interesting, showy spikes of flowers in shades of cream, mauve and purple in late spring. Considered difficult to raise from seed, these orchids have nevertheless begun to seed about naturally in a most gratifying manner.

Gentiana acaulis, colonies of which appear in the alpine meadow and on the rocky cliff face, is one of the showiest of alpines, the stemless trumpet flowers being of such a pure rich shade of deep blue as to be the standard by which the blueness of other flowers is judged. This Gentian presents a baffling problem in cultivation; in some gardens it will bloom with the utmost abandon while in others the identical clone will steadfastly refuse to flower freely. Much has been written about this problem and it has been the subject of many an experiment, yet the real reason for its shyness in some gardens has yet to be explained conclusively. Fortunately, our plants bloom very well indeed, but whether this is because of, or in spite of, the large quantity of well-decayed horse manure that was incorporated in their soil at the time of planting is uncertain.

The blue of the Gentian's flowers is rivalled if not actually surpassed by that of *Lithospermum prostratum* (*Lithodora diffusa*), a spreading, evergreen, half-shrubby member of the Borage family. The intensely blue flowers, 1.25 cm long, are produced over a long period in May and June. The cv. Grace Ward has somewhat larger flowers and is less exacting as a garden plant. A good foil to grow near the *Lithospermum* is *Cytisus* x *kewensis* (*C. multiflorus* x *C. ardoinii*) with its cascades of pale creamy-yellow flowers. These two plants compliment each other so well that this close association, seen in so many gardens, is almost a cliche, but nonetheless delightful.

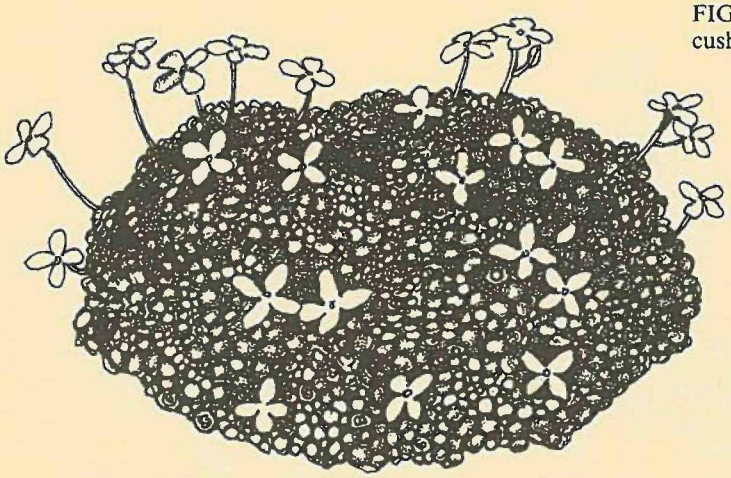


FIGURE 4. *Draba bryoides* var. *imbricata,* a small cushion plant with golden yellow flowers, x 0.80.

The southern end of the European section is reserved for some of the more difficult high-alpine species. Here, in the scree among the tufa rocks, grow many diminutive treasures that could be overlooked in the course of a quick walk-by. Among them is *Pulsatilla vernalis* which the great plant explorer and writer Reginald Farrer rhapsodically dubbed "Queen of the Snows". It blooms as soon as the snow melts in its native habitat of the high Alps and Pyrenees. In the garden its pure white flowers with a central boss of golden stamens appear in March, arising from a small rosette of foliage to a height of 7-10 cm. The effect is enhanced by the thick covering of silky, silvery hairs that cover the stem and calyx of the flowers. There are many cushion plants in this tufa scree. *Armeria caespitosa* forms large cushions with almost sessile heads of pink or white flowers. The many species of *Draba* are tight buns with mostly yellow flowers on thin wiry stems. *Draba polytricha* and *D. bryoides* var. *imbricata* are outstanding species in this genus, with particularly tight symmetrical cushions. The closely related *Petrocallis pyrenaica,* another tight cushion, covers itself with small heads of fragrant cruciform flowers of pale lilac. *Douglasia vitaliana,* a member of the Primula family, forms a spreading mat of gray-green leaves, a fine background when spangled with its clear yellow flowers. *Phyteuma comosum,* a Campanulad from the Dolomites, is a lime lover that appears to be happy in its tufa crevice, although it has not yet flowered. The flowers, on 5-7.5 cm long stems, are of a color somewhere between pinkish-purple and blue, and of a shape likened by Farrer to a cluster of little soda-water bottles.

So rich is the European flora, and so strong is the desire to grow them all, that it is difficult to avoid a confusing, spotty effect in the planting. An attempt has been made to overcome this effect by grouping certain genera (e.g., *Primula, Sempervivum*) in their own loosely-defined areas and by using other plants (e.g., *Thymus serpyllum* var. *lanuginosus, Armeria maritima* and certain grasses) as a *leitmotif* throughout the area in order to provide a sense of unity.

2. *North America*

A glance at the map will tell us that the more important North American mountains have a north-south orientation. This means, of course, that the floral distribution along these ranges is governed as much by the latitude as by altitude. Glaciation during the great Ice Age extended halfway down the continent and from ocean to ocean. The southernmost reaches of the glaciers occurred in the west at approximately 47°N latitude and dipped down to 38°N at a point south of the Great Lakes. Thus, the repopulation by plants in the post-glacial period occurred from south of this line, where today most endemic species are to be found. A large part of Alaska was spared from the ice age and repopulation has occurred from that direction as well, mainly of circumpolar and Asian elements.

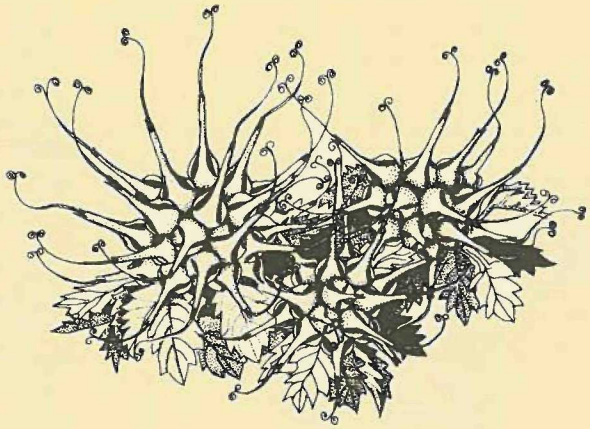


FIGURE 5. *Phyteuma comosum,* x 0.75.

Although plant exploration of North America is reasonably complete, there are new species still being discovered in the more remote regions. As far as alpines are concerned, our knowledge of the plants and their distribution is generally good but there is a pronounced lack in the extent to which these plants have been acclimatized to the point where they could be considered good garden plants. The process of acclimatization involves first the selection of superior or more vigorous forms from the wild and then growing them in cultivation through several generations. Each generation must be reproduced from seed of the most desirable specimens of the preceding generation until finally a satisfactorily garden-worthy plant is obtained. The process, which may or may not involve hybridization, is in effect an accelerated form of evolution, but with most of the chance elements controlled by the hand of man.

There are entire genera of North American plants to which the process of acclimatization could be applied with benefit. The genus *Calochortus* contains sixty species distributed all the way from British Columbia to Guatemala in Central America. But it cannot be said of a single one of these exquisitely beautiful members of the Lily family that it has gained even a foothold as a reliable garden plant. The genus *Trillium* is another example. While the eastern *Trillium grandiflorum* is quite widely grown, none of the other species is likely to be seen as a fast turnover item in our local garden centres. And so it goes with *Eriogonum, Erythronium, Lewisia, Penstemon,* and *Phlox.* Each of these genera offers a tremendous potential reservoir of garden plants but, with few exceptions, the surface has barely been scratched. *Phlox subulata* has, admittedly, given us a number of first-rate easily grown cultivars and hybrids, but there remains a vast number of yet-to-be-tamed *Phlox* species in the mountains of western North America that offer even greater potential.

There are, of course, a good number of North American species that are both beautiful and easily grown, as there are in other parts of the world. But it is the challenging species that provide both the exhilarating peaks of success and the chastening valleys of failure that together constitute the quintessence of alpine gardening.

From a distance the most noticeable plants in the North American section are the dwarf conifers, used as much for shelter from wind and sun as for their intrinsic beauty. A grove of the popular and well-known *Picea glauca* cv. Albertiana Conica climbs a rocky bank and spills over into the upper woodland meadow. Nearby are scattered specimens of the dwarf *Pinus strobus* cv. Nana, White Pine, with their elegant glaucous-green needles. The innumerable and ever-proliferating forms of *Tsuga canadensis,* Canada Hemlock, are represented by cv. Cole's Prostrate, a grouping of which creates an attractive waterfall effect cascading over some rocks, and by groups of progressively larger forms in cv. Bennett's Minima and cv. Sargentii Pendula.

FIGURE 6. *Calochortus albus,* x 0.80.

Tufa outcroppings appear in three places and in some of these rocks holes have been gouged out for such choice lime-lovers as *Aquilegia jonesii,* a miniature gray-blue foliaged Columbine from the Rocky Mountains of Alberta, Montana and Wyoming. It has pale blue flowers that, unlike most Columbines, face upwards. Another crevice provides a home for *Kelseya uniflora.* When not in flower, this could be mistaken for a clump of moss but it is actually a dwarf, extremely slow-growing shrub of the Rose family with an intricately branched structure of tiny branches and twigs beneath its emerald-green mantle of foliage. The flowers, should they ever deign to appear, are like small, single roses of a translucent pink.

Adjoining the lower southwest path is the dryland scree, in which are grown plants of a more or less xerophytic type from the numerous arid regions of western North America. Care is taken never to artificially water this area; its only water is received as natural rainfall, in itself an excessive amount for many of the plants here. These include species of Cactus and many bulbous and herbaceous plants that go dormant in the summer, such as some of the Lewisias. Plants here include the white-flowered species of *Lewisia nevadensis, L. oppositifolia* and *L. triphylla;* the small deep pink flowered *L. pygmaea,* and *L. rediviva* with gorgeous multi-petalled flowers of glistening pink. Most North American buttercups have yellow flowers but a species from Idaho, *Ranunculus andersonii,* has white ones displayed against handsomely dissected gray-green leaves. Alas, it has adamantly refused to flower here. More accommodating are two species of Evening Primrose, *Oenothera acaulis* and *O. pallida,* both with a succession of ephemeral white flowers that bloom for but a day and then fade to pink.

The bulbous species in this scree have not been planted long enough for a fair trial of their performance but among those that appear to be doing well and even increasing is *Fritillaria purdyi* from northern California. It has formed a small colony of nodding bell-shaped flowers on 10 cm tall stems of a most unusual combination of color markings in shades of yellow, brown, purple and white. The flowers have a glistening sheen which gives them the appearance of being sopping wet. *Fritillaria glauca* from southern Oregon is doing fairly well, though not noticeably increasing. Its specific name refers to its pair of broad glaucous leaves, and its flowers are yellow mottled with deep brown. *Calochortus albus* and *C. amabilis* have managed to produce flowers. Both are of the Eucalochortus section with nodding globe tulip flowers, the former pearly white, the latter yellow.

The woodland meadow in the upper central part of the North American section is made up of a deep humus-filled soil mix over several centimetres of gravel for drainage. Some shade is provided for this area by the aforementioned conifers and by a number of deciduous Rhododendrons of the Azalea series, among them *Rhododendron arborescens, R. occidentale* and *R. periclymenoides* (*R. nudiflorum*). There are about a dozen different species of *Trillium* here with flower colors ranging from the deep mahogany of *T. sessile* cv. Rubrum and the pale yellow of *T. luteum* to the pristine white aging to pink of *T. ovatum*. Some interesting cultivars are seen in *Trillium ovatum* cv. Kenmore and *T. grandiflorum* cv. Flore Plena, both of which have fully double flowers, while *T. grandiflorum* cv. Roseum is a good clear pale pink. Across the path in the peat bed is the so-called tetramerous form of *Trillium ovatum* f. *hibbersonii* (*T. hibbersonii*) from the west coast of Vancouver Island. While this does throw up the occasional flower with four petals, the characteristic is not constant, varying from year to year. In any case, the extra petal adds nothing to the beauty of the plant. Closely related to *Trillium* is *Scoliopus bigelovii,* a most curious inhabitant from the sombre depths of the Redwood Forest of coastal northern California. It has a pair of mottled leaves rather like an *Erythronium,* and short-stemmed, three-parted flowers with broad spreading purplish sepals and unusual upright recurving petals. Its common name, Fetid Adder's-tongue, attests to the foul scent of the flower, an attractant for the carrion flies that are its pollinators. In the garden it blooms in very early spring, cowering under a dwarf conifer as if to protest this pathetic substitute for its native Redwoods.

The inhabitants of the peat bed are a diverse lot of plants that demand good drainage but that must never be allowed to dry out. Prominent in this group are many dwarf members of the Ericaceae family: *Cassiope, Phyllodoce, Kalmia, Kalmiopsis, Andromeda,* and *Rhododendron.* There is an interesting bigeneric hybrid here which can be compared with its nearby parents. The hybrid is x *Phylliopsis hillierii* cv. Pinocchio and its parents are *Phyllodoce breweri* and *Kalmiopsis leacheana.* The hybrid plant is intermediate between the parents in flower and leaf characteristics but appears to be more vigorous than either.

To the left of the peat bed is a steep scree bank that has been planted with numerous *Penstemon* species with flowers of every imaginable shade of pink, mauve, blue, purple, scarlet and, rarely, a pure white albino. Unfortunately, many of these plants are subject to a blight disease that causes a sudden and complete dying off, so they cannot be regarded as permanent residents and must constantly be replaced. Quite a number of self-sown seedlings have appeared, however, some of them being obvious hybrids.

