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The Bulletin

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Cover Picture: *Campanula persicifolia* f. *planiflora*
Laura Louise Foster, Falls Village, Conn.

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CAMPANULAS IN MY ROCK GARDEN

Betty Blake
Onsted, Michigan
Illustrations by Allan G. Stavos
Wayzata, Minnesota

I have been learning about campanulas for about 20 years, now. At the beginning you could say my mind was completely open on the subject, I knew so little about it. As the need arose to grow plants that would not only bloom, but do it at a certain time and in something less than full sun, I became acquainted with a wide range of campanulas. Not all turned out to be suitable for the rock garden and some, indeed, seem hardly suited to any garden, no matter what its size. These, then, are those presently in my garden, as well as a few of fond memory.

CC. aucheri, bellidifolia and *tridentata* grade into one another so gradually it is difficult to say where one species stops and the other starts. They all make four inch clumps of simple, narrowly spatulate leaves above which are borne, singly, large erect blue-violet bells. The color varies considerably, and usually *C. bellidifolia* has had the deepest, nearly purple, tones, but there is a white blotch at the bottom of each flower in all three species. The astonishing thing about these is the large size of the bloom in relation to the plant size. They are said to be perennial, but with me, not many have been, though there is now hope that *C. bellidifolia* will continue to give a good account of itself, as it has for the last three years. Late May

Campanula Trichentata

and early June is when they are at their best, on a north slope where there is nearly full sun. They are all easy from seed, but what you see on the label is not necessarily what you will get, so just plant and enjoy.

C. barbata is interesting to photograph, with its long-whiskered light blue bells. These hang several at a time from rough leafless stalks eight inches high above a lax clump of long narrow leaves, also roughly hairy. It is easier to appreciate the beauty of all this hairiness if you view it against the light. Accordingly, the top of a wall seems the natural place for it. So far mine have died after flowering, but it is said to be perennial and I am trying again.

C. betulaefolia produces a graceful clump of dark, heavy-textured birch-like leaves which make a fine backdrop for the pale pink — sometimes mottled-reddish — buds. These open to clear white bells, which are cut into segments about a third of the way. The six-inch stems carry several flowers and this weighs the stem down so that the best spot for this plant is in a wall. There it is proving to be satisfyingly perennial. In late summer after the old leaves have nearly all disappeared a fresh tuffet of tiny leaves appears. These are miniatures of those early leaves, but will develop into full size ones by the time the flowers come along in mid-June. This is a well-behaved, handsome plant, both in and out of flower and shows no inclination to run about. It is sometimes listed as *C. finitima*.

C. caespitosa did not stay long with me, but was beautiful while it lasted. It looks as though it might be related to *C. rotundifolia*, but with shorter stems. The distinctive part is the constriction near the mouth of the bell which makes it look as though a drawstring were being pulled ever so lightly just back of the petal divisions. Because of this, it cannot be mistaken for any other campanula. The real problem here is to locate seed. I have not seen it offered since mine departed.

C. carpatica is a wonderful plant, but seeds itself too freely for use in the rock garden. This is one of the things I discovered the hard way. Even dwarf forms tend to get out of hand, seeding into crevices where they look charming, but, after all, variety is the idea, not wall-to-wall *C. carpatica*. I am weeding diligently, but every once in a while there is a form with tiny crinkled leaves and huge flowers, and I cannot pull it up. Some of these small seedlings have flowers an inch and a half across on four inch stems and bloom intermittently from June until frost. You can see I have a problem.

C. cochlearifolia is one of the essentials, to my mind. The little bells face out or hang down and can be of various shades of blue, through gray-blue to a clear white. The four-inch stems arise from a thin root that is a real runner, make no mistake about that. It tends to keep on the move and cannot be depended on to be in the same place from

one year to the next. If you are lucky, it will continue to come up on your side of the fence come spring. It is easy to grow from seed or selected color forms may be purchased in bloom if you can find them. A wall is a good stage for this star.

C. collina makes a bold show in May. The rather coarse, long, narrow leaves form a base for the sturdy eight-inch flower stems that bear several large purple-blue bells. When a number of stems flower at the same time, it is quite a sight. Mine has done much better in an east-facing limestone wall than it ever did in a flat garden, but it took two years or more to bloom after moving. It looks well established, now, and I expect to keep it for a while. The season of bloom is not long, but the color is bright and beautiful while it lasts.

C. elatines and its varieties *garganica* and *elatinoides* are pretty well mixed in my mind, as seed packets with these names have produced mixed bags fairly consistently. Whatever the name, they are all well worth having. Decumbent stems reach out in all directions displaying the numerous lavendar-blue stars to best advantage over rocks and on the face of a wall. They seem to hug the surface, but do not root down as they go, and do not, therefore, become pests. Leaves are round in general outline, but with deep indentations and are a dark rich green on some plants, while on others, hairs are so fine and so thick as almost to suggest velvet. They have never self-sown here, but are easy to grow from seed. Tufa suits them, and even out of bloom the healthy clump of leaves helps soften any awkward angles. They beg to be photographed.

C. filicaulis is a ground-hugger, and is really difficult to locate at all until it blooms and reminds you it is there. Leaves are dark green, nearly linear, produced a few at a time on a wiry wandering stem that lies flat, but does not root. Flowers are half-inch red-purple stars with a white center and are produced sparingly. It is difficult to explain why this is such a fascinating plant. It may be that thinking of its home, in the Atlas Mountains of north Africa, makes me respectful of its tenacity or perhaps it is interesting because it is decidedly different from all the other campanulas I know. Flower color is said to be more often a pale blue than the bright one I had. It survived four Michigan winters outside, but I could not find it when we moved. Seed is the only way to get it, but I do not see it offered very often.

C. kemulariae simply showers you with rather short open bells of a bright medium blue-purple. These are borne in their multitudes on six-inch leaning stems in June. A wall suits it best, not only because of the leaning stems, but because it helps to confine the exuberant growth. For years it behaved

itself, but in the new garden, everything must have been to its liking and there is more of it than I could ever pot up for a plant sale. It grows easily from seed, if there is no other way to get it started, but bears watching, once you have.

C. lasiocarpa seed was difficult to find, but once found, couldn't wait to bloom. It took only five months from germination to flower. Four-inch stems hold up-and-out-facing light blue bells at an angle. The corolla is cut into lobes about a third of the way. Leaves are small, in a basal rosette and of a light green. Plants do persist from one year to the next, but more often there is a general modest migration, with new plants showing up several inches away, all around. If allowed to get very dry after flowering, the whole establishment may disappear, so a bit of watching and watering is in order. A sandstone wall in half shade as well as flat area in nearly full sun both seem to provide the necessities. A neat, not flashy plant.

CC. nitida and *planiflora* are the same, and should now be known as forms of *C. persicifolia,* and not under separate names, but you know rock gardeners!* (See note at end of text.) The plant in question, which should correctly be named *C. persicifolia* forma *planiflora*, is rigid and stylized, but with a certain inflexible grace. Leaves are heavy textured, almost crisp, twisted, with rounded teeth, sessile on a stem that reaches six or seven inches. Flowers are like those of a sturdy, flattened *C. persicifolia* and appear over a period of two or three weeks in June. The white form is soundly perennial and is happy on a north slope in full sun.

The blue form, grown side by side, lasted one year with me. This is not an uncommon experience, apparently. Propagation is best by division or basal cuttings as seed produces mostly *C. persicifolia*. Highly recommended.

C. pilosa makes a huddle of shiny spatulate leaves three inches high through which the large mid-blue up-facing bells push their way. Flowers are quite large in relation to plant height and are usually one to a stem. It took several years for my plant to reach blooming size and another two years before there was anything to rave about. Now well established in a gravel and clay soil in sun, it is quite a spectacle in early June. Seed is an easy way to propagate it, but division should be no problem. Offsets are made, but they stay close to the parent plant so that the result is a slowly increasing plant and not a running one. I like it.

C. porscharskyana has a reputation for invasiveness, but I have not found it to be a nuisance, yet. It is not, admittedly, one of the choicest, but it is reliable and decorative, will flower in some shady places where nothing else will, and over a long period in summer, too. Sun suits it better than shade, however. There is a white form with rather milky flowers. This is less robust than the blue form, but it is interesting because the flowers show up better against the leaves and anything other than blue is a relief among campanulas. It is known as 'Elizabeth Frost.'

I am amazed every year by the wealth

of bloom, graceful habit and sheer beauty of *C. portenschlagiana*. In two years a tiny plant established in a wall will cover any area roughly 18" by 18" and will have so many flowers in June that leaves are scarcely visible at all. Flower color is a medium purplish blue and lobes of the corolla are cut about half way down the bell. This is one you can look down on or up to with equal pleasure. Some gardeners say this verges on weediness and in this case, if you still want the flowers without the exuberant growth, you could try it in tufa. There the root reaches the ground, but the plant does not run. I like it in walls, where it blooms off and on until frost. No wonder it used to be called *C. muralis*.

C. pulla is a tiny plant, frail-looking, with intensely deep-purple, nearly inch-long hanging bells each on its own thin, three or four inch stem. This grows easily from seed and, if you can keep the roots moist enough and the leaves in sunshine, it will dole out those ridiculously large bells for a long time in June. It can be properly appreciated when grown near eye level in a wall. If you are lucky, it will run about a little, but could never be a pest.

C. x pulloides is reputedly a hybrid between *C. carpatica turbinata* and *C. pulla*. It makes a fine floriferous running plant with short half-open bells looking down from five inch stems. A wall suits it and shows it off to good advantage. It has not been too "runny," but just enough to keep me vigilant. Flower color is a good bright purple. Division is the way to increase it.

C. raddeana is one of my earliest acquisitions, and while it took a long time to identify (it came as *C. raineri*), I still have a piece of the original plant, now 19 years old. It has somewhat leathery leaves and long, bright purple, slightly flared bells on stems eight inches long. This is generous with bloom and will even give a few flowers all summer if seed is not allowed to set. The stems try to stay upright, but are often bent down by the weight of the many blooms. This also does well in walls.

C. raineri has a reputation for being difficult, but the real difficulty lies in getting properly named seed. Three times seed produced plants that have been correct and the flowers, too, but only once has the color been the clear, nearly pure blue I hoped it would be. No matter whether a washy pale blue or a clear one turns up, if it is really *C. raineri*, there is a certain crystalline quality to the flower that, along with the open shape, fuzzy leaves and three-inch stature, clinch it. It has usually taken until the second spring for seeds to germinate, and plants are small the following year. The next year there is a bloom or two or three, amid general rejoicing, but the year after that — oh, my! What a sight it is to see twenty-one open blooms against a gray wall — each one perfect. It is certainly worth a try. It was immediately following this display that slugs discovered this treasure-trove.

The plant survives, but strict anti-slug measures will continue to be in force from now on. Bloom is in July.

Seed offered under this name is often a hybrid with *C. carpatica* and is sometimes fairly close to *C. raineri*. It is interesting to see the different plants that develop, but only a few are "keepers."

In order to make this list complete, the subject of *C. rotundifolia* has to be mentioned. This is another I would not have in my walls, now that I know its true nature. This runs as well as seeds its way around, but the seeds are by far the worst menace. It can be very decorative, but more often the stems are too lax for real beauty. A woods setting is ideal for it and that is where it should stay. The sun only encourages it to multiply beyond all reason.

C. sartori grows flat against the ground or the face of a wall, making a mat as much as a foot across at flowering time. Leaves and stems are softly downy, the flowers white, about half an inch across. After flowering and seed-setting, the plant dies, and one must have faith that there will be seedlings showing up next year. Not showy, but interesting in a wall.

C. tommasiniana is a love. It appears to have been drawn with strokes of a pen, nearly all vertical, all very fine, thin lines. The whole plant reaches seven or eight inches in height, and is often much broader when in bloom. Leaves are small, linear, with a sharp point. Bells are narrowly tubular with a slight flare, and of a soft blue shade. They are produced in quantity and the plant makes a fine wall and crevice ornament. It does not send out runners, but does increase in size every year and is soundly perennial. It can be propagated by division, cuttings and by seed. A thoroughly neat plant.

C. waldsteiniana is much like *C. tommasiniana*, except that the flowers are up-facing instead of hanging, and the color tends to be a touch brighter. From one seed packet it is possible to have both species, with many gradations in between. All are good.

There are many more campanulas I would like to grow, and a few I expect to see in bloom next year, and there are so many species that there will be always many more to look forward to. And I certainly do.

**To add to the confusion about* Campanula persicifolia *f.* planiflora *among rock gardeners and donors of seed to our exchanges, a number of authorities have in the past assigned the name* C. planiflora *to several species of campanulas, among them* C. parryi, *a native of the Rocky Mountains. (See ARGS Bulletin, Vol. 21. p. 43.) It is, perhaps, this muddle which has led many horticultural authors, including*

such authorities as Farrer, Bailey, and Mansfield, either to assign the wrong plant to the name C. planiflora *or give the wrong provenance to the correctly described and named plant.*

The true C. parryi *of the Rockies grows from a running root which produces numerous tuffets of coarsely dentate, strap shaped leaves. Similar leaves adorn the rather trailing stems from which rise slender, upright, leafy pedicels bearing at their tips the usually single, deep lavender-blue, open funnel-form flowers. These are cut into rather starry segments at least half way to the base. On the other hand,* C. persicifolia *f.* planiflora, *described correctly in this article, and pictured on the cover, neither runs nor trails but stays put in a compact clump.*

Anyone with a keen eye, who grows the typical form of C. persicifolia *and permits it to self sow, may occasionally run into a seedling of* C.p. planiflora. *As a Mendelian recessive, the gene for dwarfism is probably present, though masked, in a number of plants of* C. persicifolia *of quite normal appearance. It should be possible, by persistent rogueing of all normal* C. persicifolia *that grow in the neighborhood of the dwarf form, to eventually produce a* C.p. planiflora *that comes 100 percent true from seed for even without such Draconian measures a fair percentage of the seed of* C.p. planiflora *will produce the dwarf plant.*

It is possible, but unlikely, that this dwarf form of C. persicifolia *was first noticed in a garden in this country. If so, this would certainly have strengthened or even started the misconception that* C.p. planiflora *is of American origin. However, because its progenitor is a native of southern Europe, we really cannot, with a clear conscience, claim it as our own. — Ed.*

John P. Osborne

The ranks of devoted rock gardeners was sadly diminished on August 10, 1981 by the death of John Osborne of Westport, Connecticut.

Even at an advanced age and seriously ill for a protracted time, John maintained a lively interest in what was going on in his own rather special garden. He was likewise as alert and inquisitive about what was happening in the rock garden fraternity.

In 1971 John P. Osborne received the ARGS Award of Merit. He was a frequent contributor of articles to the Bulletin, a keen student of rock gardening literature, with a host of friends.

To his devoted wife, Frances, and to his family we extend sincere condolence.

—H.L.F.

ROCKY MOUNTAIN NATIONAL PARK: Overview

Edited by John G. Worman
Littleton, Colorado
Drawings from *Meet the Natives*

High over the mile-high city of Denver, 50 miles to the northwest, lies the "Roof of America." The 400 or more square miles of craggy height which we know as Rocky Mountain National Park contains sixty-five peaks over 10,000 feet. Beyond the treeline ranges one third of the park area, with rolling, grassy slopes softening the panoramic onslaught of granite cliffs and spires. In the two brief months of highland summer the park is a land of enchantment, the air heady with the fragrance of alpine wildflowers. In other seasons it can be bleak and desolate, windswept, with gales of arctic intensity swirling the snows into the basins and crevices amid the vast peaks.

Far to the east, breathtakingly beautiful as seen from the uplands, the leveling edges of the Great Plains give one a sense of the immensity and variety of our continent. To the north, south and west, the skyline is broken by the irregular summits of distant mountain ranges.

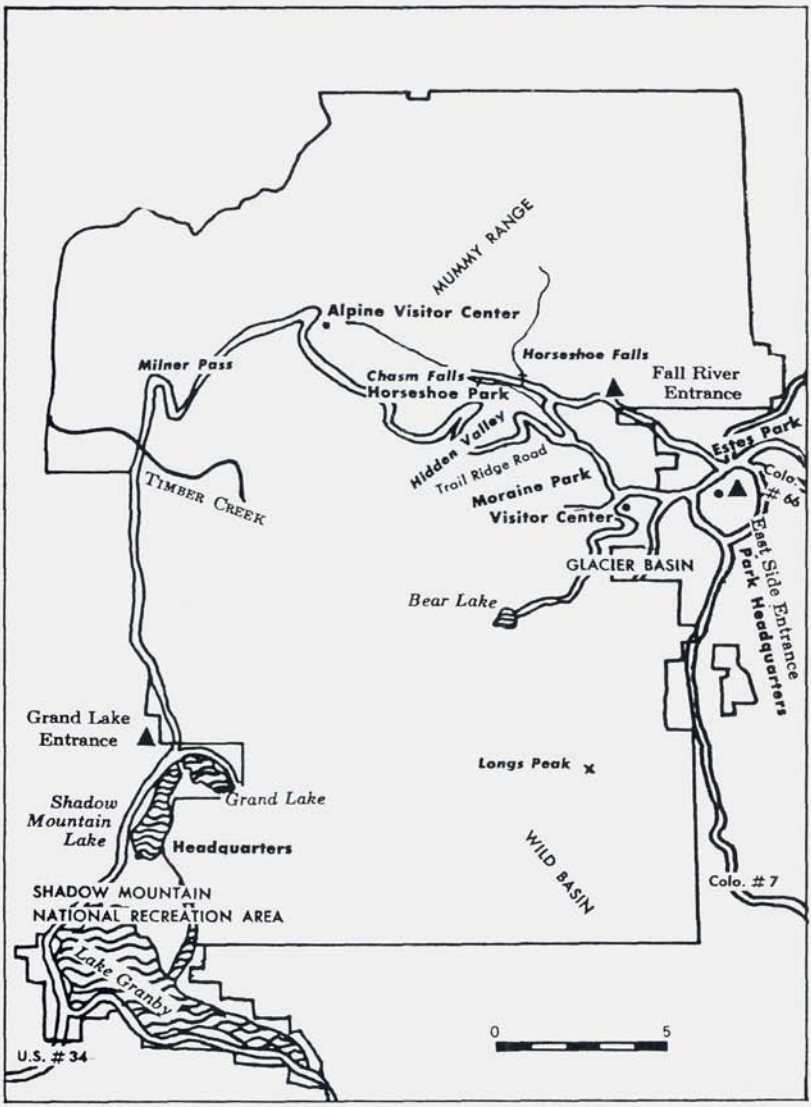
Unlike many of the Western National Parks, there is little historical evidence that the area was extensively used by either Indians or whites in the exploration and winning of the West. Hunting parties from the tribes on either side of the Divide certainly visited the area in the summer on hunting trips. Berry-picking and just plain recreation must have been commonplace. Trappers investigated the fur collecting potential of the region — these, the informal explorers, were familiar with Long's Peak, awesomely viewed from the plains to the east. Two more formal parties, Lt. Zebulon Pike in 1806, and Major Stephen H. Long in 1820 — for whom the peak was named — charted the area for future generations.

In 1859, Joel Estes and his son, Milton, topped Park Hill and became the first known white men to see the "park" (or open, forest-rimmed valley) that now bears the Estes name. The next year Estes settled his family in the grassy meadows here. By 1867 the Estes family claim was acquired by Griff Evans, who later transferred his rights to a British nobleman, the Earl of Dunraven. The Earl discouraged many enterprises that would have seriously marred the matchless landscape and also did much to bring the region to public attention.

In the early 1900s, when the automobile began to prove practical as a means of travel, influential people sponsored a plan to have the area set aside by the government as a national park. The major force behind the movement was Enox Mills: naturalist, writer, conservationist and philosopher. His years of hard work were recognized when he participated in the dedication ceremonies for the Rocky Mountain National Park on September 4, 1915.

The ancestral Rockies had their beginning about 300 million years ago when this area was uplifted from shallow inland seas. Cycles of invasion by the seas and renewed uplift of the land followed until the last sea withdrew, about 70 million years ago, never to return. Alternating periods of uplift, volcanic activity and erosion came next.