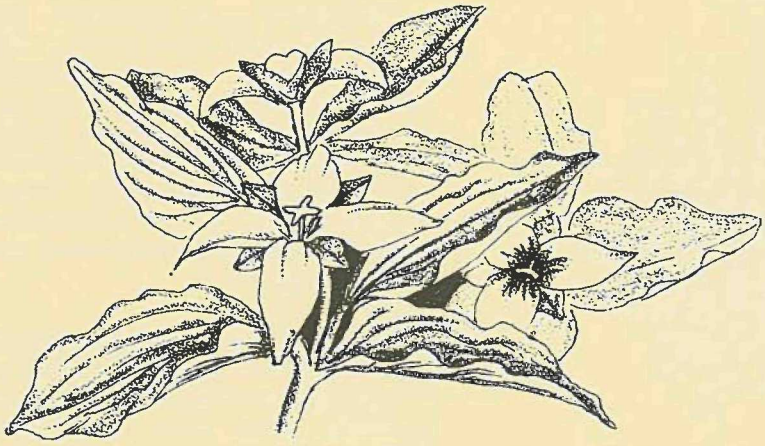


FIGURE 7. *Trillium ovatum* f. *hibbersonii,* tetramerous form, x 1.20. Note that both trimerous and tetramerous flowers are present.

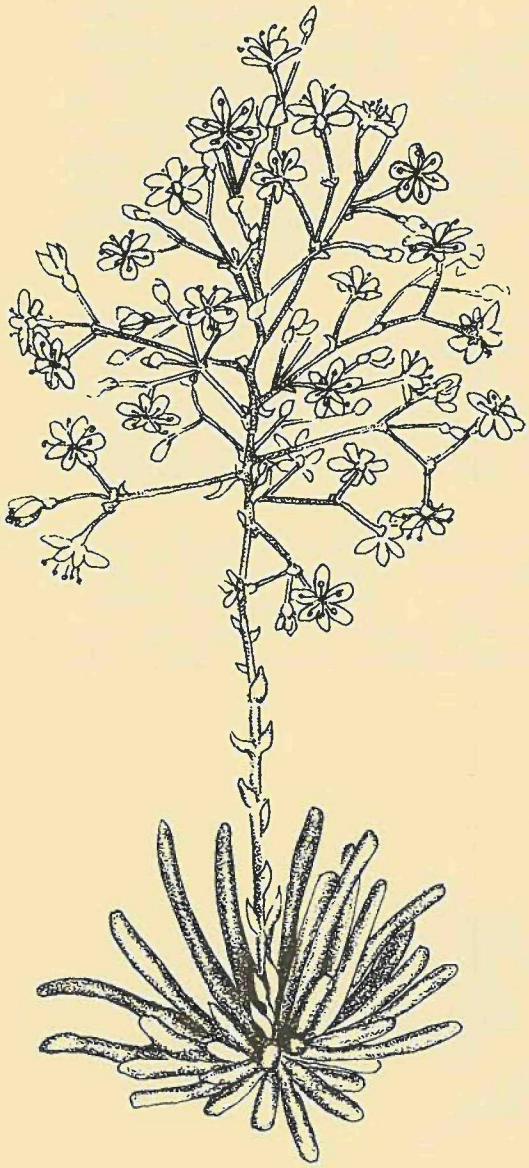


FIGURE 8. *Lewisia leana* from California and Oregon, x 1.00.

A collection of *Iris* species is centred at the top end of the path along the west side of this section. Most interesting, perhaps, are the group known colloquially as the Pacific Coast Irises or botanically as the series Californicae. These are beardless, rhizomatous Irises that are, in general, small and compact, and have narrow, grasslike leaves. They are found in the mountain ranges of California and Oregon with one species, *Iris tenax,* extending up into Washington. As garden plants, they present no problems, requiring only a well-drained, leafy, sandy soil in full sunshine. Probably the most attractive species is *Iris innominata.* It is 20-25 cm tall, with typical narrow, grass-like leaves, and well-proportioned flowers usually in shades of buff-yellow but varying to mauve, bronze and purple.

A little lower along this path may be seen a dry-wall containing a number of the evergreen species of *Lewisia.* These plants form succulent rosettes of more or less spathulate leaves from which arise the flower stems, each with several flowers. The colors vary from magenta-pink in *Lewisia columbiana* and *L. leana,* to pale pink in *L. cantelovii* and various shades of pink through a rather overly vibrant orange in the many forms of *L. cotyledon.* The showiest member of this group is *L. tweedyi* from the Wenatchee Mountains of Washington and a recently reported station at Manning Park in British Columbia. The large flowers of this species are deep pink in bud, opening to a rare and lovely shade of creamy apricot.

3. *Asia*

The greatest of the continents, Asia covers fully a third of the world's land surface. The Himalayas, the highest and most rugged mountains on earth, form a vast complex to the north of India. At the western end of the Himalayas, mountain chains radiate in all directions from the Pamir Knot, dividing the continent into isolated compartments. These ranges extend westward as far as the Mediterranean and to the northeast range after range stretch away to the shores of the Bering Sea.

That this vast area should contain alpine plants high in quality as well as quantity is not surprising. Many have been introduced into cultivation by plant explorers whose names are legendary — Fortune, Wilson, Kingdon-Ward and Farrer. Some have survived and now grace our gardens, others have died out and need to be re-introduced. And there is almost certain to be a great number of as yet totally

undiscovered species. Unfortunately, the era of the great plant-hunters is at an end and access to many of the more promising regions is at present denied to outsiders for political reasons.

Because a large number of Asian alpines are space-consuming shrubby plants, there are two adjoining sections of the garden allotted to them. One is a large rhomboid-shaped area, and the other is the smaller area immediately to the north that is shared with Asia Minor.

The larger lower section is dominated by a small pond, around which are arranged, very sparingly, a number of plants chosen to give the pond something of the character of a true mountain tarn. To this end, the ground cover of spontaneous moss has been encouraged, and the temptation to fill the pond with water lilies and goldfish has been stoutly resisted.

Trees planted for the shade they will ultimately provide in the Asian section include several specimens of *Pinus parviflora,* Japanese White Pine, and a selection of maples including *Acer japonicum* cv. Aconitifolium, *A. ginnala, A. griseum,* and scattered specimens of *A. palmatum* cv. Dissectum. The principal dwarf conifers used are forms of *Chamaecyparis obtusa, Pinus thunbergii,* and *Cryptomeria japonica.* Solid masses of color are provided by the many dwarf Rhododendrons and by the mass planting of *Primula* species, including *Primula chionantha, P. kisoana, P. rosea,* and *P. denticulata* in purple, maroon, and white forms.

Two species of flat-growing, creeping brambles are proving to be excellent ground-covers in certain areas. One is *Rubus nepalensis,* a more or less deciduous creeper with sparse pink flowers on short stems. The other is *Rubus calycinoides,* an evergreen species with small mallow-like leaves, interestingly crinkled, and white flowers in summer.

Small ericaceous plants are grown in special peat beds and also are interspersed among the Rhododendrons. Among the more unusual members of the Ericaceae family is the monotypic *Tsusiophyllum tanakae.* It is a small partially evergreen shrub that closely resembles a deciduous Azalea in habit. The small leaves are covered with fine silky hairs and the small tubular white flowers in terminal clusters appear in June. In truth, it is perhaps more interesting than beautiful.

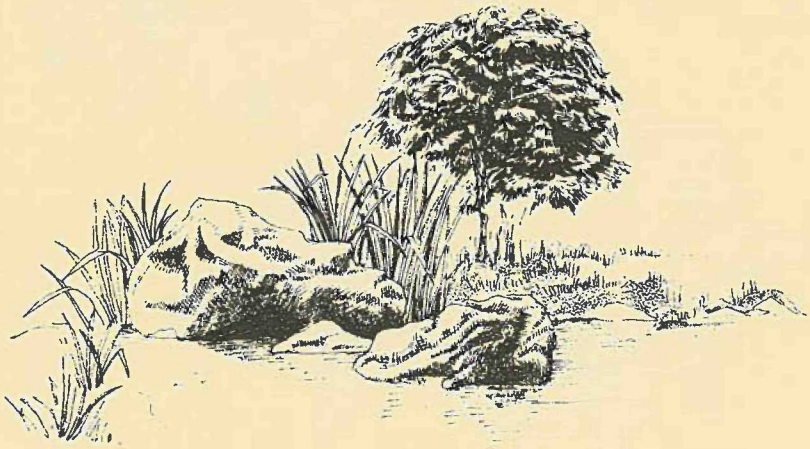


FIGURE 9. View near the dry creek bed in the Asian section of the Rock Garden, showing *Acer aconitifolium* cv. Dissectum, a dwarf form which grows to about 90 cm tall.

Another member of this family is *Arcterica nana*, a small spreading shrublet about 7.5 cm in height. It has tiny box-like leaves and racemes of small lily-of-the-valley type white flowers. Rather similar in habit is *Bryanthus musciformis,* the sole member of another monotypic genus. It, too, is a small, flat, spreading evergreen but has four-lobed pink flowers that are seldom freely produced. *Gaultheria sinensis,* another small evergreen shrublet, is grown not so much for the rather insignificant white flowers but for the large showy robin's-egg blue berries that appear in late summer. Although it comes from upper Burma and the adjacent parts of Yunnan and Tibet it is not reliably hardy in the garden and is grown in a sheltered spot.

The islands of Japan have given us a great number of truly outstanding plants that thrive in woodland conditions or that at least require a modicum of shade for their welfare. The peat bed in the upper section is home for a number of these, of which the genus *Shortia* in the family Diapensiaceae ranks as one of the finest. *Shortia soldanelloides* forms a spreading mat of tough glossy green foliage that in fall takes on subtle tones of a deep red. In spring the flowers appear, clusters of fringed pink bells that are similar in shape to the European Soldanellas. There are a number of varieties of this Asian species, the differences being mainly in the size and shape of the leaf. The variety *intercedens* is an exquisite white-flowered form. *Shortia uniflora* is similar in general habit to the preceding but has larger more widely-opened white flowers delicately suffused with pink. Its variety *grandiflora* has even larger flowers and is more free-flowering.

Tanakaea radicans is yet another monotypic genus that comes from Japan and China. It belongs to the Saxifrage family, and is a delightful little woodlander that extends by creeping rhizomes and stolons. The pointed leaves are light green and of a leathery texture while the white flowers resemble miniature clusters of *Spiraea*.

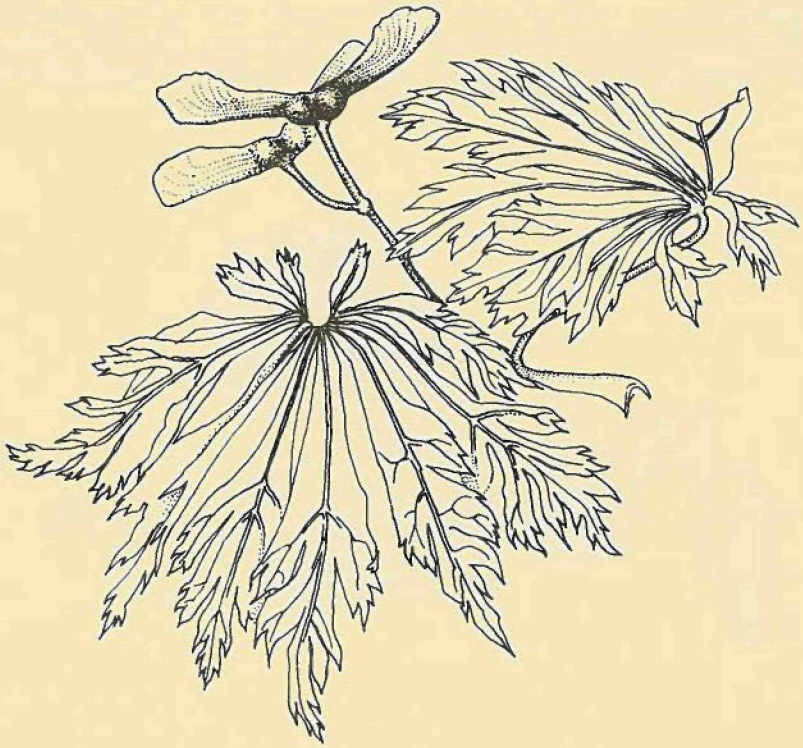


FIGURE 10. Leaves and samaras of *Acer aconitifolium,* x 0.70.

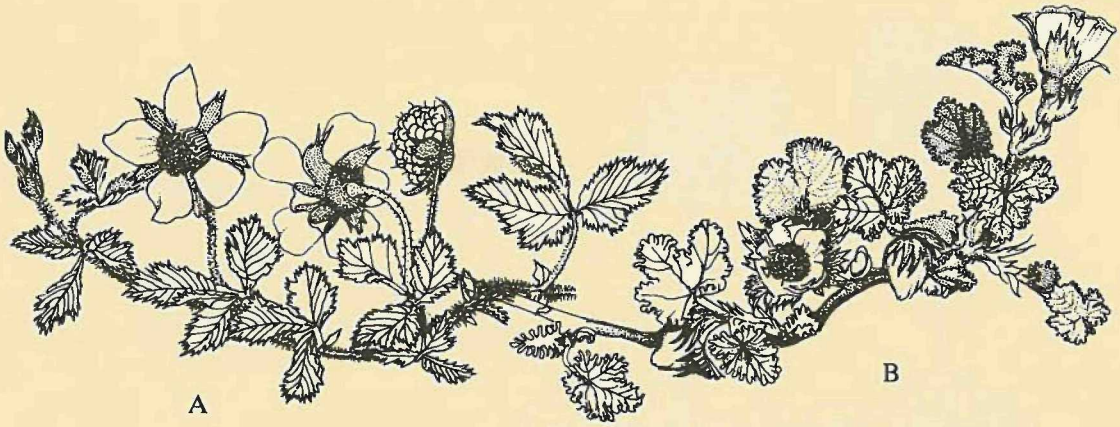


FIGURE 11. Two species of *Rubus* used as ground cover in the Asian section. A. *Rubus nepalensis,* B. *Rubus calycinoides,* both x 0.75.

There are a great many other Asian shrubs of a scale only somewhat larger than those discussed so far. Some of them are little-known dwarf forms of genera that have been familiar in gardens for centuries. *Forsythia viridissima,* for example, is a stiff erect shrub reaching 2.5 m in gardens, while the dwarf form *F. viridissima* cv. Bronxensis is a relatively recent introduction of horticultural origin. It is seen on one of the rocky slopes of the garden as a 30 cm high mass of congested branches densely clad in spring with conspicuous pale yellow flowers. *Syringa vulgaris,* Common Lilac, a shrub up to 6 m tall and long beloved of gardeners, has a dwarf counterpart in *Syringa palibiniana.* This latter species, while it may reach 2 m or more in old age, takes many years to do so and begins to flower profusely as a plant scarcely 60 cm tall. Again, the familiar Rowan Tree or Mountain Ash has a dwarf representative in *Sorbus reducta,* a crimson-fruited Chinese shrub that grows to less than 60 cm tall.

The Asian Androsaces are, in general, larger and more easily grown than the European ones. Typical of the many good Himalayan species is *Androsace sarmentosa,* which forms a mat of stoloniferous rosettes, each 2.5-5 cm across, of silvery, hairy leaves. The short-stemmed flowers are in large umbels and of a good pink color. A variable plant, it has given rise to a number of forms varying in rosette size and flower color shade.

Of all flowers, the Gentian is perhaps the most evocative of the mountain heights. While the European species flower mostly in spring, the Asian continent contains a wealth of species that provide brilliant splashes of color in late summer and fall. *Gentiana sino-ornata* is perhaps the easiest and most prolific of this otherwise rather demanding group. It forms an expanding carpet of central rosettes from which arise the leafy stems terminating in deep blue, upturned flowers with bandings of purple.

4. *Asia Minor*

"Asia Minor" in the true geographical sense refers to Turkey-in-Asia or Anatolia. In the garden, however, we have chosen to extend the Asia Minor section to include all of southwest Asia to the west of, and including, Iran and the Turkmen S.S.R., as well as the Caucasus region of European U.S.S.R., and Cyprus. The reason for these seemingly arbitrary boundaries is that the plants of the region have affinities that transcend geographical boundaries. The whole area encompasses the centres of distribution of a great many related species, many of them endemics. At the same time, it forms the crossroads where floral elements converge from eastern and northern Asia, Europe, the Mediterranean Basin, and Africa.

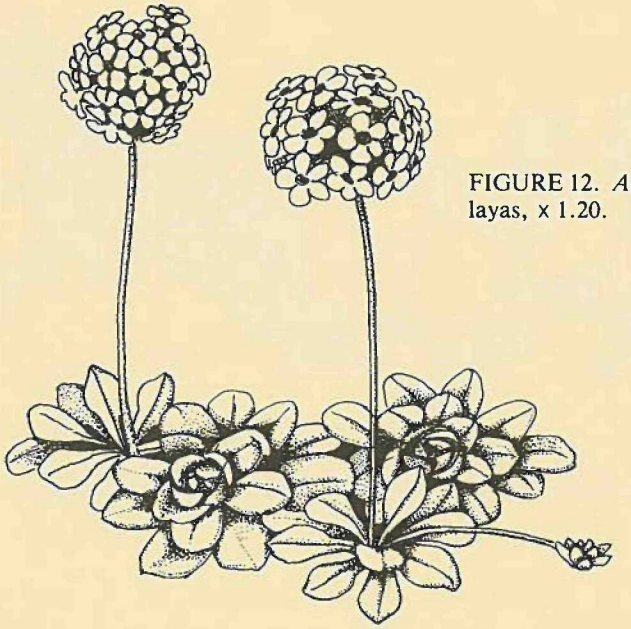


FIGURE 12. *Androsace sarmentosa* from the Himalayas, x 1.20.

The principal mountains of the region are the Taurus Mountains and the Pontic Alps (Doğu Karadeniz Dağlari) of Turkey, the Caucasus Mountains of the U.S.S.R., and the Zagros and Elburz Mountains of Iran. The highest peak is Mount Demavend or Qolleh-ye Damāvand (5600 m) in the Elburz Mountains.

In general, the climate of the region is very hot and dry in summer but extremely cold in winter in the mountains and high plateaux. The average annual precipitation is very much less than that of the garden. Thus, the difficulties of cultivation for many of the plants of the region are caused by our excessive rainfall, and this is another part of the garden where very little artificial watering is required. Moreover, this part of the garden is composed largely of fast-draining sloping screes, and is topped by a section of the *Thuja* hedge, the searching roots of which tend to dry out the soil in the summer. These conditions approximate the dry summer soil in the mountains of Asia Minor.

The foundation planting in this section includes *Cedrus brevifolia* from the mountains of Cyprus. While it is not a dwarf form and will attain approximately 12 m after many years, it is very much more slow-growing and has much shorter needles than other species of *Cedrus*. The other Cedar species native to Asia Minor is the famed and picturesque Cedar-of-Lebanon, our representative being the dwarf, mound-forming *Cedrus libani* cv. Nana.

Placed in a spot where it will eventually provide some shade for a collection of *Cyclamen* species, is *Carpinus orientalis,* Oriental Hornbeam, a small tree or shrub with small hazel-like leaves. It is most attractive in the fall when laden with pendant, hop-like clusters of fruit.

Another small tree or large dense shrub is *Phillyrea latifolia* cv. Spinosa which has elegant, glossy, dark green leaves. The rather dull, white flowers are not particularly attractive but it makes an excellent windbreak as it is quite hardy.

Gray-leaved plants are characteristic of the Mediterranean elements of this section. Easily the most dominant of these is *Phlomis fruticosa,* Jerusalem Sage, which is a shrub reaching 1.5 m tall. It is valued for its free flowering in June when the flowers appear as pale yellow swirls around the ends of the branches.

Daphnes are represented by the well-known *Daphne mezereum,* which is especially valued for its very early flowering before the leaves appear, and by an interesting hybrid, *Daphne* x *burkwoodii* cv. Somerset. This is a cross between *D. cneorum* and *D. caucasica* which is evergreen in a mild winter and which produces abundant, deliciously fragrant, pale pink flowers in June.

Among the tall herbaceous perennials are a number of somewhat coarse Campanulas of the *Campanula alliariifolia — C. makaschvilii* ilk; some Hellebores of the *Helleborus orientalis* aggregate with large saucer-shaped flowers whose underlying creamy-white color is suffused, tinted and speckled with greens, browns, and purples; and a most noble Paeony in *Paeonia mlokosewitschii.* Reginald Farrer's description of this latter plant in "The English Rock Garden" is a classic:-

> *"Paeonia MLOKOSIEVITSCHII. [sic] — This pleasant little assortment of syllables should be practised daily, but only before dinner (unless teetotal principles of the strictest are adopted), by all who wish to talk familiarly of a sovereign among Paeonies — a rare plant, and rendered almost impregnable by its unpronounceable name. It has an ample habit and lovely dark foliage, amid and above which are borne huge flowers like strayed water-lilies of delicate saffron or citron yellow. It is in the wilds of the Caucasus that this temptation has its lair."*

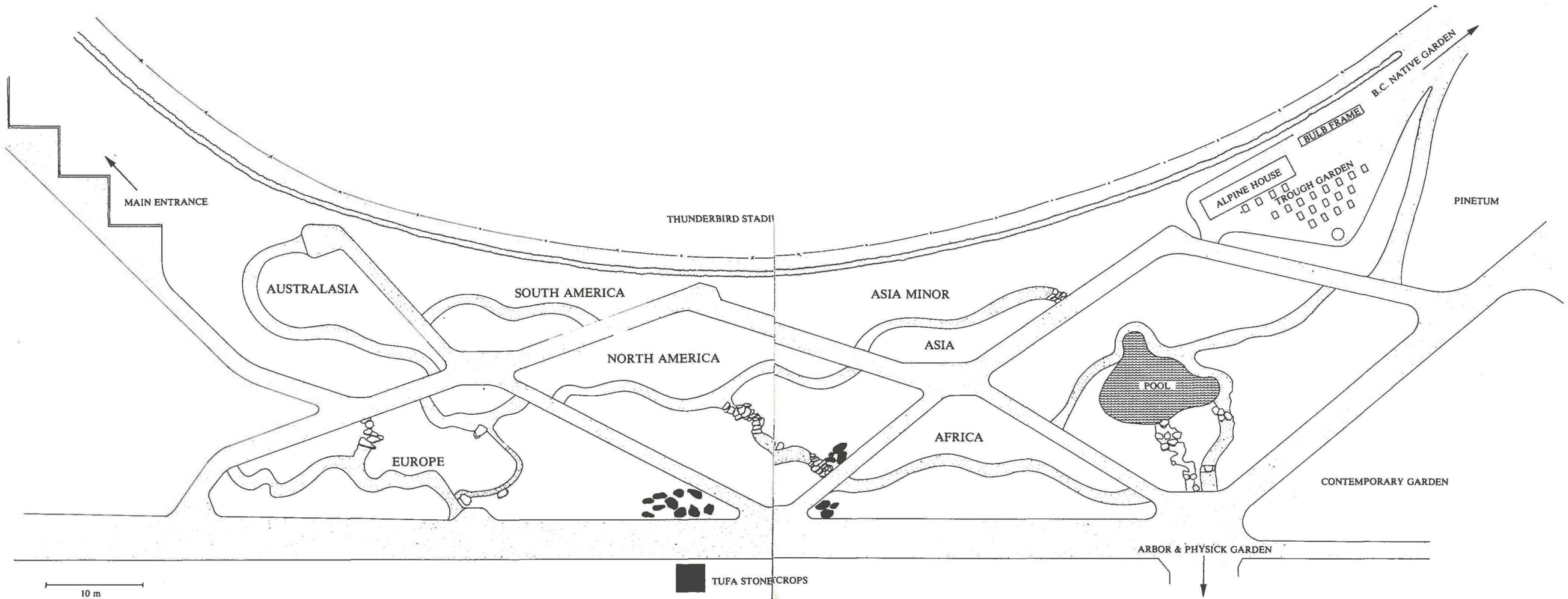
Various forms of *Aubrieta* glorify the garden in the spring with sheets of every imaginable shade of rose, violet, and lavender. There is some disagreement as to whether these are cultivars of *Aubrieta deltoidea* or whether they are hybrids with other species. In comparison, the type form of *A. deltoidea* as seen in the mountains of Anatolia is a wan thing indeed. Equally confused is the parentage (and consequently the name) of a nearby companion plant. Described as *Aethionema* cv. Warley Rose or *A.* x *warleyense,* it is variously thought to be derived from *Aethionema coridifolium, A. pulchellum* or *A. armenum.* It is a spreading, sub-shrubby perennial, 15-20 cm tall, which is breathtakingly beautiful when solidly smothered with its deep pink flowers. Unfortunately, it has a weak constitution, but benefits from the addition of lime to the soil. A good foil for this are the paler pink flowers of the somewhat larger and looser cushions of *Aethionema grandiflorum.*

Some of the other nearby cushions or mat-forming plants are very much smaller in scale and much more restrained in habit. Tiny tufted species of *Campanula,* such as *C. aucheri, C. tridentata* and *C. saxifraga,* introduce welcome shades of blue and purple; while *Asperula nitida* var. *puberula,* a delicately pink-flowered mat of practically no height, ranks among the choicest in a genus of about eighty species. *Veronica bombycina* is comparable in scale, and its cushion forms a welcome splash of velvety whiteness. The flowers are reddish according to several references, but our form produces pale-blue flowers with a notable lack of abandon. *Draba bryoides* var. *imbricata* and *Gypsophila aretioides* are grown not so much for their flowers as for their intriguing cushion forms. The latter is perhaps the tightest and most compact cushion plant in the garden.

The one characteristic of the Asia Minor section that sets it apart from all other sections in the garden is the great abundance of bulbous plants. That these plants — the true bulbs, as well as corms and tubers — should have evolved in such vast numbers in this part of the world is not surprising in view of the climate of the region. Most of the herbaceous plants take on a brown and desiccated look during the oppressive heat of summer, while the bulbs serenely sit out their dormant period beneath the soil surface, waiting only the rains of fall to reactivate their predestined cycle.

Because the rarer sorts of bulbs are available only as seeds, and as these take from three to seven years to produce flowering-size plants, the garden's collection of bulbs is not a large one. Even so, there is a fair amount of color throughout the year, though, of course, the main blooming season is in the spring.

It is not generally realized that there are some eighty other species of *Crocus* besides the ubiquitous spring-blooming Dutch forms derived from *Crocus flavus* (*C. aureus*) and *C. vernus.* Many of these species begin to flower as early as September (*C. karduchorum, C. speciosus*), with others continuing



Map of The E. H. Lohbrunner Alpine Garden in the Main Garden of The University of Btish Columbia Botanical Garden.

N

on through the winter (*C. kotschyanus, C. pulchellus*). Early spring brings on yet another wave (*C. chrysanthus, C. biflorus, C. korolkowii*). The colors of the early ones are relatively restrained, with lilacs, whites and purples predominating, while spring brings forth the more exuberant yellows and oranges.

Although there are perhaps a dozen species of *Cyclamen* native to Asia Minor, the hardiest and most garden-worthy is *Cyclamen coum*. It may often be seen in flower in the depths of winter, sometimes enveloped in a fresh blanket of snow. It is an extremely variable species, particularly in its rounded leaves, which are generally a rather dull green in color but can take on varying degrees of attractive silvery-green markings. The under-surface is normally beetroot red but may be green, or a combination of the two. The flower color ranges from a less-than-pure white through shades of pink and carmine.

The earliest group of bulbous Irises to bloom are those of the Reticulate section. One of the easiest and showiest of these is *Iris histrioides* cv. Major. Before its narrow, grass-like leaves appear, the flowers burst forth about 2.5 cm above the ground. The broad, velvety falls have a golden ridge outlined in white, emphasizing the quality of the deep rich blue of the body color.

Iris danfordiae, a golden-yellow member of the Reticulate section, follows soon after, usually in February. A challenging plant in cultivation, it has the habit of flowering well for a season or two, but then the bulbs disintegrate into innumerable bulbils which take several seasons to reach flowering size.

Iris reticulata itself is a thoroughly easy-going beauty that is spreading into large colonies in the garden. The flower color is variable — different color forms may be seen in close proximity in the wild — and many cultivars and garden hybrids have arisen in glowing shades of blue, purple and maroon. One of the most attractive is cv. Cantab with falls of Cambridge blue with an orange blotch.

Iris bakerana is similar in habit to *I. reticulata,* but the flower color is more delicate, the falls being medium blue with deep purple markings around the edge and with a yellow spot on the ridge. It is easily distinguished from others in the section by having eight-nerved leaves instead of four-nerved ones.