About 5 to 7 million years ago, forces within the earth initiated a final broad uplift of the Rocky Mountain region. In the park, the overall effect was to raise the mountains to their present altitudes above 12,000 feet. Deep erosion followed. Shallow valleys eventually became winding V-shaped canyons 600 to 1,500 feet deep. Signs of several periods of glacial activity are evident throughout the park. The quarrying action of glaciers has left sheer rock faces like those on Long's Peak. Broad, U-shaped valleys denote the passing of giant glaciers through the V-shaped stream cut valleys. The glacier-deposited ridges, heaps and scattered masses of unsorted rock debris known as moraines can be clearly seen in Moraine Park. Chains of lakes linked by



ROCKY MOUNTAIN NATIONAL PARK

streams, such as Gorge Lake (visible from Trail Ridge Road), now fill depressions that were scoured out by glaciers.

Trail Ridge Road, the highest continuous automobile road in the United States, winds its way through Rocky Mountain National Park from Estes Park on the east to Grand Lake on the west.

Climbing over 5,000 feet from the valley at Estes Park to 12,183 feet, the road's highest point, it is one of the most spectacular highways on the North American continent. Originally an old Indian Trail used by the Ute and Cheyenne on hunting expeditions, Trail Ridge was opened to automobile traffic in the early 1930s. As it winds and twists its way ever upward, the panoramic view of the jagged peaks of the Never Summer Mountains and the Mummy Range become even more dramatic. Once past timberline, the route emerges into the windswept tundra, a carpet of delicate wildflowers covering the high, rocky soil.

LUPINE
Lupinus parviflorus

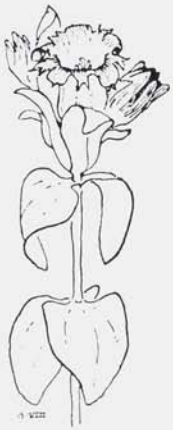
From Forest Canyon Overlook the deep, forested gorge is a sweeping vista, dotted here and there by beautiful, blue, mountain lakes, unspoiled by the hand of man. As the route nears the summit, there is a parking area high above Iceberg Lake, so called because it is at least partially covered with ice all year long. Then, a half-mile farther on, the road reaches 12,183 feet and starts its descent. At the junction with Fall River Road is the Alpine Visitor Center with information concerning the park, a restaurant and a gift shop.

From this point, the road drops quickly, making a series of tight switchbacks along the ledge cut into the mountainside. The view of the valley below is unforgettable, with the pine-covered slopes encompassing the flat, green meadows, dotted with beaver dams along the meandering headwaters of the North Fork of the Colorado River. Hiking affords an opportunity to visit scenic spots not seen from the highway. The Bear Lake and Glacier Gorge areas are both good starting points for short hikes into the numerous lakes. Other trails, which are not difficult, start from the Cub Lake and Fern Lake trailheads. Grand Lake, Colorado's largest natural body of water, is just outside the park on the western slope. The park is open all year, but Trail Ridge Road is closed beyond Hidden Valley, a popular ski area, from late October to the end of May.

At timberline Engelmann Spruce, Subalpine Fir, Limber Pine and, rarely, Lodgepole Pine, make their last stand. Prevailing winds, snow, and frost shape the highland vegetation. Wind is the most constant of these forces: transporting ice and sand projectiles, it strips the tree trunks of bark and prostrates growth against the mountainside. Like their counterparts below, the timberline trees try to send out branches on all sides, but the gale batters the new buds and desiccates them; only those on the lee side of the trunk can manage to grow. Here and there, sheltered by

rocks or large trees, ordinary seedlings spring up; but when they grow above their protection, they too become gnarled and denuded, bending away from the prevailing winds. Snow and frost also sculpt these young trees: each seedling can grow only as high as the winter blanket of snow which insulates it against the elements. Temperatures below the snow crust may be fifty degrees or more above those on the surface. But finally the tree's growing crown extends above the snow blanket; wind and frost quickly does the pruning. The tree may go on producing new shoots year after year though none will live past winter. But if they cannot grow upward, branches grow to the side away from the prevailing winds. The energy normally impelling the tree to grow upward now sends the growth outward parallel to the ground, in a dense fretwork sometimes as high as a man's head, sometimes only a foot above the ground. Snow's weight further plays a part in the horizontal growth.

Timberline trees are naturally smaller than those at lower elevations, but are much older for their girth. Their seasonal growth is limited and one needs a magnifying glass to read the history of growth that lies encoded in the trunk rings. Timberline gives way to grass, shrub, bare rock and glacier as the altitude rises. Much of the plant and animal life on the mountaintops from Montana to New Mexico is similar to that on the high mountains of Europe, Asia and Alaska. Relics of the last Ice Age, when arctic tundra covered many portions of North America, these flora and fauna still maintain a highly specialized life-style suited to extreme conditions. The plant life may be more specialized than the animal life. Grass is well adapted to life above timberline. Its modest size, narrow leaves and deep roots conserve what little moisture the heights provide. Even the smallest, most limber tree lacks the flexibility of the grass stem, which bends but does not break in the highest wind. And because it is so low, grass is assured sufficient snow cover.



PARRY GENTIAN
Gentiana parryi

The green mat covering the alpine meadows contains sedge as well as grass. Alpine sedges are short cousins of plants that grow on the prairies and in the foothills — all hardy, grasslike colonizers of arid soil. Two thirds of all alpine plants can live only in the arctic conditions. Most alpine plants spend years between germination and first blooming. Plants like the Alpine Avens are relatively speedy growers but Bear Grass must work for five to seven years before it can put out its showy creamy white flowers. Predictably, the succession of plants on an alpine meadow is painfully slow. At lower levels, slopes can run the gamut from bare rock to forest in eighty or one hundred years; at altitude the lichens alone may need several centuries to create enough humus to nourish grass and shrubs. Typically alpine plants clump together in low, dense mats, which absorb the sun's heat much as an animal's fur does; the in-

tense color of their flowers and the deep green of their stems and leaves is further evidence that they absorb heat rather than reflect it. These plant clusters thus create their own microclimate in a harsh land. Often the ground temperature around them is only a few degrees above zero, while within the plant colony temperatures rise to forty or fifty degrees.

FAIRY SAXIFRAGE
Saxifraga chrysantha

Unlike the plants of the slopes, the alpine zone dwellers depend very little upon bees for pollination. Insects better adapted to the heights perform the function. Here sphinx moths, butterflies and dragonflies travel from flower to flower for their freight of pollen and nectar. The insects, too, are specialized species — darker than their lowland cousins and so more able to take in the sun's warmth. Some tiny plants here look like evergreens. The Mountain Heath bears small, dark green needles whose margins roll downward and inward when freezing occurs, protecting their precious moisture content by exposing less surface to the elements. Narrow, sheathed in wax, and stiffened by a thick cuticle, these leaves are well designed for life in rocky sites.

Summer comes suddenly to the alpine world. Snow drifts linger into May and June, but underneath the snow's crust plants are putting forth tentative shoots in response to the longer days and more intense sunlight. Often buds pierce the snow blanket, to burst into bloom as the snow melts. One day all is white and severe, seemingly bare of life; the next day, flowers of every hue cover the ground. The blue of Sky Pilot *(Polemonium viscosum)* mingles with the gold of Avens *(Geum turbinatum)*, the pink of Mountain Heather *(Phyllodoce empetriformis)* and the purple of saxifrage *(Saxifraga oppositifolia)*. July and August are full of fierce activity, since these plants must make the most of the short season. The Sky Pilot, as with other alpine plants, has adapted its leaves to harsh weather. Each plant is actually a plant cluster, whose leaves are composed of thirty to forty small, whorled, roundish leaflets covered with a sticky coating which keeps moisture in. Polemoniums grow in the shelter of rocks and, when crushed, emit a disagreeable skunky odor that wards off hungry foragers.

HARE BELL
Campanula rotundifolia

PURPLE BELLFLOWER
Campanula parryi

Alpine sunflowers (*Hymonoxis acaulis* and *H. grandiflora*) and bluebells (*Campanula* spp.) are reminiscent of

their relatives on the lower slopes, but their stems — short, stiff and covered with insulating hairs — are adapted to the severe climate of the alpine meadow. Amidst all this unlikely extravagance, the Purple Saxifrage, pioneer of the rock slides and boulder piles, is the unlikeliest of all. Saxifrage means rock-breaker, an appropriate epithet for a plant whose roots grow best in rock crevices, in whatever humus and moss they find in the fissures.

The avens too are constructed to thrive under alpine conditions. This evergreen's low, woody stem scorns wind and frost, its rolled leaves conserving moisture. Its flowers mature quickly, producing a multitude of seeds to ensure survival of a few in the harsh environment. The plant stores nutrients in its root nodules as a legume does. Once established, the avens slowly extends year after year to form a carpet over the surrounding terrain.

To help identify various plants, one may wish to take along one of the books on wildflowers of this region. Perhaps the best choice is *Plants of Rocky Mountain National Park* by Ruth Ashton Nelson.

The following sources were used for the above article:

The National Parks of America; Stewart L. Udall & Editors of Country Beautiful, C. P. Putnam's Sons, N.Y. in association with Country Beautiful Foundation, Inc., 1966.

Roaming The American West; Donald E. Bower, The Stackpole Co., Harrisburg, Pa., 1971.

The Magnificent Rockies, Crest of a Continent; Editors of American West, American West Publishing Co., Palo Alto, CA, 1973.

Rocky Mountain National Park, National Park Service, U.S. Dept. of the Interior, Circular, 1973.

Unidentified Scroph Named

The "Unknown Scrophulariaceae" pictured (upside-down) on page 74 of Ronald A. Beckwith's article, "A Visit to the Flowery Kingdom", in Volume 39, No. 2, has been identified as being in all probability *Oreosolen wattii* Hooker fil., named after Sir George Watt, according to David G. Long of the Royal Botanic Garden in Edinburgh, Scotland. Mr. Long, who is currently writing a Flora of Bhutan and Sikkim with Mr. A.J.C. Grierson, adds: "There is an allied species, also in Sikkim *(O. williamsii* Yamazaki), which has more sharply pointed leaf serrations and more equal corolla lobes." Mr. Long also says that: "The plant referred to in the article [on the same page] as *Myricaria germanica* var. *prostrata* is a quite distinct species, *M. rosea* W.W. Smith. *M. germanica* does not occur in the E. Himalaya."