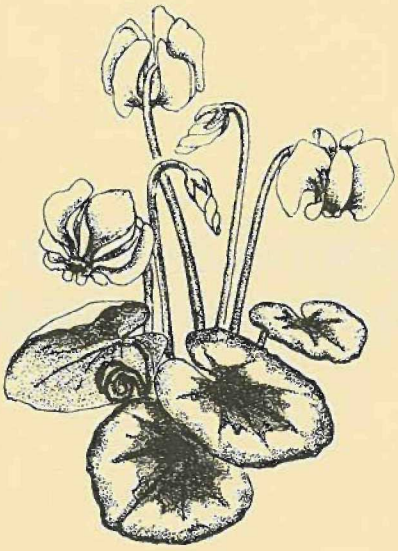


FIGURE 13. *Cyclamen coum,* x 0.60.

Iris aucheri (*I. sindjarensis*) is representative of the Juno section of Irises which have distichous (two-ranked) leaves, and bulbs with fleshy roots that persist even in the dormant season. *Iris aucheri* has pale bluish-white flowers that reach 20-25 cm tall. It is considered difficult, but has been given an extra well-drained scree location, and is slowly increasing.

The characteristics that make the species Tulips so endearing to the rock gardener have been deliberately bred out of the race that fathered the modern exhibition Tulips of the Darwin type. Variations abound within the species. Some, like the stridently scarlet *Tulipa fosterana,* have large solitary blossoms that open out almost flat. Others have tiny blooms, like *T. biflora* and *T. turkestanica.* Many bear from two to eight flowers per stem. Some flowers resemble round goblets; others are star-like when open. The leaves may have a plain or undulate margin, and range in color from emerald-green to blue-green, with curious brown markings in some species.

The genus *Fritillaria* encompasses eighty species distributed over the temperate regions of the Northern Hemisphere, with a goodly number occurring in Asia Minor. However, only a few of these are reliable in the open garden. *Fritillaria imperialis,* Crown-Imperial, is undoubtedly the most statuesque member of the group. The brick-red or orange nodding flowers appear in terminal umbels on stems up to 91 cm tall, and are surmounted by a tuft of green foliage.

Fritillaria nigra produces a single flower of dull sombre purple with a faint checkered pattern on a stem 20 cm tall, while the flowers of the similarly sized *F. assyriaca* are brownish-purple.

The springtime palette of the Asia Minor section is further augmented by the golden yellow of *Sternbergia,* the royal purple of *Muscaria,* the delft blues of *Scilla,* and the green-lined whites of *Ornithogalum.*

The Onion family contains many ornamental, as well as edible, bulbs, and some species extend the flowering period well into the summer. The flowers are in terminal umbels, either tight and globular as in the exquisite blue-flowered *Allium caeruleum,* or lax and drooping as in the yellow-flowered *A. flavum.* The foliage is usually narrow and linear but one species, *Allium karataviense,* is worth growing for the effect of its pair of broad, mottled, glaucous leaves that lie flat on the ground. The rather muddy white or pink flowers appear on stout 15 cm tall stems, and are startling for the size of the umbels which may be up to 15 cm across. The individual flowers are only about 0.8 cm long.

5. *Africa*

Most of the true alpine plants from Africa presently in cultivation originate in two mountain ranges: the Atlas Mountains of Morocco and Algeria in the extreme northwestern part of the continent, and the Drakensberg Mountains at the extreme southeastern part of South Africa. These two regions are separated from each other by over 8000 km, including the awesome expanse of the Sahara Desert and the steaming jungles of tropical Africa. It is not surprising, therefore, that there is little in common between the floras of the two ranges.

The snowy peaks of the Atlas Mountains, with the highest being Jbel (or Djebel) Toubkal at 4165 m, support a flora that is largely of the circum-Mediterranean type. There are a number of interesting endemics, including many species of genera belonging to the Mediterranean element, and a lesser number of species belonging to a purely African element.

The flora of South Africa as a whole is strikingly distinct, not only from that of other continents as might be expected, but even from the flora of the rest of Africa itself. The flora of the Drakensberg is characterized by the abundance of certain families, especially the Asteraceae, Scrophulariaceae, Fabaceae, Iridaceae, Liliaceae, and Orchidaceae.

The highest peak in the Drakensberg is Injasuti, which is 3408 m high. There are far higher peaks in the Ethiopian Highlands and in East Africa — Kilimanjaro (5895 m) in Tanzania is the loftiest peak on the continent — but these areas lie close to the Equator, and have thus far produced little in the way of hardy material.

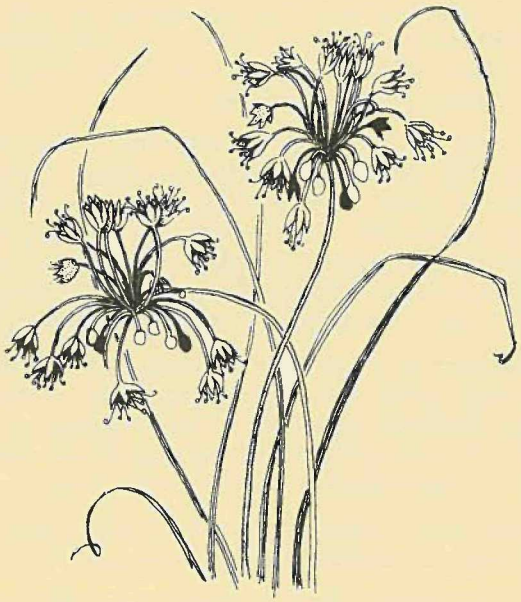


FIGURE 14. *Allium* sp., an as-yet-unidentified species collected in Turkey by Mr. MacPhail, x 0.65.

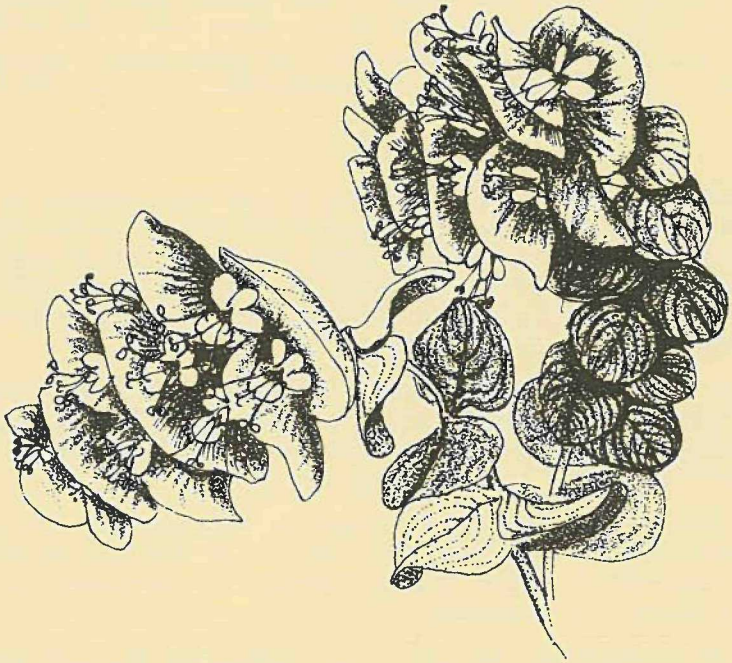


FIGURE 15. *Origanum rotundifolium,* native to Turkey and Iran, has whorls of pale pink flowers between large papery bracts, x 1.20.

The African section of the garden has relatively few rock outcroppings. This gives it a rather barren or, more euphemistically, a veld-like appearance. The large as yet unplanted areas attest to the general unavailability of alpine material from this continent, as well as to the lack of hardiness of much that is available.

The foundation planting, the basic framework that sets the mood for the garden, is at present made up of hardy Mediterranean elements of the African flora: different forms of *Taxus baccata,* and several species of *Cistus.* It is planned to replace much of this with South African material eventually, in order to establish a more exotic mood. Finding the right material is an on-going, and in all likelihood lengthy, process. Certain shrubs have been tried but have not survived the winter, for example, *Buddleia salviifolia.* Currently, a number of *Protea* species and more Ericas are being raised, with the intention of giving them a protective structure of some sort until they become established.

In the meantime, several species of the dwarfer Kniphofias or Red-Hot-Pokers — *Kniphofia galpinii, K. nelsonii* and *K. pumila* — fulfil much the same function as foundation plantings. These are planted in bold groups and clumps, and their evergreen foliage is attractive all year round. The red and orange flower spikes come as a bonus in late summer.

A small shrub that has proved to be perfectly hardy is *Euryops acraeus.* This comes from the Drakensberg Mountains in Basutoland and Natal, where it is described as growing to a height of over 1 m in moist sandy situations on southern (shady) slopes. In the garden, it grows on a sunny dry bank and is a compact rounded shrub about 30 cm in height. The flowers appear in late spring and summer as large yellow daisies attractively displayed above the silvery-gray foliage.

Looking like a small gnarled tree with tiny leaves in perfect scale, *Crassula sarcocaulis* from Natal is a succulent shrub that has also proven hardy in a well-drained spot. The clusters of small pink star-shaped flowers are also in perfect scale with the plant. It has a dwarf mat-forming relative in *C. milfordae* which comes from high elevations in Basutoland. This is a good ground cover for a small area, but is not very free-flowering.

Helichrysum is a large genus belonging to the Asteraceae family, with five hundred species distributed in every part of the world except the Western Hemisphere. *Helichrysum milfordiae,* from high elevations in the Drakensberg, is probably the best of the lot. It is a mat-forming plant with small rosettes of woolly, silvery foliage. In flower, it is literally smothered with short-stemmed silvery-white "everlasting" flowers, very large for the size of the plant. It has been given a rich but well-drained soil, and has spread to over 60 cm across. It is given the protection of a fibreglass cover because the rosettes tend to rot off in a wet winter.

Rhodohypoxis baurii is a dwarf, rhizomatous plant belonging to the Hypoxidaceae family. The strap-shaped leaves are up to 10 cm long and are partially covered with silky hairs. The flowers arise singly from the leaf axils, and have a velvety texture. Cultivar names have been given to a number of attractive color forms ranging from white through pastel pink to chalky red. Although quite hardy, it is not an easy plant to grow in the garden. The rhizomes are inclined to rot off in a wet winter, and so it needs an extra well drained spot. *Rhodohypoxis baurii* was discovered in Natal as recently as 1935, although it is not, apparently, a rare plant in the wild. An account written in 1969 describes it as being "found in myriads all over the 'Berg".

Diascia cordata, from moderate elevations in the Drakensberg, is an effective and colorful, low-growing, ground cover plant. The flowers are pink and have twin spurs instead of the one usually found in the Scrophulariaceae family, to which it belongs. It has been crossed with a taller species, *D. barberae,* to produce the hybrid *D.* x 'Ruby Field' which is somewhat more vigorous.

Many of the plants, especially the bulbous ones, grown in this part of the garden are natives of the rolling grassy plains in the interior of South Africa known as the High Veld. Others come from the Cape Mountains in the southwest, where the latitude rather than the altitude is responsible for the

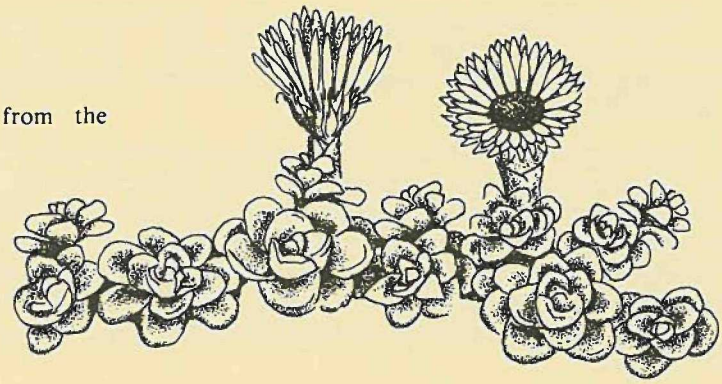


FIGURE 16. *Helichrysum milfordiae* from the Drakensberg Mountains, x 1.25.

existence of many reasonably hardy species. The climate is comparable to that of California: Cape Town is as far south of the Equator as Los Angeles is north of it.

Suddenly appearing out of the bare ground in September, *Amaryllis belladonna,* Belladonna Lily, is a much admired focus of attention. The sheathed bud pierces the ground, then shoots up at the tip of the thick red scape to a height of 45-60 cm within a few days. The sheath splits to reveal several large pink trumpet-shaped flowers, each about 13 cm long and 7.5 cm wide at the mouth. The effect is all the more startling because there is no foliage at flowering time; the broad strap-shaped leaves appear in the winter and die down again in the early summer.

Nerine bowdenii, another member of the Amaryllidaceae, also flowers in the early fall. The translucent pink flowers in loose umbels atop 45 cm tall stems have a lovely crystalline quality that glistens in the sunshine.

The Iris family is well represented with various species of the genera *Homeria, Lapeirousia, Romulea, Schizostylis,* and *Syringodea.* For the most part, their flowering season is also summer and fall. Many of them have not been in the garden long enough to evaluate, nor have most of them yet undergone the rigours of a really severe winter.

In contrast to the generally late-blooming habit of the South African flora, those from the northern part of the continent are mostly spring-flowering, with the bulbous species in the vanguard. The pink-flowered *Crocus nevadensis* has probably migrated to Algeria from its centre of distribution in Spain, as has the fall-flowering pale-lilac *C. salzmannii.*

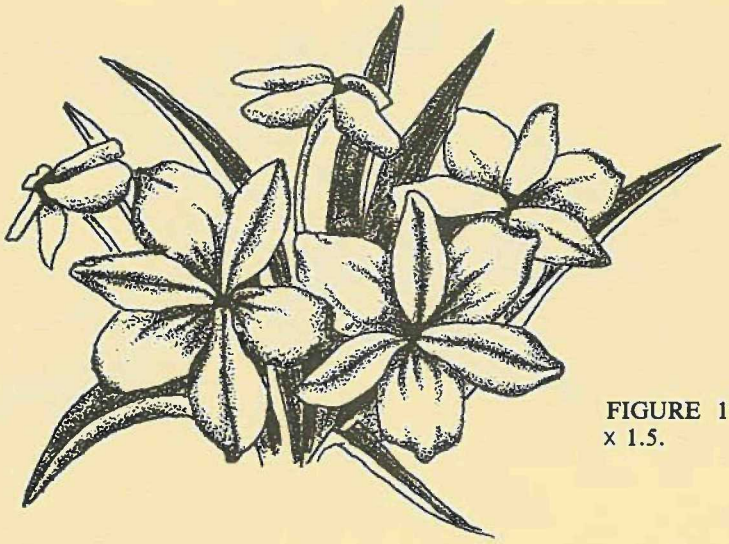


FIGURE 17. *Rhodohypoxis baurii* cv. Albright, x 1.5.

Narcissus watieri is endemic to the Atlas Mountains and is one of the gems of the genus. One of the Jonquil group, it has a snow-white flower, which is over 3 cm in diameter, on a stem up to 15 cm tall.

Two Atlas Mountains endemics, subspecies of *Narcissus bulbocodium,* bloom in the garden before the European type of the species. They are *N. bulbocodium* subsp. *albidum* with pale yellow, almost white, flowers, and subsp. *romieuxii (N. romieuxii).* The latter bears large widely flaring "hoop petticoats" of pale lemon-yellow.

Carduncellus rhaponticoides, unlike most other members of this thistle-like genus, forms a flat rosette of foliage, perhaps 10 cm across. The stemless flowers squat directly on the rosettes like enormous bluish pompoms. *Carduncellus pinnatus* var. *acaulis* is similar in habit but with pinnately dissected foliage. Both are endemics of the Atlas Mountains.

Saxifraga demnatensis comes from just below the summit of Jbel Toubkal, and belongs to the Dactyloides section, which includes the well-known Mossy Saxifrages. It forms a loose mat of pale green, sticky leaves covered with glandular hairs. The flower stems rise well clear of the foliage and bear umbels of up to ten white flowers. Cultivation of this plant in the open garden is problematical; it most likely would be happier in a little shade, as are some of the other "mossies".

In a genus that includes many tall and some rather weedy species, *Erysimum wilczeckianum* stands out as a really first rate rock garden plant. It is a dwarf, tufted perennial with gray-green leaves and clusters of fragrant cream-colored cruciform flowers. It, too, is endemic to the Atlas Mountains.

6. *South America*

The dominant physical feature of the continent of South America is the massive Andes Mountain range. Hugging the west coast of the continent, this geologically complex range is made up of a series of north-south oriented cordilleras between which lies the essentially arid Altiplano, or high plateau, at an elevation of about 3660-4270 m. There are a number of spectacular volcanic peaks and one of them, Aconcagua, is the highest point on the continent at 6959 m. The mountains have a tremendous latitudinal range from 10°N to 55°S, and support a legion of micro-climates depending on latitude, elevation, and exposure. In general, the permanent snow-line at equatorial latitudes in Ecuador and Peru lies at an elevation of approximately 5100 m. The alpine plants

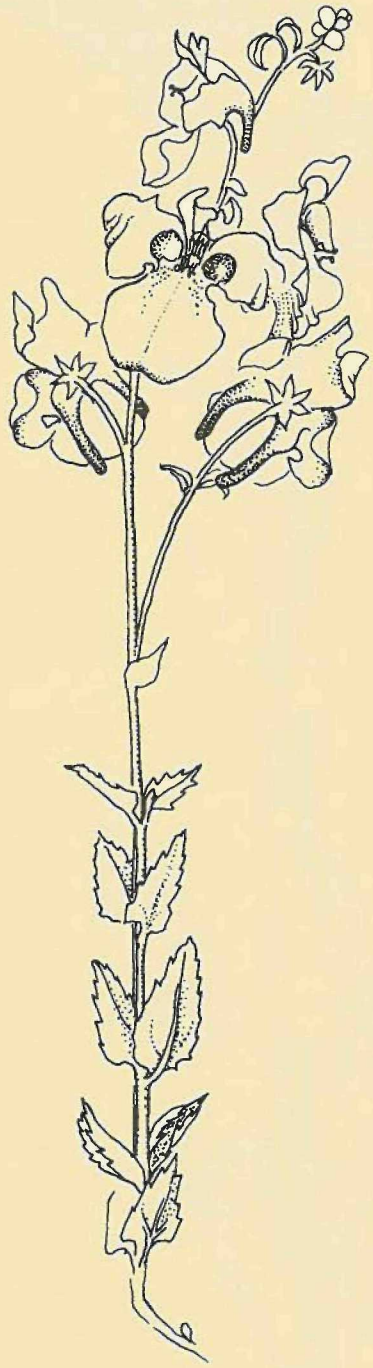


FIGURE 18. *Diascia cordata* from the Drakensberg Mountains, x 0.90. Note the twin spurs on the flowers.

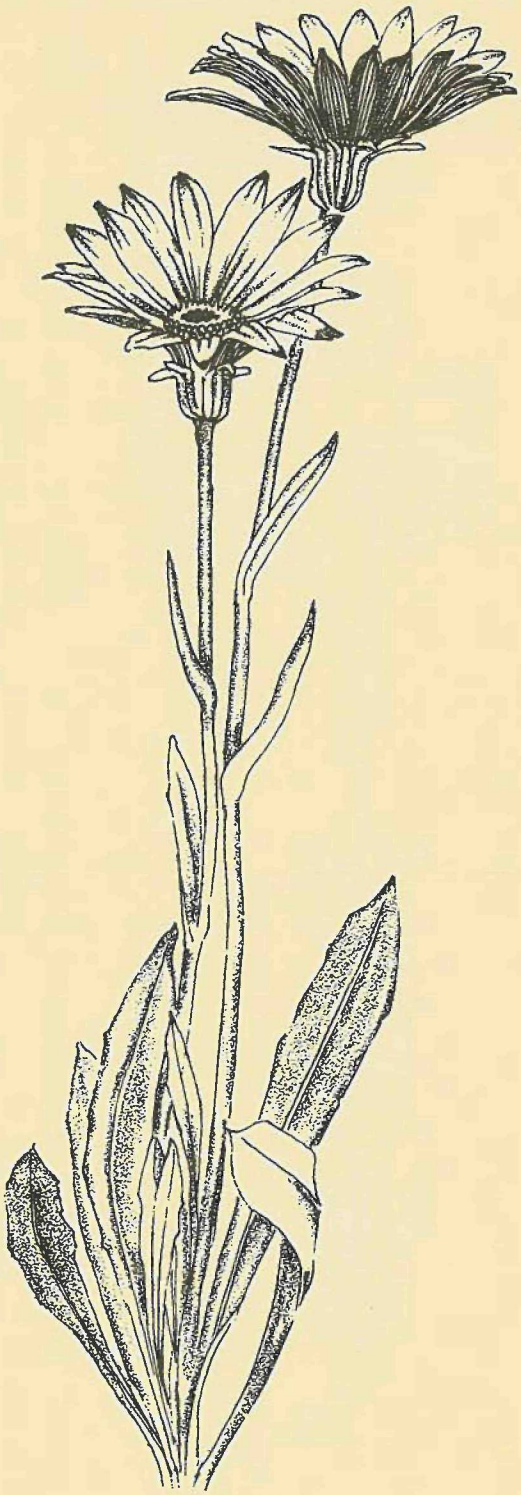


FIGURE 19. *Osteospermum barberiae* (or *Dimorphotheca barberiae*) from South Africa is a somewhat shrubby perennial with daisy-like flowers which are deep purple and over 6 cm across, x 0.75.

from this level down to approximately 3960 m are the most promising ones in cultivation; below 3960 m the plants are not reliably hardy. Because the prevailing winds are from the east, it is the most easterly slopes that receive the most precipitation, while desert conditions prevail for hundreds of kilometres along the lower Pacific slopes of Peru and Chile.

A further complication in equatorial latitudes is the more or less constant length of daylight throughout the year, so that a decreasing length of daylight is not a factor in the initiation of a plant's dormant period. Rather, it is seasonal and regional moisture variations that are the greatest determinants of the plant's growth cycle. As these moisture variations can be capricious, it is not uncommon to find a given species in full flower in one location and with ripe seed on a nearby slope with a different exposure.

More temperate conditions prevail in the southernmost reaches of Chile and Argentina — which extend as far south of the Equator as Prince Rupert (British Columbia) is north of it — and it is these regions that have supplied the bulk of hardy garden plants, particularly trees and shrubs.

Because the section of the garden allotted to South America is exposed to the full brunt of the winter winds, some care has been taken in placing trees and shrubs to act as windbreaks. Particularly effective for this purpose is an as-yet-undetermined species of *Schinus,* a small broad-leaved evergreen tree with a wonderfully dense bushy habit of growth, that has not yet flowered. *Azara microphylla,* a broad-leaf evergreen of somewhat more upright habit, has produced flowers although they are inconspicuous, apetalous, yellowish, and hidden in the axils of the small, shining dark green leaves. Other shrubs, smaller in stature but providing a degree of wind protection, include the magnificent *Berberis darwinii,* discovered by Charles Darwin in 1835 during the voyage of the "Beagle". The flowers appear in prolific racemes of golden-orange in spring, followed by blue, white-bloomed fruits.

Various small-growing Fuchsias are grown for their free flowering in summer and fall. Though most are on the tender side and may be killed to ground level in a cold winter, they will normally send up new shoots in the spring. Nevertheless, they are subjects for the most sheltered nooks and crannies that the garden can provide. They all have pendulous flowers similar in shape to the varieties frequently seen in hanging baskets, but much smaller in size, and infinitely more graceful. Perhaps the hardiest is *Fuchsia magellanica* cv. Tom Thumb which has very abundant flowers with a scarlet calyx and violet petals. *Fuchsia* cv. Iris, a hybrid of indeterminate parentage, has smaller, more slender flowers with a red calyx and pale mauve-pink petals. *Fuchsia minutiflora* and *F. thymifolia* both have red and purple flowers. All of these plants appear in the garden as dwarf shrubs about 0.5 m in height, but their size in any particular year depends on the extent of winter-kill in the previous winter.

The genus *Pernettya* is composed of about thirty species, mostly from Central and South America but with a few species in New Zealand and Tasmania. These members of the Ericaceae family have been mass-planted in certain areas for ground cover. The largest is the well-known *Pernettya mucronata,* whose main attraction is its long-persistent marble-like berries, which appear in shades from pure white through pink and lilac to deep red in the various cultivars. The small prostrate species, such as *P. prostrata* and *P. pumila,* are not nearly as showy in fruit but do have a very attractive habit, eventually forming very neat and tidy green carpets.

If a visitor returns to the Rock Garden at different times of the year, he will soon become aware of the fact that the plants from the Southern Hemisphere do not, as a group, burst forth into flower in the early spring as those from the Northern Hemisphere are wont to do. Rather, they are content to bide their time, awaiting summer conditions of more equal day and night length similar to those in their native climes. This is a fortunate state of affairs as it extends the blooming period of the garden as a whole and, at the same time, avoids the harmful effects of a late frost on the generally less hardy flowers of the Southern Hemisphere plants.

However, there are exceptions, and one such is *Ipheion uniflorum,* Spring Starflower. This plant has undergone several name changes, having been at one time or another a *Brodiaea,* a *Milla* and a *Triteleia*! It is a delightful bulbous plant from Argentina, which flaunts its azure blue and white star-shaped flowers at the ends of 15 cm tall stems in the earliest days of spring. Although each flower is only about 2.5 cm across, the plant increases quickly by offsets and the effect is like a solid sheet of color.

While *Ipheion* is perfectly hardy, many South American bulbs are only half-hardy, and are grown — with some apprehension — in protected pockets. These members of the Amaryllidaceae family include *Habranthus andersonii* with yellow and copper flowers, and various species of *Hippeastrum* and *Alstroemeria* whose long-term permanence is yet to be determined.

Although the genus *Iris* is totally lacking in the Southern Hemisphere, there are South American members of the Iridaceae family that are proving to be thoroughly hardy and accommodating plants, spreading into large colonies and flowering over a long period in the summer months. These plants are in the genera *Libertia, Sisyrinchium,* and *Solenomelus.* All have graceful, more or less arching, iris-like foliage, and predominantly yellow terminal flowers on stems up to 30.5 cm tall. Another Irid, *Orthrosanthus chimboracensis,* which has lavender-blue flowers, is distributed from Peru to as far north as Mexico and is probably much less hardy.

Much lower in stature are the very few hardy members of the very large (about 800 species) genus *Oxalis. Oxalis adenophylla* and *O. enneaphylla* are rather similar in foliage: the gray-green leaves are rounded, about 2.5 cm across, and are divided into nine or more leaflets. *Oxalis adenophylla* has lilac-pink flowers on 10 cm tall stems which arise from a rounded bulb-like rhizome. *Oxalis enneaphylla* has white flowers and a slender horizontal rhizome. A relatively recent introduction is *O. laciniata* from Patagonia, which is, without doubt, the choicest member of this group. It is somewhat dwarfer than the species described above, with fascinating crinkled leaves and pale lilac flowers

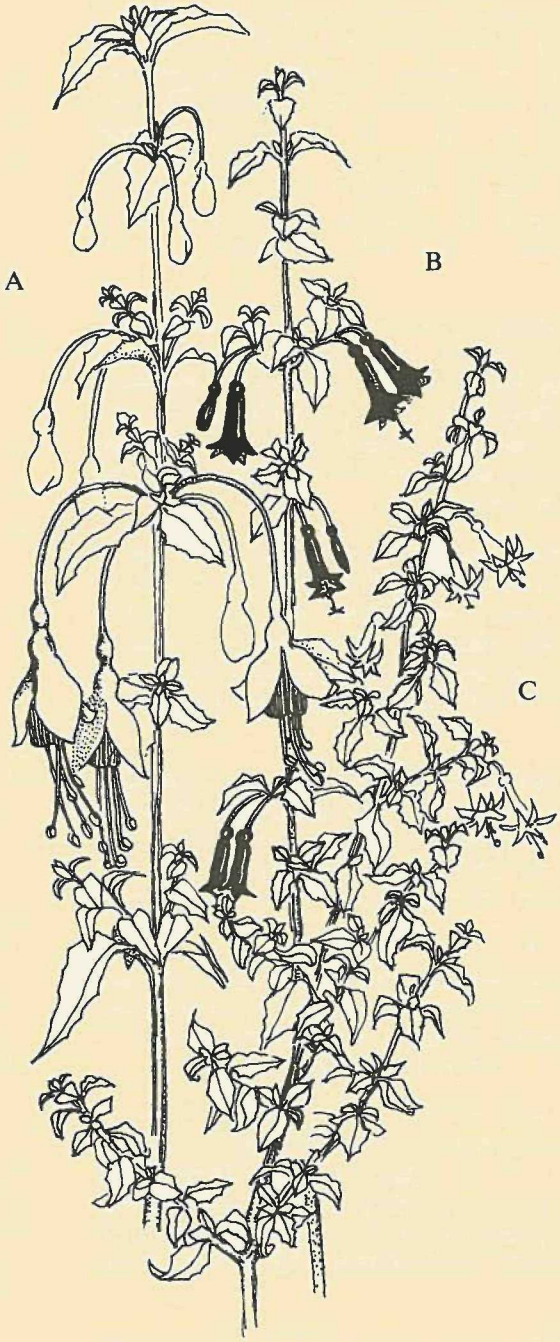


FIGURE 20. Three species of *Fuchsia* from South America, all x 0.90. A. *Fuchsia magellanica* cv. Tom Thumb, B. *Fuchsia* cv. Isis, C. *Fuchsia minutiflora*.

delicately veined with purple. It appears to be less vigorous than the other species, and its performance in the open garden is an unknown quantity.