Our thanks to Mr. Long.

RUTH ASHTON NELSON

MARJORIE L. SHEPHERD

Through the years, Ruth Ashton Nelson, botanist and instructor, has been a writer and has contributed articles to papers and magazines. As early as 1924 she was writing a column for the *Estes Park Trail* entitled "Our Friends Out-of-Doors" and after she settled in Colorado Springs following the death of her husband, Dr. Aven Nelson, in 1954, she wrote frequently for the Green Thumb, publication of the Denver Botanic Gardens.

The first edition of her *Plants of Rocky Mountain National Park*, originally written as a thesis for her Master's in Botany at Colorado State University, was published in 1933 by the U.S. Government. The first printing was exhausted by 1945 but Ruth had already started a revision. The material was sent to the printing office in Washington but for some reason publication was delayed and when Ruth finally heard her book had gone to press, she had difficulty in getting the proof to read. The new book eventually appeared in 1953. It is now no longer a government publication but is under the wing of the Rocky Mountain Nature Association, which brought out a third edition in 1970. To visitors to the park from the lowlands such a book to give them some understanding of different plant life zones is a great help. Flowers are one of the outstanding attractions of the park and they vary much as one travels from the entrance to the top of Trail Ridge Road.

When Ruth first moved to Colorado Springs, in 1954 she shared a house with Kathleen Marriage who was a well known horticulturist and an authority on native plants, alpine plants and garden design. It was Mrs. Marriage who had

Ruth Ashton Nelson

planned the plantings at the old Horticulture House on Bannock Street in Denver, which contained a number of quite unusual shrubs and vines. She was the founder of Upton Gardens, a world famous nursery, especially for alpine plants. *(Mrs. Marriage was an early member of ARGS and wrote a number of articles for the Bulletin. — Ed.)* It was a nice situation for Mrs. Nelson as they shared the same interests. In 1955 she moved into her own house next to that of Mrs. Marriage.

In July 1954, Mrs. Nelson attended the International Botanical Congress in Paris. The party made a field trip to the Alps, leaving Paris on July 14th. There were only five or six people who spoke English, one of these being Joe Penland from Colorado Springs. After the scheduled trip, Ruth visited the Swiss National Park located on the eastern border of Switzerland. It was on this trip that she met Dr. Beatrice E. Willard, who at that time was teaching high

school in California and was traveling on a fellowship from the Ford Foundation. Ruth and Bettie spent some time together, even sharing accommodations. This was the beginning of a long friendship as soon after Bettie came to Colorado where she started work on advanced degrees at the University of Colorado. The work on her doctorate was in connection with her research on the human impact and damage to the delicate ecology of the land above treeline. Ruth and Bettie shared many of the trails in Rocky Mountain National Park during the years that Bettie was working on Trail Ridge Road. *(Miss Willard's study of alpine ecology culminated in the book,* Land Above the Trees, *co-authored with Ann Zwinger and published in 1972. This book was reviewed in the Bulletin, Vol. 31, p.124. — Ed.)*

Harold D. and Rhoda N. Roberts were among the early photographers working in color to produce a large collection of flower slides. Some of these slides were used for Museum Pictorial No. 8 published by the Denver Museum of Natural History. It was titled *Some Common Colorado Wildflowers*. The Roberts had begun work on a second pictorial but Mr. Roberts passed away in 1956 before the new book was finished. The Museum decided to go ahead with the second pictorial as a memorial to Mr. Roberts and Mrs. Nelson was asked to collaborate with Mrs. Roberts for the botanical material in it. Thus Museum Pictorial No. 13, *Mountain Wildflowers of Colorado* by Rhoda N. Roberts and Ruth Ashton Nelson was published in 1957.

In the years following a summer spent in Alaska, Mrs. Nelson became herself a very fine photographer of the wildflowers with which she worked. While in Colorado Springs she taught botany classes, which were very popular, and she used her color slides for teaching and illustrating many delightful lectures. In the summer she spent much time at Skyland Ranch and when the summer seminars were started by the Nature Association at Rocky Mountain Park she taught there also. In 1967 and 1968 she made a trip around the world. She wanted to see the spring bulbs in bloom in the Near East and thought she would be able to join the Baggleys who were located there. She had become acquainted with them through the park service as they had worked at Yellowstone National Park. She was advised, however, that due to the political conditions it was not a good time to visit the Near East so instead she went to Kifissia, Greece, where she was welcomed by Nicki Goulandris who was involved with the museum and wanted Ruth to spend some time there. She was furnished with a room with private bath for three months while she did some work with the museum and was able to take some short trips. She came home with many beautiful slides.

Shortly after she had finished working with Mrs. Roberts on the Museum Pictorial for the Denver Museum of Natural History, Ruth began to plan a plant book which would cover more territory than the book written for the park. Her friends encouraged her to go ahead with it. This new book, called *Handbook of Rocky Mountain Plants,* was first published in 1969 and last year, 1980, was reissued in a revised edition. (See review p. 189.) It covers the Rocky Mountain region from the Canadian border south to New Mexico.

Later, while on a trip to Zion National Park, Mrs. Nelson visited the headquarters where she met Robert C. Foster, former Chief Park Naturalist of Zion National Park and later executive secretary of the Zion Natural History Association. One of Ruth Nelson's books was on his desk and he asked her when she was going to do one for them. *Plants of Zion*

National Park was published in 1976. The text is written by Ruth Nelson and some of the colored pictures were taken by her and are so attractive that one can enjoy the book by just leafing through it. In addition there are pencil drawings by Tom Blaue. The book was put together by a book designer, Robert Jacobson and Mrs. Nelson has said that she thought that this added to the looks of the publication. It is a lovely book, pleasant on a coffee table just to enjoy, but if you are going to Zion National Park for a visit, it is a book you must take with you no matter what the season.

In 1963 Mrs. Nelson had sold her house in Colorado Springs and purchased a house in Estes Park. Later she sold this house and bought a comfortable condominium. Now she spends her summers at Skyland Ranch near Estes Park and her winters in town. Having recently finished her revision of *Rocky Mountain Plants*, has Ruth Ashton Nelson, now in her eighties, finished writing? No, she is thinking about a book on plant identification.

Excerpted by John G. Worman, Littleton, Colorado with permission of Denver Botanic Gardens from articles appearing in Green Thumb, *Vol. 35, Nos. 3 and 4.*

MY FAVORITE ROCK GARDEN SHRUBS

Anita Kistler
West Chester, Pennsylvania

A rock garden is not complete without shrubs — not Korean tree peonies with their huge eight inch blooms, nor a nine foot fragrant viburnum, but the shrubs that are scaled to the bun plants of androsace, aquilegia, campanula and dianthus. Shrubs are defined as woody plants that remain low and produce shoots or multiple trunks from the base. The following are some of my favorites, which may vary widely from those of some readers.

Starting alphabetically: *Aethionema armenum* 'Warley Rose' is invaluable for twelve months of beauty. Peeking through the snow with its glaucous gray-green foliage or crowned with the lovely heads of pink crucifer blossoms in spring, its shape is trim throughout the year, adding color and form to the sunny scree. A few years ago, I tried coddling it and covered it with pine boughs in winter, always uncovering it too early, I eventually lost this plant. Now I cover nothing and my plants survive better.

Alyssum serpyllifolium is the gem of this genus. With its tiny, almost white leaves, it is an asset summer and winter as a complement to any green foliaged plant and its yellow crucifer blossoms are not the garish shade of the more common *Alyssum saxatile* — Basket-of-Gold. As with all the alyssums, it needs full sun and good drainage.

Betula nana, the arctic birch, makes a graceful shrub. A bushy plant, no higher than sixteen inches, its many upswinging branches are cloaked with tiny, almost circular, toothed, deciduous green leaves. Growing in full sun on the scree, it creates a nice microclimate on its east and north sides for scree dwellers which want a little shade, albiet good light and air circulation. In the autumn, when this birch loses its leaves, they are so tiny that they never harm nearby buns.

Chamaespartium is just the updated

name of two plants I grow under the old name of *Genista*. *Chamaespartium sagittalis* always looks miserable in winter, but its winged stems perk up quickly in spring and by June the tips are covered with golden legume flowers. The plant looks nice until Christmas, crisp and green, then wilts with the cold weather. *Chamaespartium delphinensis* is a more refined, condensed version of *C. sagittalis* and does hold its shape a little better through the winter. Both need sun and scree conditions.

Cotoneaster 'Cooperi' is the only one of this genus that I trust in 'Her' rock garden. I lost about three plants before I found the right location for this shrub — sun, but not continuous and plenty of light and air. Now it thrives, planted on the north side of a small mound with a cool root-run under rocks. Here it gets full sun all morning, then high shade until three in the afternoon. Now about ten years old, eight inches high and twenty-four across, it makes a good evergreen mound all year. Its tiny leaves are more ovate than those of *C. thymifolius* and it does not have the untidy habit of irregular growth that is so characteristic of *C. thymifolius*. No pruning is ever needed on *C.* 'Cooperi.'

Cytisus decumbens was grown from ARGS seed eight years ago. My plants do not quite fit the description, because no branch is straight; they all have a curve — from gentle to almost curved back over themselves. The leaves are simple, ovate, blunt tipped, hairier on the bottom than on the top. The stem, too, is hairy. This foliage fits the description for *C. decumbens*, but even the trunk curves upward for about three inches, then every branchlet curves downward. When covered with its yellow pea-flowers, it is particularly lovely trailing over a low rock wall. Plant in a well drained spot in full sun and then do not move it as it does not take kindly to transplanting when of any age. In eight years it is only fourteen inches across.

Dryas octopetala grows well and flowers nicely for me, but never makes the huge mats that cover some hillsides and roadsides in the mountains of Europe and western North America. I must grow this plant in a site that gets only very early and late day sun, but has good light the remaining period of time. Both the white Rosaceae flowers and seed heads are attractive over the mat of miniature, almost oak-like leaves.