The genus that perhaps more than any other typifies the exotic other-worldly quality of the South American flora is *Calceolaria*. They are at once curious, because of their slipper-shaped flowers, and charming, especially those dwarf species that produce their flowers either singly or in pairs on the top of a slender scape. The smallest species is *Calceolaria tenella* which has tiny (0.8 cm long) leaves and the creeping habit of *Linnaea borealis*. The citron-yellow flowers are about 1.25 cm long and appear in twos and threes on slender ascending branchlets about 10 cm tall.

Philesia magellanica (P. buxifolia) is another curiosity — curious because, while it is a monocotyledon, it is not easily recognized as such. It was formerly placed in the Liliaceae family but has recently been moved to the Philesiaceae, along with seven other genera including the closely related but much larger *Lapageria*. *Philesia magellanica* is a short-jointed, hard-wooded shrub with leathery evergreen leaves. It is said to attain a height of 1.5 m in its native Patagonia, but it is of such extremely slow growth in cultivation that it is doubtful if it will ever approach that height in gardens. Our specimen is now about twelve years old, having been grown in a pot for some of that time, but it is only 10 cm high, and has shown no inclination to grow at all vertically, although it has spread laterally to some extent. Nor has it yet produced its tubular scarlet flowers, which are reputedly very beautiful.

"Curious" is an adjective which is not easily overworked when applied to South American plants. It could well apply to *Mitraria coccinea,* which is unique in that it is the sole woody member of a family, the Gesneriaceae, that is normally herbaceous, at least as far as the very few other hardy members are concerned. *Mitraria coccinea* is an evergreen shrub, scandent in habit, and prized for its bright scarlet flowers in summer and fall. It is not, in truth, reliably hardy here, and requires at least two consecutive mild winters in order for it to flower, however sparingly. But it is well worth the perseverance!

Saxifraga magellanica is yet another curiosity. It is unique in being the only species of *Saxifraga* native to the Southern Hemisphere. It is closely allied to, and perhaps but a form of, the North American *Saxifraga caespitosa*. It has obviously migrated down the length of the Americas, and one can only speculate on how it managed to cross the Tropics. It forms a slow-growing, green mat of tight woolly rosettes with white flowers in small panicles.

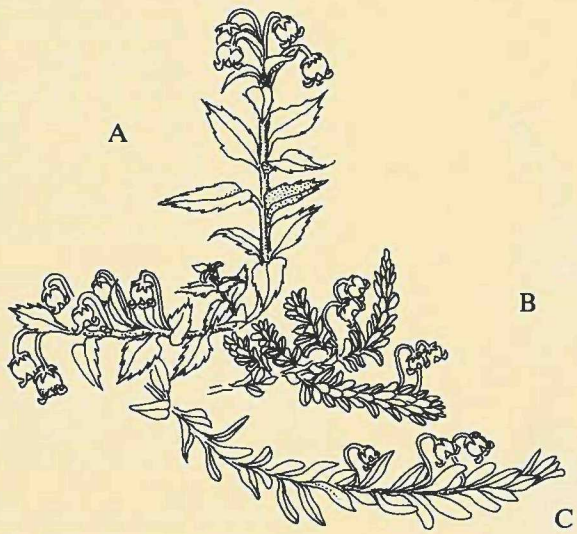


FIGURE 21. Three species of *Pernettya* used as ground cover, all x 1.10. A. *Pernettya mucronata,* B. *Pernettya pumila,* C. *Pernettya empetriformis.*

The annual Nasturtiums of gardens are well-known and widely grown for summer color. But the hardy perennial members of the genus *Tropaeolum* are less familiar. *Tropaeolum tuberosum* is a low prostrate plant with the typical lobed orbiculate leaves of the genus, light gray-green in color and contrasting well with the yellow flowers. It grows from a spreading rhizome and needs careful placing as it can, eventually, overwhelm any nearby less vigorous plants. *Tropaeolum speciosum* is a delicate airy climber that scrambles gracefully through low trees or shrubs. The typically spur-shaped flowers are scarlet, and are followed by equally decorative blue fruits.

Another genus of climbing plants, and one with great potential for gardens in our area, is *Mutisia,* the so-called Climbing Daisy. Unfortunately, the showiest of these members of the Asteraceae family are not the hardiest. *Mutisia viciaefolia,* which has large brilliant orange flowers, was collected as cuttings in Peru at close to 3960 m elevation. In the garden it has been killed outright two winters in succession. *Mutisia spinosa,* however, was grown from seed collected in southern Chile and has survived several winters unscathed, now forming a large mound on the bank in the upper part of the garden. The specific name refers to the spiny-margined, holly-like evergreen leaves. The flowers, though of a rather muddy shade of pale pink, are like large flat daisies about 7.6 cm across, and appear over a long period in the summer and early fall.

Two species of *Verbena* provide welcome pools of color in the waning days of fall. The first is *Verbena rigida,* Vervain, a tuberous-rooted perennial with stiff stems to 4.5 cm tall on which are borne terminal spikes of lavender-purple flowers. The other species, *V. peruviana,* is procumbent with creeping rooting stems. The flowers are in low dense corymbs and are of a vibrant scarlet that is unsurpassed in intensity by any other plant in the garden.

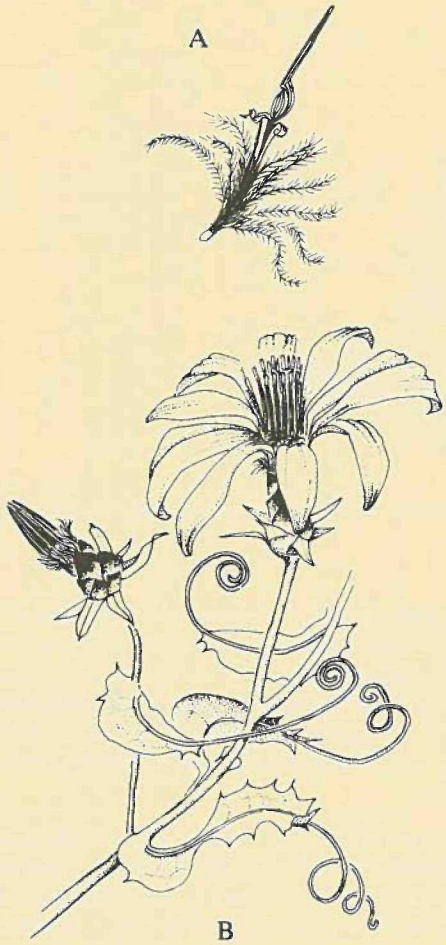


FIGURE 22. *Mutisia spinosa.* A. Individual floret, x 1.10, B. flower stalk showing the daisy-like flower and the spiny-margined leaves, x 0.55.

7. *Australasia*

"Australasia" includes New Zealand, the island continent of Australia, and the nearby islands. The isolated geographical position of the region at the "Antipodes" has led to the evolution of unique forms in both the flora and fauna.

Both the flora of Australia and that of New Zealand contains a very high percentage of endemics, that of New Zealand being 80% endemic for the flora as a whole and 93% for alpines. The two countries are separated from each other by over 1900 km of ocean, but do, nevertheless, share some forty genera, including *Pimelea, Aciphylla, Cyathodes, Coprosma, Celmisia,* and *Craspedia.* Over two hundred species are thought to be common to the two countries.

The presence of a Subantarctic element in the Australasian flora hints at the possible existence of an ancient land bridge connecting Australasia through the Antarctic to South America. Genera that are common to Australia, New Zealand and the southern part of South America include *Muehlenbeckia, Fuchsia, Pratia, Hebe, Libertia,* and *Ourisia.*

Australia has no truly high mountains. The only mountain range of any size is the Great Dividing Range that parallels the east coast and reaches its highest elevation of 2230 m at Mount Kosciusko in New South Wales. Above 1830 m on the surrounding Kosciusko Plateau the trees cease to exist, being replaced by alpine herbfields. On Mount Bogong in Victoria the herbfields occur at an elevation above 1750 m. These herbfields are reputed to be much richer in vegetation than are those of the European alpine zones.

In Tasmania, high mountain vegetation occupies a greater percentage of the total area than it does on the mainland, as the island has many individual peaks over 1525 m in height. The level at which the true alpine flora occurs in Tasmania is also much lower — 915 m and above in the more southern parts of the island.

The two principal islands that make up New Zealand have little in common. North Island is of volcanic origin and consists largely of forested hills and plateaux. The more rugged South Island has glaciers and snow-clad peaks that rival the Alps of Switzerland. Indeed, the mountains that run the length of the island are called the Southern Alps. Mount Cook is the highest peak at 3764 m. The lower limit of the Alpine zone throughout the country decreases inversely with

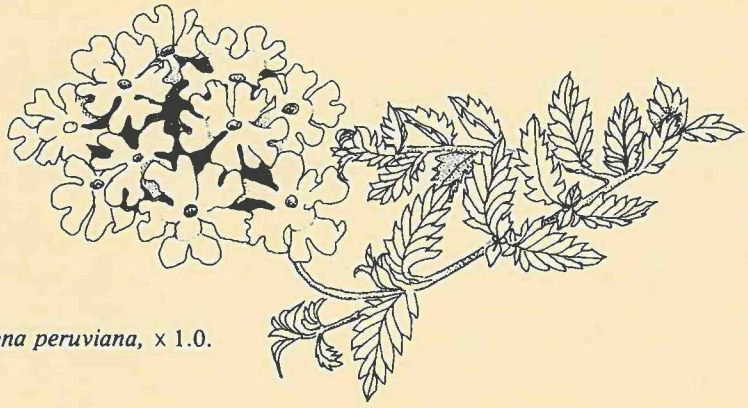


FIGURE 23. *Verbena peruviana,* x 1.0.

latitude, being about 1460 m in the Kaweka Range in the north of North Island and decreasing steadily to about 915 m in the mountains in Fiordland in the far south.

The climate of New Zealand is more temperate than that of Australia, and it is from that country that most of our garden-worthy plants originate. Nevertheless, the general lack of hardiness of these plants constitutes their greatest problem in cultivation. If a map of New Zealand were to be superimposed at a corresponding latitude on a map of North America, it would extend from central California to the southern tip of Vancouver Island.

The two worst enemies of half-hardy plants are wet feet and winter sun. The rapid thawing caused by the winter sun causes more damage than the initial freezing. For this reason, that part of the garden offering the least exposure to winter sun has been allocated to the Australasian section. Because this section of the garden is wide open to the cold north wind, an adjacent windbreak of conifers has been planted. In addition, a large berm has been created as an integral part of this section along its north side.

This is the most recently planted section of the garden, and is still incomplete. Like the African section, it is very much a trial garden as far as the foundation planting is concerned. There is no shortage of reasonably hardy shrubs; hardy trees, however, are scarce. Those being tried include *Sophora tetraptera,* a small evergreen tree known in New Zealand as the Kowhai. It belongs to the Fabaceae family, has pinnate leaves, and exotic-looking pale yellow flowers that hang downwards in clusters. *Sophora microphylla* is a closely allied species with much smaller leaflets.

Hakea lissosperma is a small tree from subalpine regions in New South Wales, Victoria and Tasmania. This remarkable plant could easily be mistaken for a conifer because it has stiff narrow leaves, but it actually belongs to the Proteaceae family. The cream-colored flowers are without stalks and appear in the leaf axils, although our plant is not yet of flowering size.

Pittosporum crassifolium, the New Zealand Karo, is said to be one of the hardiest in the genus. It forms a rather erect compactly branched shrub. The under-surface of the leathery leaves is coated with a thick gray or whitish indumentum. It is valued more for its foliage effect, but does have dark reddish flowers in terminal umbels.

Several species of the so-called "Daisybushes" or "Tree Daisies" are being tried. They belong to the genus *Olearia,* and are, for the most part, small to medium evergreen shrubs with creamy-white daisy-like flowers. The hardiest one is *Olearia* x *haastii. Senecio greyi* is rather similar, but the felted leaves are gray-green and the flowers yellow.

The common name "Wire-netting Bush" aptly describes the tortuous tracery of the branchlets of *Corokia cotoneaster,* which is seen to good effect when silhouetted against a plain background. It is a small to medium sized shrub with small yellow starry flowers followed by orange fruits.

Perhaps not a very beautiful plant but remarkable for being a woody member of the Violet family, *Hymenanthera crassifolia* forms a spreading semi-evergreen shrub about 60 cm tall. Its inconspicuous flowers and stiff, awkward habit are redeemed somewhat by the not unattractive white (in ours) berries borne along the undersides of the branches.