Eriogonums are a challenge to the rock gardener in the East. After the 1976 Interim Conference in Seattle and Vancouver, we rented a car in Canada for a drive through the mountains to Denver, Colorado. We collected *Eriogonum umbellatum* on a cousin's property in Wyoming — a plant and some cuttings. As soon as I got home, I planted the rooted plant directly in my rock garden. Today that plant is growing and blooming — a mat about ten inches across and one inch high. Naturally it does not make the show that it does at the higher elevations, but I like it. The foliage is a nice green with the reverse side almost tan with matted hairs. The leaves turn a lovely red in fall and winter.

As I stated above, I also brought back eriogonum cuttings. These were a complete failure. I had anticipated that the rooted plant pried out of the rocks would probably die, but that I would have about a 75% success with these cuttings, but success with the cuttings was zero.

Forsythia viridissima 'Bronxensis,' for the first time since I have had it, put on a show in 1979. Though it had been in the rock garden for six to seven years, it had previously had only eight or nine blooms per year. This shrub stays low, fairly compact, and has never sent out any long ungainly shoots. It has never

been trimmed, though occasional cuttings have been taken from it, but has stayed in scale with my rock garden of small plants.

Gaylussacia brachycera in full sun is a SHOW — in bloom, fruit, and for winter color. My introduction to this ancient shrub was on a field trip when I drove with Dr. Edgar T. Wherry above Harrisburg, Pa. to collect some cutting material.There the gaylussacia grew in duff between rocks under tsugas. I was rather disappointed. Although a single plant covers about two acres, I had to search for the shoots popping up here and there as much as twenty-four inches apart; it certainly was not the green carpet I had expected. We also visited a New Bloomfield Preserve where the plant behaved in an identical manner.

Later, on talking to Don Smith of Watnong Nursery, Morris Plains, N.J., I discovered there are only twelve known plants, each one requiring pollination by another clone if it is to have any berries. Don suggested planting in full sun to make it grow in a tighter stand than it normally seems to in the wild.

Two of my plants are in a shady section of the rock garden, where they are quite wispy, while the plant in full sun is compact, blooms with pretty pink and white bells, and fruits well as it is pollinated by my wispy plants. Then in winter, its stems and evergreen leaves turn a rich red color.

Helianthemum oelandicum ssp. *alpestre* can be planted in any choice location in either rock garden or trough as it will never smother any neighbor. My plant is only two inches high and eight inches across. It has tiny, dull green evergreen leaves and, in June, clear yellow, five-petalled flowers, each half an inch across. The stems are red. An excellent plant.

I like *H. nummularium rhodanthe carneum* with its soft gray foliage and ashes of roses flowers, but in one growing season it can cover twenty-four inches so is not a plant to put among choice buns in the scree. *Helianthemum lunulatum*, however, is nice looking with narrow evergreen leaves, making a low mound about eight inches high by twelve inches across. A good little scree shrub with small yellow flowers.

Hypericums are lovely but almost too garish; in full sun they are dazzling. *Hypericum olympicum citrinum* has pale lemony yellow flowers, making it a prettier plant than most. This *H.o. citrinum* came from a batch of Seed Exchange grown seedlings. No difference was noticed until the plant bloomed.

Hypericum buckleyi, an American native from Tennessee, looking as a dwarf shrub should, has square red stems and grows only to eight inches. The leaves are quite glaucous, turning red in autumn, though not the rich red of gaylussacia. Even the seed capsules turn reddish. A very neat and tidy little native for any sunny position.

Iberis sempervirens 'Little Gem' makes an almost overwhelming display in April and May. Although one of my plants is only twelve inches across by five inches high, another plant, which I thought was from the same batch of cuttings, is also only five inches high but almost twenty-eight inches across. I prefer a little beauty grown from Seed Exchange seed as *I. pygmaea*. This is very slow growing, being only one inch high and taking two years to get four inches across. The foliage is typical iberis foliage, only miniaturized. The blooms are in compact clusters, which make a good show in spring and again in late fall.

Jasminium parkeri does not bloom as fully as I would want but is such a nice quiet dark green, pinnate-foliaged plant that I am very fond of it. It grows next to a big tufa rock in full five-hour sun. Although several of the branches die back each year it survives our Pennsyl-

vania winters well. I cannot comment on its fruit because it has never formed one berry for me. It is a choice rock garden plant.

Next we come to another native American genus that has universal appeal: the Penstemons. *Penstemon angustifolius* is never the tidy plant described in my books, but as my original seed came from Claude Barr, I feel secure with the name. The leaves, quite lanceolate, are a nice glaucous blue-green on seven inch long branches and the flowers open the most gorgeous clear blue from pinkish buds. This blue remains a good color in both sunny and rainy weather unlike the blue of many penstemons that turns quite muddy on overcast days. Grow this for the blue flowers and forget its rather straggly growth habit.

For their attractive foliage, I grow both *Penstemon davidsonii* and *P. pinifolius,* very different plants. *Penstemon davidsonii* has shiny, little, opposite evergreen leaves, making a nice low mat along the ground. It blossoms well in June, producing lavendar labiate flowers held well above the foliage, and reblooms in September. This plant wants plenty of light but not hot sun, so I grow it on the north side of a mound. Here it gets direct sunlight only very early in the morning, but lots of overhead light the remainder of the day.

Penstemon pinifolius is very different in appearance. Its many little linear leaves might almost be confused with those of a dwarf conifer. This mature plant becomes three to four inches high by about twenty inches across, making a good evergreen matlike accent. My plants are in full sun in the scree, but I suspect we have too many summer rains in Pennsylvania to allow it to cover itself with tubular, labiate, coral red flowers as it might in its native, dry New Mexico. There is a scattering of bloom every year, but I grow this penstemon for its year-round soft green mound.

My *Potentilla fruticosa* came from the Plant Sale at the ARGS Annual Meeting in Milwaukee and in the intervening years it has attained a height of fifteen inches, and covers twenty-four. The good clear yellow Rosaceae blooms start in June and continue to a lesser degree through late August. Sun and good drainage are necessary for good flowering.

I always want to list this plant under the alyssums, but it is classified as *Ptilotrichium spinosum,* well deserving the species name. When grown in full sun in the scree, it makes a cushion of grey-white, with blossoms either white or pale pink, adding much year-round interest to the rock garden where it compliments the greens. The books list this shrub at a height of ten inches, but mine has never exceeded seven.

Prunus pumila depressa is exactly described by its specific and varietal names. This was the first plant I ever bought for my rock garden, about fifteen years ago. Now its black trunk, clothed in typical cherry bark, is about three inches thick. To be precise it should be called a tree, but as it grows only three inches high and creeps along the ground to form a mat about thirty inches in diameter, I include it as a shrub. In winter, the bare branches make a pleasing silhouette against the ground; in spring the plant is dotted with numerous small white Rosaceae flowers, which are followed by little purple-black cherries. The foliage consists of obovate, sharply pointed leaves of good scale that turn red in the fall. A very interesting addition to any rock garden, this little shrub is a dwarf form of the Sand Cherry, native only from northeastern American from Massachusetts north. It is seldom seen in cultivation though it is not a difficult plant and propagates easily from rooted layers, cuttings or seed.

My plant was purchased from Boyd Kline, who propagated it by cuttings and had never seen it fruit. Shortly after I acquired my plant, John received one as a gift for 'His' garden from Linc and Timmy Foster. As both plants in our gardens produce fruit, it is possible that two clones are necessary for fertilization. Both plants originally came from pits collected by Linc and Timmy on Mont St. Pierre on the Gaspe Peninsula. They report it grew in mats on the gravelly slope of the mountain with creeping juniper and a dwarf silvery-leaved shrub, which they think was a low form of *Elaeagnus commutata*. It sounds as though it were a nice combination of plants.

Finally, I come to my favorite genus. It does not appeal to everyone, but the dwarf salix have taken my fancy; they are quiet plants. They grow in my rock garden, not in moist spots, but not in full hot sun either. *Salix* x *boydii* is extremely slow growing, yet one notices the plant both in winter and summer: the compact growth habit attracting your attention in winter, while the wonderfully veined, hairy leaves draw your admiration in summer.

Salix x *morei* is also very low growing. It never layers itself, just stays very discretely where it is planted. Its leaves are oval-oblong, dark glossy green — darker than the foliage of the nearby plants. An azalea gives these salix afternoon shade. The rabbits love their upright branches, so give the plants a yearly shearing that makes them more compact than normal.

The tiniest willow is *S. serpyllifolia*. It just undulates over rocks where it makes a charming picture, particularly when its tiny green leaves sparkle with dew. My plant came in an envelope as a cutting from Austria, where my husband and I had admired the parent plant. You need a special spot for this wee one.

My favorite, however, is *Salix pendula*. Why? Because this one has the most beautiful catkins. They last about a month — first as shiny gray fuzz, then as catkins covered (in the male plant) with yellow pollen-laden stamens. This plant never gets higher than five inches and its branches curve and twist in and out among each other. Though this willow covers about a thirty inch space, I do not begrudge it its bit of the rock garden. The deciduous leaves are a lighter green and more lanceolate than those of my other willows. This is a great beauty.

Lastly, I have to mention a second Ericaceous favorite: *Vaccinium macrocarpum*, our native Thanksgiving Cranberry. I grow it near *Salix* x *morrei*, and while the salix is deciduous, this shrub is evergreen, turning a lovely deep red in winter. The plant sends out long runners, but judicious snips keep them within bounds. The blossoms are very showy, with white reflexed petals and protruding anthers of red. These are followed by the large, nearly three-quarter inch cranberries of bright red, thus providing a fine display throughout the year. I have planted it along the main path through the rock garden so I can enjoy it every month of the year.