The largest genus of plants in New Zealand is *Hebe* with about one hundred species. This ratio holds in the garden also, where it is the largest genus with some two dozen taxa represented at the time of this writing. They are mass-planted on the berm where it is hoped that they will, in time, become a solid ground cover. The genus *Hebe* was formerly included in *Veronica* but was separated mainly on account of the shrubby habit and because the flowers are in specialized axillary racemes. The species often present a baffling array of forms, and hybridism is common between some species, so that identification can be a problem. Basically Hebes can be separated into two groups: those with leafy branches, and those of whipcord form. The latter have small scale-like leaves tightly appressed to the branchlets so that they can be easily mistaken for conifers. Although most Hebes are hardy and of quite easy culture, some may be damaged by severe frost. Some species are grown for their flowers, which are usually white to lilac-pink in color. Other species are grown for their attractive gray foliage, and still others for their interesting form.

The second largest Australasian genus represented in the garden is *Celmisia.* They are herbaceous or sub-shrubby plants of the Asteraceae family, and rank among the most important and characteristic groups in the alpine vegetation of New Zealand where there are more than sixty species. The daisy-like flowers invariably have yellow disk-florets and white ray-florets, rarely flushed with lilac, mauve or pale yellow. While there is a monotonous uniformity of flower form and color among the species, there is a remarkable assortment of vegetative forms and leaf shapes within the genus. Most

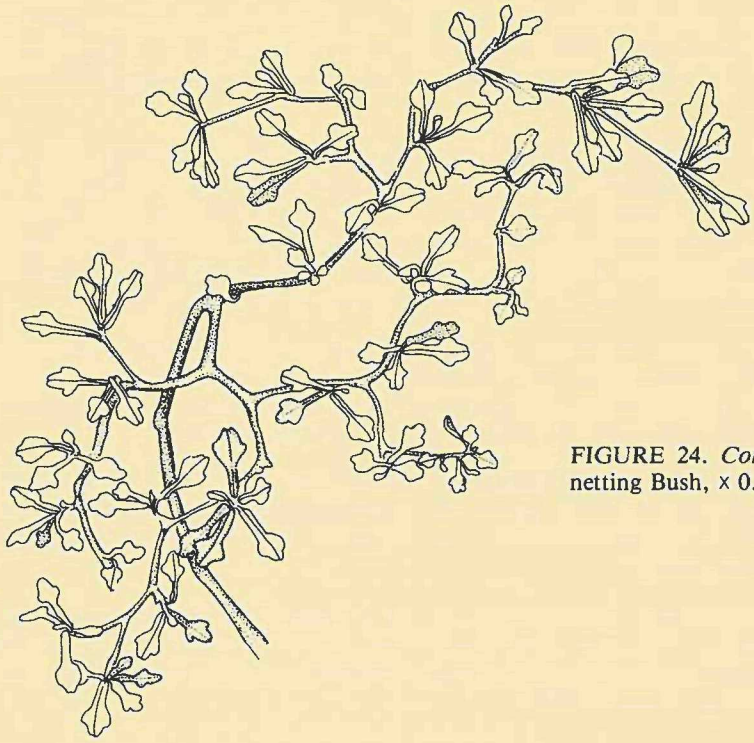


FIGURE 24. *Corokia cotoneaster,* Wire-netting Bush, x 0.55.

species have very leathery leaves, sometimes covered with silvery hairs, and a thick velvety white or buff-colored indumentum to the under-surface. Many are tufted herbs with the foliage in rosettes, either solitary (*C. densiflora*) or spreading into carpets (*C. spectabilis*). Some have a branching habit, either with rosulate tufts of leaves (*C. dubia*) or with the leaves densely covering the branchlets (*C. ramulosa*). Most have more or less spathulate leaves, but in some the leaves are narrow and grass-like (*C. graminifolia*), while others have stiff dagger-like leaves (*C. petriei*). The majority are green in color, but some are almost white (*C. allanii*), others are brown-mottled (*C. gracilenta*). Some form beautiful silvery carpets (*C. hectori*). In spite of their generally xerophytic appearance and texture, Celmisias in cultivation require a moist humus-rich soil, and many do well in peat beds.

Fuchsia procumbens is so different from the other members of the genus that it is scarcely recognizable as a *Fuchsia.* It is a slender, creeping plant with tiny roundish leaves about 1.25 cm long. The flowers appear from the leaf axils along the length of the spreading branchlets, facing upwards. They have no petals: the calyx has a pale orange tube with green and purple reflexed lobes. The flowering season extends for a long time and overlaps with the appearance of the bright red berries.

Perhaps the most legendary, and certainly the most striking, of New Zealand alpines is *Ranunculus lyallii,* Giant Buttercup. It is the largest member of the genus, and is found on alpine and subalpine herbfields and by mountain streamsides throughout the length of South Island. The plant has very large, round, glossy green leaves. The tall, branched flower stems usually have many pure white flowers, each with many overlapping petals surrounding, and contrasting with, a central cluster of yellow stamens. The plant is reported to reach a height of 1.5 m in the wild, but it is very much less in cultivation. It is, in fact, disappointing as a garden plant, being generally finicky and reluctant to flower at all.

Blue flowers are virtually absent from the alpine flora of Australasia. One or two of the Parahebes have a suggestion of blue, but are in fact closer to mauve. The closest to a real blue flower is that of *Wahlenbergia albomarginata* which is a small tufted perennial spreading by underground stems to produce scattered colonies of green rosettes. The flowers of palest blue on leafless scapes resemble those of *Campanula,* to which family it belongs.

There are comparatively few hardy bulbous plants from the alpine regions of Australia and New Zealand. The entire Iridaceae family in New Zealand is represented by four species of *Libertia,* all of them rhizomatous plants with white flowers similar to those of *Sisyrinchium.* The Liliaceae family has many species in the genera *Astelia, Herpolirion, Arthropodium,* and *Bulbinella.* In general, though, the flowers are small and often hidden within the leaves, the exception being *Herpolirion.* However, these plants can be quite attractive in fruit, with many having handsome red capsules. True bulbs are entirely absent from the alpine flora of New Zealand, those mentioned here perrenate by means of rhizomes, corms or tubers. True bulbs are also the exception among the alpines of Australia where the "bulbousness" of the subalpine *Bulbine bulbosa* is doubly asserted as such in its very name.

Many species of *Acaena* are used as ground cover in this section. While not very ornamental in flower or fruit, they do have a pleasant evergreen foliage that spreads into large mats, and are fairly shade tolerant.

Some of the *Raoulia* species are much choicer ground covers for small areas in full sun. *Raoulia australis, R. glabra, R. hookeri* and *R. lutescens* form delicate sheets — to call them mats would border on the gross — of tight silvery rosettes. The effect is almost as if the ground had been sprayed with silver-gray paint. They are temperamental plants, difficult to establish, and sometimes brown off in spots. The cushion or mound-forming members of this genus, the so-called "Vegetable Sheep" of New Zealand, are even more difficult in cultivation and are more suitably grown as pot specimens in the Alpine House.

FIGURE 25. *Celmisia coriacea,* from New Zealand, has silvery leaves up to 61 cm long, x 0.50.

b] Alpine House

The Alpine House is a glass house, 12 m long by 3 m wide. It is distinguished from a normal greenhouse in being unheated, and by having provisions for an extreme degree of ventilation. Ridge ventilators run down one side of the roof while the other side of the roof itself can be completely raised. Side ventilators run down each side of the house at staging level, and there are others below the staging and in the doors at either end. The fact that the Alpine House is unheated is not, as might be supposed, a matter of economy or convenience; it is a matter of preference. Alpines, quintessentially fresh air fiends, soon grow out of character and are beset by all manner of unprecedented ills when grown under the close conditions of a heated greenhouse.

The primary purpose of the Alpine House is to broaden the range of plants that can be grown in our climate. The plants in the House are grown in pots which are plunged to their rims in a lightweight porous gravel on the staging. The plants are rotated with others grown in cold frames in the garden's service area, the intention being to have something of interest on display for as long a period as possible throughout the year. The plants displayed in the Alpine House can be broadly categorized into four groups:-

(i) Plants that are not reliably hardy. It has been estimated that the degree of frost protection afforded by an unheated alpine house is the equivalent of the benefit derived from moving eight hundred kilometres further south. Therefore, it is possible to accommodate in an alpine house at this latitude a range of plants whose northern limit in the open garden would be somewhere on the coast of southern Oregon.

As might be expected, the majority of the half-hardy species in this category are from the Southern Hemisphere. Examples are also found from the Northern Hemisphere in the genera *Cyclamen, Pleione,* and *Talinum,* to name but three.

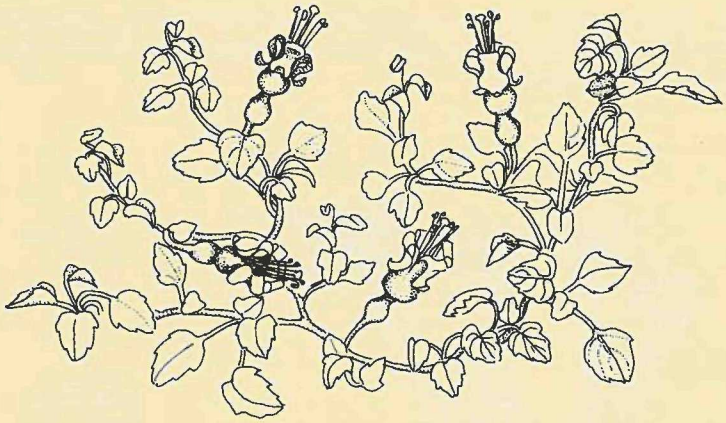


FIGURE 26. *Fuchsia procumbens,* x 1.00.

(ii) Plants that cannot tolerate winter wetness. A great many plants, even though perfectly hardy, may succumb to damping-off or rotting-off during a typically wet winter. While the end result may be a fungal disease leading to the subsequent death of the plant, the initial cause is an excess of atmospheric humidity and moisture on the surface of the plant. The foliage of pubescent or woolly leaved plants is particularly susceptible because the minute hairs aid in the retention of moisture, resulting in the blockage of the stomata through which the plant's normal gaseous exchange takes place. The effect is compounded if the plant should have pubescent foliage arranged as rosettes in a tightly packed cushion shape. Examples of this type of plant, which are virtually impossible to grow in the open, include most of the Aretian section of *Androsace* and that classic bête noire of the alpine gardener, *Eritrichium nanum.*

Another totally different kind of plant in this category is typified by the evergreen species of *Lewisia.* These plants are made up of succulent parts that are adapted to assist in the retention of moisture, and are totally unsuited for getting rid of an excess. Their foliage is arranged so that rainfall is channelled toward the central rootstalk. This is an admirable arrangement in their relatively arid natural habitat, but one that renders the collar of the plant at soil level prone to rot in winter in the garden. The effect can be minimized by planting these forms on a vertical rock face, but it is nevertheless prudent to keep a few plants in the Alpine House. Haberleas and Ramondas have a similar shortcoming and a few of them are grown in the Alpine House for the same reason.

(iii) Plants that flower very early in the year. Late winter flowering plants quite often coincide with the most inclement weather of the year, with the result that their flowers are often unkempt and mud-splattered in the open garden. Many of these are grown in the Alpine House as well, where, incidentally, they bloom two or three weeks earlier than in the garden. These include many of the dwarf *Iris* and *Crocus* species and — perhaps the most pertinent example — the Kabschia Saxifragas. The Kabschias are tiny cushion plants whose flowers are borne only 2.5 to 5 cm above the ground and — fair weather or foul — are better appreciated closer to eye level in the Alpine House.

(iv) Research collections. Certain groups of plants being assembled for research purposes are more conveniently studied as pot plants. As an example: parasitic or partially parasitic plants of the genera *Pedicularis* and *Castilleja* can be grown in pots in company with different host plants with the goal of determining which, if any, of the prospective host plants are suitable.

Apart from these four groups, there are a number of plants grown in the Alpine House for a variety of other reasons. Some simply supply color or fragrance to the House. Moreover, it is desirable to have a representative assortment of portable pot-grown plants on hand for lectures or the various displays and plant shows in which the Botanical Garden is asked to participate.

Finally, the Alpine House serves not only as a plant protector in bad weather but also as a people protector, particularly for those species not equipped with the usual umbrella-like aerial appendage adnate to one of the upper extremities.

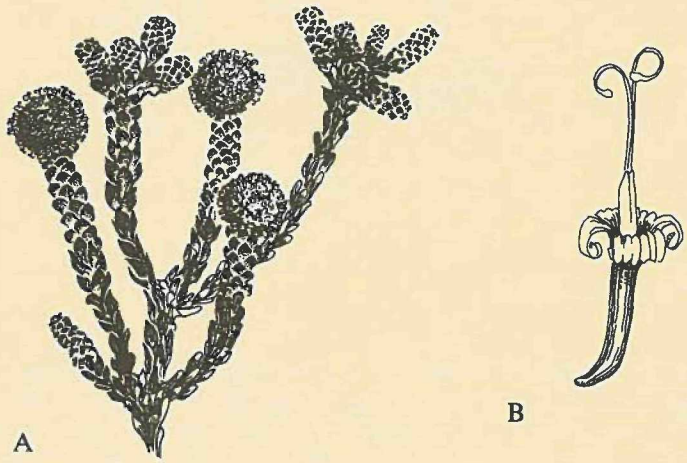


FIGURE 27. *Helichrysum coralloides* from New Zealand. A. Flowering shoot, x 0.90, B. floret, x 7.20. An example of a plant grown in the Alpine House because it is not reliably hardy.

c] Bulb Frame

This is a concrete block frame 9 m long by 1.5 m wide and 0.6 m above ground level at the front. The bottom of the frame below soil level is filled with a deep layer of gravel from which any accumulation of water is led away in a drain line to a nearby sump. The Frame is filled with a suitably porous yet rich soil mix in which bulbs are grown.

Bulbs are grown in the Frame for the same reason that certain plants are grown in the Alpine House rather than in the open garden. Bulbs can be — and many are — grown in pots in the Alpine House. But many require more root-run and a greater depth of soil over them than is afforded by a pot of manageable size. It is quite often found on repotting these — a chore which must be done regularly — that the bulbs have worked themselves down among the drainage material at the bottom of the pot. *Calochortus* bulbs are quite troublesome in this respect, as are certain species of *Fritillaria*.

The Bulb Frame is protected in winter by a covering of fibreglass panels. Since the soil can thus be kept relatively dry, it is a better insulator against cold, and the more tender bulbous species do better here than in pots which, in very cold weather, can freeze solidly on the relatively shallow Alpine House staging.