Weeding's prevailing virtue is that it gives you a chance to garden when, maybe, you ought to be doing something else.
— Joseph Kastner in the *Smithsonian*

SOUTHWESTERN YUCCAS

Richard Kleinboehl
San Francisco, California
Artwork by David Longley

Many of the plants of the southwestern deserts and mountains do not grow well in the Bay Area. While I have been unsuccessful with some of the groups of showy plants in the southwestern floras, such as townsendias (Easter daisies), *Phlox nana* (among the largest flowers in the genus), and legumes such as *Erythrina flabelliformis* (Western Coral-bean), others grow well here. Among these are *Penstemon barbatus*, the Scarlet Bugler, a hummingbird pollinated plant, which, along with *Gilia aggregata*, the Fairy Trumpet, dapples the autumn pine forests of the southwestern uplands with splashes of red, and helps keep the bellies of migrating hummingbirds full of nectar. Also successful in this area are *Heuchera sanguinea* (the wild species of Coral Bells), various cacti, and several of the yuccas and agaves.

What follows might best be viewed as excerpts from a field notebook on the ecology and culture of the southwestern species of *Yucca*. My discussion should be read with some reservation, however, for two reasons: I have not made any formal, "legitimate" studies of the genus; and most of the references from which I have obtained the taxonomy used here are pre-cytological. These names are the fruit of the old "alpha-taxonomy" school, rather than products of modern cytological and biogeographic studies.

As with any complex group there is much disagreement in the literature, some of which has been resolved. The differences between the keys in Kearney and Peebles' *Arizona Flora* and Webber's 1953 monograph are melded in the supplement to the 1964 edition of the flora. If only the plants were as cooperative. For example, my plants of *"Yucca angustissima"* are dead ringers for the species description save the fact that they are supposed to have thin-walled capsules. My plants bear capsules of the right size and configuration but nearly as hard as walnuts. Such confusion is the natural order of things in the genus *Yucca*, and we can take solace in the struggles of the masters.

My preoccupation with yuccas began on a 1975 collecting trip through the Southwest at which time I accidentally traversed the *Yucca glauca-Yucca elata* hybrid zone from north to south (see Fig. 1). Shortly thereafter I began working as a secretary in San Francisco and did most of my botany while traveling to and from work on the 8-Market bus. A purchase order for yucca seed from Herbst Bros. Seedsmen of Brewster, N.Y. enabled me to return to the Southwest in October, 1978 to photograph yuccas and collect seed. The last stop on my trek was the lovely rock garden of Loring and Margaret Williams in Sparks, Nevada, which contains a number of well grown yuccas. Margaret acquainted me with and kindly lent me her copy of Webber's *Yuccas of the Southwest* from which I quote the following excerpt:

"Throughout the northern half of New Mexico and well into adjacent parts of Texas and Oklahoma and in the southwestern corner of Utah and adjacent Nevada, the majority of capsular-fruited yuccas lack constant characters

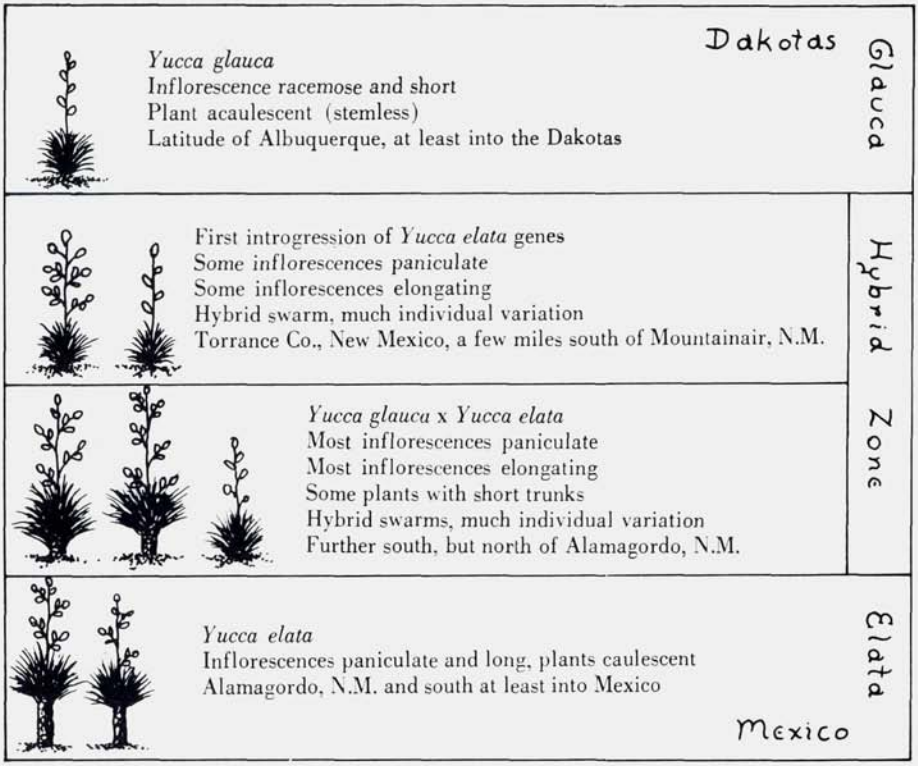


Fig. 1

and are difficult to identify or classify as named species or forms. Although occasionally a plant or a group of plants approaches a named type, the majority of them appear to be hybrids or hybrid derivatives. Many of the apparent hybrids are midway between two named types, whereas others appear to be of quite remote hybrid ancestry, and still others to have involved several named types in their origin."

It was through reading Webber that I was able to begin to put my — well-known, as it turns out — hybrids into perspective. Although I spotted the most obvious of the Southwestern yucca hybrids, a closer look would have revealed many more.

The classical botany of Webber gives the reader some idea of the peregrinations of yucca genes and the vast genetic plasticity yuccas have accumulated against future selective pressures.

Let us now return to the possibility of yuccas as garden subjects.

Yuccas, with their basal rosettes of stiff, pointed leaves, are excellent constituents in a collection of rock plants. Although the species I have grown come mostly from low rainfall areas in Colorado, New Mexico, Utah, and Arizona, they thrive here in the San Francisco area in well-drained soils both in the garden and in pot-culture. They seem to take excess moisture in stride and need little care, except for root pruning potted plants. I will confine myself to the eight species I have observed in the field and grown from seed. Though most may be considered too

large for the rock garden except as specimen plants (some, indeed, have the proportions of trees and shrubs), others are of quite small stature.

Yuccas can be divided into two groups: the fleshy-pod species and the dry-pod species. Actually the characteristic used to separate these two groups is referred to as dehiscence. The "dry pods" split open at maturity (dehiscent); the "fleshy pods" do not (indehiscent). *Yucca baccata, Y. schottii,* and *Y. thornberi* are the fleshy-pod species described here, and *Yucca angustissima, Y. baileyi, Y. glauca, Y. elata,* and *Y. whipplei,* the dry-pod species. Major lacunae in my species list are yuccas of the Mohave Desert (I share Dwight Ripley's disdain of "the torrid wastes east of Victorville") and the splendid arborescent species of west Texas, which I would like to see one day. Both groups would grow well in the Bay Area, whereas the other repository of yuccas in the United States — the South, contains species such as the overworked horticultural warhorse, *Yucca filamentosa,* that probably would be miserable here.

Starting in the southeastern corner of Arizona, the pine-oak-Arizona cypress forests of the Chiricuahua Mountains, at elevations of roughly 5,000 to 7,000 feet, *Yucca schottii,* the Hoary or Mountain Yucca, is a conspicuous element of the forest subcanopy. Rising gracefully to heights of ten to fifteen feet or higher, this yucca keeps its old leaves as a kind of straw-colored hanging garment, with the glaucous blue-green leaves atop making the plant appear almost tropical and palm-like in aspect. It would not be drab in a lineup of Hopi kachinas. The fruits are light green, somewhat banana-like, pendant, to eight inches long, and taste something like cantaloupe. It takes quite a bit of shade in nature, but my impression was that the shade cast by the canopy is quite patchy, suggesting an intermediate light regimen for the plant in cultivation. It would be quite a plant to bonsai!

Yucca thornberi is another southern Arizona fleshy-pod species, which I found in the Sonoran Desert east of Phoenix. My familiarity with this species is limited to a few scattered colonies along about a ten-mile stretch of road, where the plants formed patches of one to fifty stems, rising to heights of perhaps five feet. Some authors call this plant *Yucca arizonica* x *Yucca baccata.* I have not yet met true *arizonica.*

True *Yucca baccata,* the Banana Yucca, is an old friend from four years spent in northern New Mexico. There, it is a predictable associate of the pinyon-juniper woodland, which occurs mostly at elevations of 5,000 to 7,000 feet. It makes some attempt at becoming arborescent, but fizzles out at about seven feet in height. Prospering in the light shade of the "elfin woodland" (pinyon pines and junipers create a pygmy forest, rising to perhaps twenty-five feet at lower elevations, and not much more than fifty feet at the upper elevational limit), the Banana Yucca is a staple of landscaping in Santa Fe. The leaves of *Y. baccata,* while bluish in seedlings, often mellow to a nice yellow-green or even lime green. The plants are frequently chosen by pack rats for midden sites.

Sympatric (said of two species within a genus growing in close proximity) with the Banana Yucca is *Yucca glauca,* the Great Plains Yucca. In the pinyon-juniper, *Yucca glauca* never grows under trees, always in the open areas between the trees of this park-like forest. *Yucca glauca,* and its more southerly congener, *Yucca elata,* the Palmilla or Soaptree Yucca, are often photographed and well-known. They form the two

end points of a swarm of geographical segregates, with much hybridization.

Yucca glauca and other members of the *Yucca glauca* complex range widely, with *glauca* itself occurring northward into the Colorado Rockies and out onto the Great Plains. As one travels south from Albuquerque, several characteristics of *Yucca glauca* (length of inflorescence, type of inflorescence, and trunk height) merge into those of *Yucca elata* (see Figure 1). The hybrid zone seems to be at least one hundred miles in length north and south, and by the time one reaches the latitude of Alamogordo, New Mexico, the plants are tall, paniculate, typical *Yucca elata*, with well-developed trunks and graceful, elongate curving inflorescences. True *Yucca glauca*, as found around Albuquerque and northward, is a strictly acaulescent plant, with the top of the basal rosette seldom over two feet tall, and the racemose inflorescence seldom over three feet in length, while *Yucca elata* may reach thirty feet in height, with ten foot and longer paniculate inflorescences.

Both *Yucca glauca* and *Yucca elata* are grassland species, always growing in full sun. They are found at lower elevations than *Yucca baccata* and *Yucca schottii* respectively, although there is some overlap in the altitudinal ranges of *Y. glauca* and *Y. baccata* where they occur together.

In both groups, the more northerly species is short and more or less without a trunk, while the more southern species in the two groups are tall with well-developed trunks. Although I did not observe intermediate forms in the fleshy-pod group, the parallel variation in growth habit is striking, and strongly suggests some climatic factor, which permits yuccas to become treelike in the southern portions of Arizona and New Mexico, but not in the more temperate northern parts of the state. A better plant ecologist than I could undoubtedly elaborate an interesting explanation of the phenomenon.

Many of the yucca populations are discontinuous. Much of the discontinuity is undoubtedly caused by disturbance of habitat by man and man-introduced species, although the richness of the southwestern topography has undoubtedly always provided much opportunity for speciation, especially in the higher-elevational species. In fact, many "species" of plants in the southwest are actually "incipient species" that are isolated from nearby "species" geographically, but have not been isolated long enough to evolve perfect isolating mechanisms. Hybridization among named "species" is rampant in the Southwest, but this is actually a boon rather than a curse, for it is the hybrids that illuminate the relationships among species, and thereby the evolutionary history. Because hybrids tend to occur at the margins of a species' range, an accurate geographical label makes identification manageable. Without such information, taxonomy quickly becomes an exercise in wild speculation.

Two glauca-type yuccas from the Utah canyonlands — *Yucca baileyi*(?) and *Yucca angustissima*, round out the southwestern species that I have become acquainted with in the field. *Yucca baileyi* has the largest pods I have seen in the dry-pod group, and *Y. angustissima*, which I call the "pygmy" yucca, is the most dwarf. Both grow on the red sandy laterite soils of the canyonlands. While *baileyi* must have enormous flowers, judging from the pods, and flowers extending all the way down the inflorescence (all other species observed had naked inflorescences for at least the first eight to ten inches), the flowers of *angustissima* are dwarf and in scale to the plant, whose rosettes sel-

dom reach more than a foot in height.

The only California yucca I have grown is *Yucca whipplei*, Our Lord's Candle. I have collected seed of the dwarf coastal form, subspecies *intermedia*, on the coastal bluffs near Malibu, and the more typical form in the vicinity of Big Sur. Both are splendid in the garden, and very different as young plants — with subspecies *intermedia* taking longer to form a rosette; three-year old plants have only a half-dozen leaves and no rosettes in evidence. Four-year old Big Sur plants have perhaps a hundred leaves in perfect eight-inch rosettes. The leaves of both are almost a steel blue.

Each of the six kinds (five species and a hybrid) of yucca that I have attempted to bring from seed has come freely and easily. Because the seeds of the fleshy-pod species are thick and heavy (whereas the seeds of the dry-pod species are thin and light), it takes a bit longer for the embryos of the fleshy-pod species to break through the stronger seed husk; otherwise, the simple chemistry of growing yuccas from seed seems to be moisture plus warmth equals germination.

This is surprising, since many desert plants, especially desert annuals, display a very pronounced pattern of delayed germination, whereby seeds of a given crop year will germinate, a few at a time, over a span of five, ten, or more years. Few years in the desert will present favorable spring seasons, and many desert seedlings will only survive in those rare years of high spring rainfall. Not knowing when the favorable years will come, desert plants program their seeds to germinate a few each year, thus guaranteeing that some of the few that happen to germinate in a good year will survive to continue onward. In addition to hard seed coats, some desert seeds are thought to bear germination-inhibiting chemicals on their surface, which do not wash off easily, thus allowing germination to occur only when a considerably amount of rain has fallen. Still further inside the seed, there may be genetically controlled and variable time clocks. We yucca fanciers are lucky. Consider Dwight Ripley's account of one of the difficult desert groups, the bear poppies, genus *Arctomecon*. In his article, "Utah in Spring" in the September, 1942 issue of the *Quarterly Bulletin* of the Alpine Garden Society, he says: "Some boil their desert seeds, some burn them; others scratch and cut them. (Yet others, after three years of waiting for them to germinate, have been known to dig them out of their mouldering pans and stamp on them.) Violence, it seems, is necessary. And so, by following the modern precepts of fire and sword, we can perhaps conquer this arctomecon in our own humble way with fire and scissors."

Young yuccas of the dry-pod group devote most of their first-year energy to developing an underground caudex (stem), which looks much like a small crocus bulb. This organ becomes woody and large as the plant matures. Young yuccas of the fleshy-pod group are more succulent and, though easy enough to germinate, are prime targets for snails and slugs, which often shear off the young leaves at the base, thereby killing the seedlings. This necessitates some type of protection in snail-infested areas. Because of losses to snails and slugs, I now start many of my outdoor plants in wooden frames covered with fine-mesh screen. Bringing a yucca from seed to bloom is probably a long-term process, but, as with many rock garden plants, the rosettes of leaves are a reward in themselves.

Since none of my plants are near flowering stage, I will ask to be excused from the task of describing the gar-

dener-as-yucca-moth (the method of hand pollination), by saying that the symbiosis between yucca and moth is one of the great stories of botany.

Seeds of Yucca may be obtained from:
Herbst Brothers Seedsmen, Inc.; 1000 N. Main St., Brewster, N.Y. 10509
Peter B. Dow & Co., Box 696, Gisborne, New Zealand

LINUM CAPITATUM

ZDENEK ZVOLANEK AND JAROSLAV KLIMA
Prague, Czechoslovakia
Photograph by Jan Hulka, Prague

The short-grassed meadows of the Southern Pirin Mountains in Bulgaria are decorated by the wonderful golden yellow color of the flowers of *Linum capitatum* in late spring. Its bright green leaves are made up into rosettes that bear the flower stems in the center. Rosettes are about two and a half inches across with the flowering stems reaching a maximum of eight inches. This plant forms colonies in small valleys between the hills, which are richly supplied with water when the snow thaws. As summer advances this moisture slowly dries up until the grass is burnt by the parching sun and the bright green rosettes overtopped by the ripening seed pods are all that can be seen of the linum.

Localities in the Southern Pirin are sharply drained. There is no water from 1600 meters (5248 feet) at the Popovy livadi chalet up to 2083 meters (6832 feet), the top of Mt. Orelek, the highest peak of the region. The area also has a number of other characteristic features: the upper sections are of limestone raised over granite. This limestone occurs above 1700 meters (5580 feet) and this line is almost identical with the beginning of the alpine region. At 1800 meters (5900 feet) we meet *Linum capitatum*, which reaches some 1900 meters (6235 feet), the highest level at which it occurs. Plants occupy all exposures but it would appear that they do best in the valleys where they are protected from winds.

The species creates plenty of seed but these do not germinate all at once; in fact we are still getting seedlings from seed sown in 1976 in a large pan while the first seedlings of 1976 were exhibited in bloom this year (1978).

The species is well worth growing as you can leave them during your summer holiday without any care. It seems the plants do not suffer from pests and diseases here in Prague. Plants look like a more robust *Linum* 'Gemmels Hybrid' and are as free flowering. Our plants flourish in full sun in humusy loam among tufa stones and do not require crevices or screes facing exactly south. In fact, in the *Northern* Pirin Mountains they grow in western exposures. Domesticated plants in a rockery, however, will not grow as tall as normal in semi-shaded positions and their leaves will have a bluish tint, though we can recommend slight shade in regions where air humidity is low.

The plant in the photograph had deep yellow flowers and was six inches tall but we also found plants with light

Linum capitatum

yellow flowers. Probably selection could have some significance.

At the moment we have only one problem: how long must we wait before we get all the potential seedlings hidden in our big pan.

THE SHOW BENCH

Annual Meeting 1981
Plant Show

The number of entries staged at the 1981 Annual Meeting Plant Show exceeded the expectations of the Committee, both in quantity and quality. A total of 21 exhibitors from the states of Georgia, Maryland, Ohio, New York, Michigan, Wisconsin and Pennsylvania showed a total of 205 entries with a good representation in the 26 classes.

The award for the First Highest Aggregate Score went to Carl Gehenio of the Allegheny Chapter. Second place was awarded to Ted Berginc of the Wisconsin-Illinois Chapter. Close runners-up were Hans Asmus of the Wisconsin-Illinois Chapter and Dr. Bob McDermott of the Allegheny Chapter.

The Best of Show was awarded to a flawless 12 inch pan of *Saxifraga* 'Mrs. Piper', one of the "Mossy" hybrids. It was in peak condition, the scarlet flowers forming a low canopy over the bright green mound of foliage. This plant reflected the quality of the many other entries by Ted Berginc.

The Connecticut Horticultural Society Award for the best in Class 21 (Hardy shrub other than Ericaceae or Conifers) was awarded to Hans Asmus for a pan of *Kelseya uniflora*. Difficult to grow well, this specimen was of the quality we have come to expect from this skillful grower.

The Allegheny Chapter Merit Award for the best entry in Class 1 (six pans rock garden plants) went to Carl Gehenio. All of the entries without exception were of top quality, well groomed and well presented; certainly a sign of a healthy future for plant shows within the Society. Non-competitive exhibits staged by several members of the host chapter [Allegheny Chapter] did much to add to the over-all appeal of the show. The Committee wishes to thank all those, who by bringing their treasured plants, made this show a great success.

Margaret H. Wisner,
Greensburg, Pennsylvania

Gentiana Scabra

The floriferous, long-blooming *Gentiana scabra*, with its blue flowers, is a handsome sight in gardens during September and October. It is easy to grow, a self-sower. How limited is color, especially blue, in the fall. Why isn't *G. scabra* seen more often?

I asked Henry Fuller, one of our eminent ARGS members that question. His answer: Gardeners do not keep young plants coming along. A mature *G. scabra* does not normally live more than three or four years, thus to have hues of glorious blue from this gentian every fall it is necessary to allow some of the young self-sown plants to grow alongside the older plants each year as eventual replacements.

— D. DeV.

SOME WESTERN TREASURES

Boyd Kline
Medford, Oregon
Photographs by the author

Our western mountains and valleys seem especially endowed with excellent plant material for the rock garden.