Bulbs in general need a period of baking in summer after they have gone dormant. The fibreglass panels can then be replaced on the Bulb Frame in the not unlikely event of a wet summer.

The Frame is also a convenient place for growing on young seedlings of bulbous plants which can take anywhere from three to seven years to reach flowering size. Many mature bulbs have a natural mode of vegetative increase in that they product small offsets adjacent to the parent bulb or corm. These can be separated and grown on in the Bulb Frame, eventually providing mature bulbs which can then be tried in the open garden. In this respect, the Bulb Frame operates as a very efficient propagation unit.

FIGURE 28. *Thymus cilicicus* is native to Anatolia and has large clusters of lilac-pink flowers, x 1.0. An example of a plant that cannot tolerate winter wetness.

The main purpose, however, is as a display unit for bulbs that could not otherwise be grown in the garden.

d] Trough Garden Courtyard

This area adjacent to the Alpine House and Bulb Frame is occupied by a number of miniature gardens on raised pedestals. Each of the gardens has some theme or unifying element. It may contain miniature plants from a given geographical region, or plants of a single genus or type. Because the troughs are raised above the ground, they may be conveniently enjoyed by elderly people or those confined to wheelchairs. Or, indeed, by anyone who appreciates the type of miniature plant that is often overlooked in the relatively vast expense of the Rock Garden.

The troughs have a textured, stonelike surface resulting from the incorporation of a quantity of peat moss into the concrete mix out of which they are made. Their construction and planting has been fully detailed in Davidsonia, volume 5 number 1.

e] Dwarf Pinetum

Until fairly recently dwarf conifers have been little appreciated and much under-used as garden plants. This is due in no small degree to the unrivalled complexity of their nomenclature, as well as to the general unavailability of the choicer, more slow-growing varieties. Non-specialist nurserymen have a tendency to stock a preponderance of the faster growing, more commercially viable forms which has led to disappointment among gardeners. This has further cast dwarf conifers into disrepute. It is common to see so-called "dwarf" conifers used in rock gardens or as foundation plantings for dwellings that have, in short order, smothered their neighbouring plants, or grown up to block windows or spread across driveways. This is not to say that there is not a legitimate use for these plants, just that they have been, to a great extent, misused. Once the gardener becomes familiar with the rate of growth of these plants and with the great diversity of material available, he is able to appreciate the landscape value of the true dwarf conifer as well as that of the slow-growing, but ultimately large-sized, varieties.

Dwarf conifers originate in one of several ways. Some are true species that appear in nature as dwarf entities. The smallest known species of conifer, *Dacrydium laxifolium* or Mountain Rimu, is one of these. It is a prostrate shrub with slender, trailing branches which is native to New Zealand. Mature, cone-bearing specimens are often less than 8 cm in height. It has no particular beauty in the garden, and could easily be mistaken by the uninitiated for some form of heather not in flower.

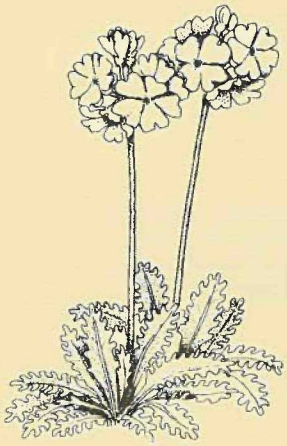


FIGURE 29. *Primula sapphirina* is native to the Himalayas and has violet-purple to blue flowers, x 0.75. It is grown in the Alpine House to supply color.

Many dwarf conifers are naturally occurring forms of species that are commonly arborescent. Our native Juniper, *Juniperus communis* subsp. *alpina,* fits in this category.

Other forms originate as mutations of one sort or another. The well-known *Picea glauca* cv. Albertiana Conica was found as a dwarf seedling in Alberta growing among normal-sized White Spruce reaching a height of 25 m or so. When the mutation appears on the parent tree it is classed as a bud mutation. Most of the forms with variegated foliage have originated in this way as a single branch on an otherwise normal tree. Another type of growth anomaly produces the congested, stunted growth known as a "Witches'-Broom". From a distance, a Witches'-Broom resembles an enormous bird's nest on an otherwise normal tree. Witches'-Brooms have to be propagated asexually, when they usually result in plants that retain the congested habit. Many cultivars of *Picea, Abies* and *Pinus* have originated in this way.

The Dwarf Pinetum is intended as a demonstration garden in which is grown a wide assortment of these trees so that the differences between them may be readily compared. This part of the garden is still under development and is not yet completely planted.

The display labels used here provide information of interest for anyone contemplating the landscape use of these plants. The label not only shows the name of the plant and the family to which it belongs, but also its height and width at the time of planting, and the year in which it was planted. It also indicates whether the particular specimen is grafted or is growing on its roots, a factor that has a bearing on the rate of growth.

The little trees in the Pinetum are not arranged in any systematic classification as to family or geographical origin. Rather, they are grouped into combinations that exploit the diversity of form and texture of the plants. It is left to the individual observer to judge whether the combinations are pleasing and worthy of emulation, or whether they are dissonant and best left unrepeated. In fact, one may approach the whole Alpine Garden from this point of view.

FIGURE 30. The Trough Garden Courtyard and the Alpine House in The E. H. Lohbrunner Alpine Garden.

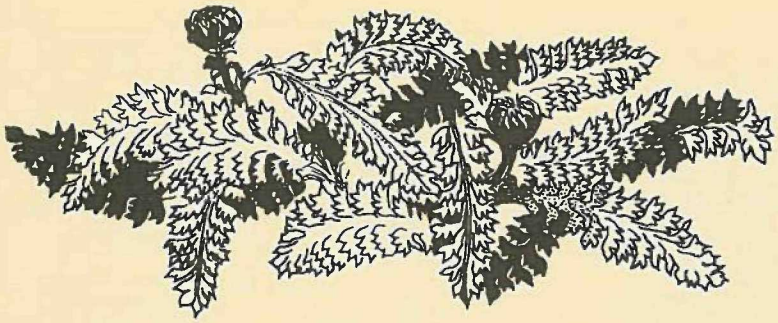


FIGURE 31. *Cotula cariosa* is a prostrate mat-forming perennial with greenish-white flowers, x 1.0. It is native to South America, and may be found in that section of The E. H. Lohbrunner Alpine Garden.

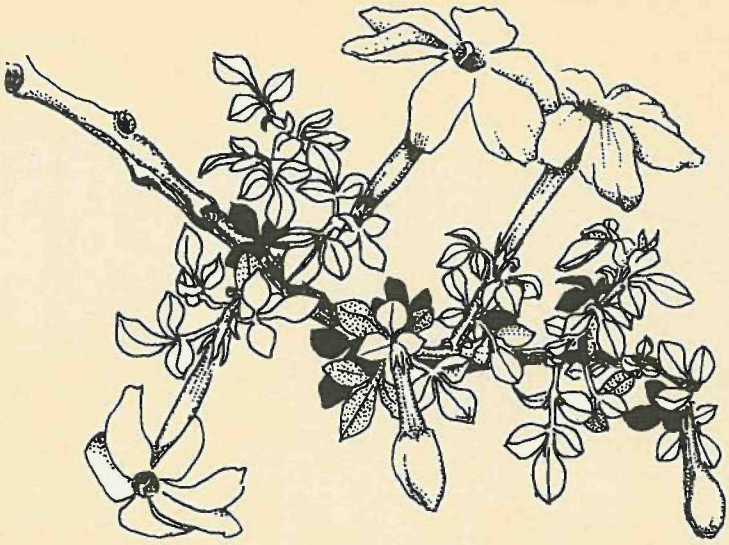


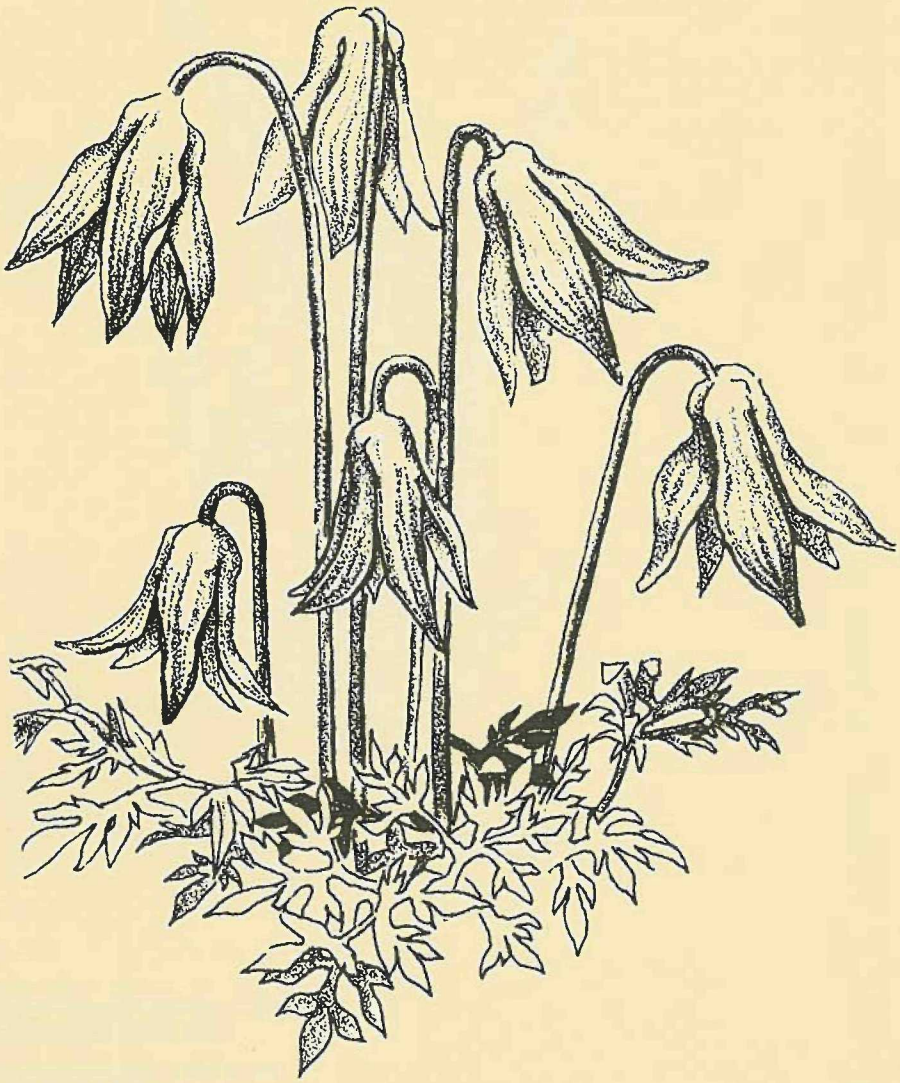
FIGURE 32. *Jasminum parkeri* is a prostrate form with yellow flowers which is native to the Himalayas, x 1.5.

Climatological Summary*

Data 1978	JULY	AUGUST	SEPTEMBER
Average maximum temperature	21.3°C	20.1°C	16.5°C
Average minimum temperature	13.6°C	13.3°C	10.9°C
Highest maximum temperature	28.0°C	29.4°C	21.9°C
Lowest minimum temperature	10.2°C	9.3°C	5.5°C
Lowest grass minimum temperature	6.0°C	5.5°C	-0.2°C
Rainfall/no. days with rain	14.2 mm/3	158.8 mm/17	90.9 mm/23
Total rainfall since January 1, 1978	518.1 mm	676.9 mm	686.8 mm
Snowfall/no. days with snowfall	—	—	—
Total snowfall since October 1, 1977	41.1 cm	41.1 cm	41.1 cm
Hours bright sunshine/possible	306.3/482.5	228.4/439.0	106.3/372.2
Ave. daily sunshine/no. days total overcast	9.9 hr/2	7.37 hr/4	3.5 hr/5

**Site: The University of British Columbia, Vancouver, B.C., Canada V6T 1W5*
Position: lat. 49° 15" 29" N; long. 123° 14' 58" W. Elevation: 104.4 m

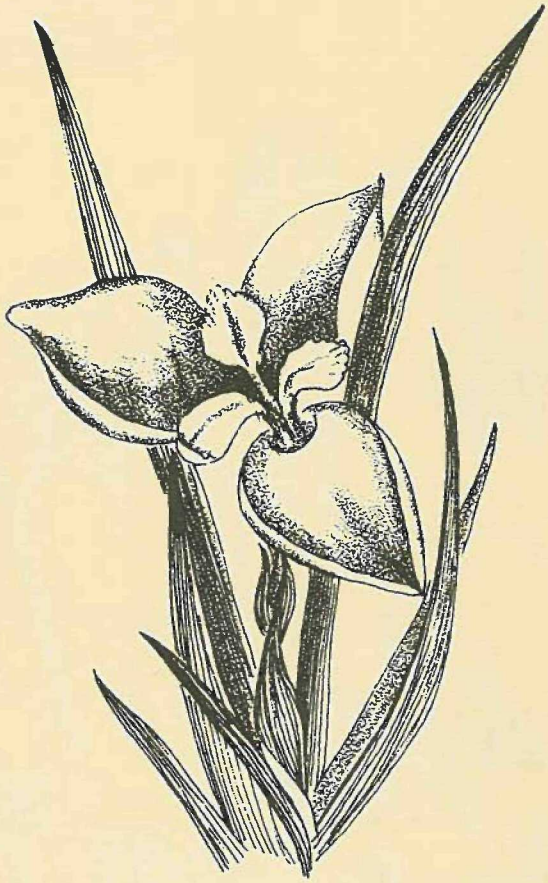
Clematis tenuiloba, a trailing vine with blue or purple flowers which is native from South Dakota to Arizona, x 1.5.



An Explanation!

A number of subscribers have queried the reason for the "upside down" mailing wrapper. The Canadian regulations for a second-class mailing permit require that the address should be so placed that it "can easily be read by a post office mail sorter when he holds the publication by the bound edge in his right hand." To conform with this regulation, the journal has to be inserted in the wrapper upside down!

Diplarrhena moraea, a native of Australia and Tasmania, grows 60-90 cm tall and has fragrant flowers which are white, flushed with lilac, x 1.6.



DAVIDSONIA

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