Campanulas are a favorite with most gardeners and our *C. scabrella* is a fine plant to test your skill. In nature it grows in deep, rough scree and in the garden it likes a rock crevice or deep sand bed. It has cord-like roots that probe their way into cool runs. Single, up-facing, pale blue flowers top one inch stems over short, strap foliage. The plant does not form a mat but rather runs about as though in search of food. It can be cut into many single runner-and-rooted pieces that will grow on nicely in pots or scree. Sand beds in light shade will get the plant started with feeder roots.

Campanula shetleri is much on the same order of growing. It will form tight, thickly growing communities in rocky screes and crevices. The only place we have found this plant is high in the Castle Lake area of northern California. The plant looks very much like *C. piperi* both in foliage and flower. Though the flower is much paler it is nearly the same size. The plant has also proven more difficult to grow and propagate than *C. piperi*. It doesn't like pots and seems happy mainly in lightly shaded sand beds. Propagation is much the same as the above, with the running root-pieces sharply cut into small segments and planted into sand beds to form new feeder roots. Both these campanulas produce very tiny seed which in turn give tiny, delicate seedlings a bit difficult to maintain throughout a full first season. Being extremely rare and attractive both these plants are well worth attempting.

Campanula piperi comes easily from seed and likes a coarse sand bed with lots of room to scramble about. It comes readily from cuttings also but the mother plant will resent the taking of too much cutting material and eventually die if it is restrained to one small area. This is a well known plant from the Olympic Mountains of Washington and is much respected by all gardeners who are fortunate enough to possess it.

Campanula scabrella

Western silenes are sometimes difficult for gardeners to keep in the rock garden but if they will just remember that these silenes revel in rock-piles their eyes may be opened to the glories of this race. Our native species in the hookeri group are possibly the most attractive in the world.

Silene hookeri grows in wide, low

mats of gray-green foliage, and produces a host of bright pink blossoms sitting neatly upon the stems. These silenes form a very long, brittle tap root that is next to impossible to dig up, but *S. hookeri* comes very easily from seed and will bloom the first season from seed. If cuttings are wanted these should be taken early in the spring when the plant is breaking ground. At this time young foliage will show all around the main plant but careful digging will reveal that these trace back to the original plant and are not seedlings as first hoped. These long stemmed pieces can be rooted in coarse sand and bottom heat of 68°, however. When seedlings or rooted pieces are ready they should be planted in very deep scree or sand beds and lightly shaded for the first year after which they can take full sun.

Silene hookeri var. ingrami, unlike the type, does not form a large mat but grows in a tight clump of dark green foliage. The flowers are much the same but a darker reddish-pink in color, with a lighter apricot-pink reverse. This form comes easily from seed and blooms the first year. Cuttings can be taken in early spring but will be much shorter than those of *Silene hookeri.*

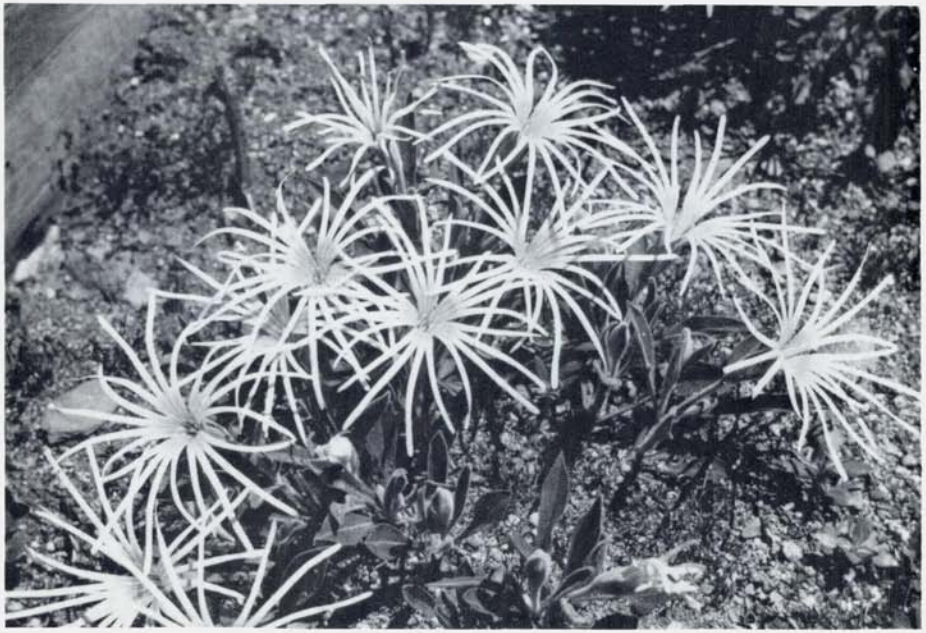
Silene hookeri var. *ingramii*

Silene hookeri

Silene hookeri var. bolanderi is perhaps the most exotic looking of all our native plants. It forms a slowly spreading mat upon which sit the incredibly beautiful flowers. Each blossom is three to four inches across with pure white petals that are narrowly laciniated all the way to the center of the flower. These large blossoms are at the tips of each procumbent stem and lie flat upon the carpet of foliage. This plant also comes readily from seed and may also bloom the first year but more often the second. A very deep sand bed in light shade suits the growing needs of the long tap root. Cuttings can be taken in early spring. This variant is a bit tender and should be protected from severe cold.

All these silenes are completely dormant in winter and should be marked well as the deep tap root, resembling a long white radish, can be sliced through very easily. Here in Medford, Oregon, where our winter low is an average 15°F., we lay a corrugated fibre-glass over the plants which lets in air but gives some protection because of the ground warmth caught beneath it.

Phlox adsurgens is a native of the western mountains that stretch along the border between southern Oregon and northern California. Where it is usually found, above the 3000 foot elevation, this plant forms a loose spreading mat from one foot to sometimes three feet across. In one area of Whiskey Peak the plants cover two acres of a hillside and present a lovely sight. Dark salmon-pink blossoms at the end of the many procumbent stems, set over the mat of smooth, oval-pointed foliage of a medium to dark green gives this plant a very alluring attraction. This is one of the few western phloxes that demands light shade. It does well in woodsy soil but even better in deep sand. When new growth shows in early spring the stems can be easily rooted in sand with bottom heat. It also comes readily from seed.



Silene hookeri var. *bolanderi*

Rock Gardens

by Wilhelm Schacht. Fifth edition, revised, edited and with introduction by Jim Archibald, 1981. Universe Books, New York, N.Y. $19.00 postpd.

The name Wilhelm Schacht echoes through the halls of rock gardening. He was a great wanderer in the hills and mountains where his perceptive eye sought out particularly good forms of already known species and utterly new plants of rock garden potential. There also in his excursions he studied the habitats of the special flowers gracing the rock faces, the screes and the meadows of these mountain realms.

After many years of this basic grounding in alpine ecology among the plants in their native haunts, plus years of growing alpine plants in his own and in public gardens in Austria, Herr Schacht was pursuaded to compose a book condensing his experience and advising the growing numbers of rock gardeners. Thus, twenty-five years ago, when many of the readers of these pages were not even aware of rock gardening, Herr Schacht published a work in German called *Der Steingarten und Seine Welt — "The Rock Garden and Its Plants."*

This book went through a number of editions. Now, with some revisions by the author and with editing and an introduction by Jim Archibald, there is this English edition, a splendid addition to the library of the rock gardener.

Jim Archibald, himself a seasoned plant explorer and expert grower of alpines, makes an admirable team-mate for Herr Schacht, and together they have produced a thoroughly useful work. In his graceful introduction to the volume, Archibald points out the ways in which the work has been brought up to date in nomenclature and the inclusion of plants only recently introduced into cultivation.

A modest quotation from Jim Archibald's book: "In attempting to internationalize the English edition, I have added a great many plants, which are important to gardeners in such cool, wet climates as the north of Britain and the Pacific Coast of North America as well as many for gardeners in more temperate areas, such as western Britain, the milder parts of the USA and much of New Zealand. To try to satisfy everyone is to court disaster. Any compact book claiming to deal with such a wide-ranging subject is inevitably an easy prey to critics, who can seize on its ommissions, irrelevancies and unsuitabilities to their particular gardening circumstances. I hope that most readers will regard it with a more positive attitude and see it not only as a small book, which can stand on its own as sufficiently sound, modern and reasonably comprehensive to be the only book about alpine plants which many gardeners may ever need, but also as a book which opens doors into the more con-

suming, specialist aspects of this subject. If its fault is that it tries to compress too much into a small space, this is the characteristic of alpine plants themselves, as well as being one of the more infuriating and pleasurable pitfalls of rock gardening as a whole."

In the book there are concise and eminently sound chapters on the informal rock garden, the formal rock garden, the dry-stone wall, rock garden beds, peat beds, miniature rock gardening in containers, water in the rock garden, the rock garden under glass, — each chapter with an extensive list of plants for each situation. These chapters are followed by an alphabetical encyclopedia of rock garden plants with separate sections for bulbs, grasses, dwarf shrubs and dwarf conifers, with sound advice for growing.

Of special note is the excellent quality of the numerous color plates scattered throughout the work. The quality of the blue rendering in the two pages of nine different alpine gentians is stunning, alone almost worth the price of this beautifully designed volume. —H.L.F.

For those who wish to do some homework on the Colorado flora prior to the Annual Meeting in Boulder in July, 1982, John Worman has compiled the following annotated booklist. Unless otherwise indicated these may be ordered from John G. Worman, 730 East Arapahoe Rd., Littleton, Colorado, 80122. Please include cost of postage and handling along with the cost of the books as follows: 2 to 12 oz. - $1; 13 oz. to 1 lb. - $1.25; 1 lb. 1 oz. to 2 lbs. - $1.75; 2 lbs. 1 oz. to 4 lbs. - $2.25. Overseas handling and postage to be determined by the purchaser from package weight and known country equivalent rate.

Alpine Wildflowers of the Rocky Mountains by Bettie E. Willard and Chester O. Harris. Estes Park: Rocky Mountain Nature Assoc. Revised 1979, paperback. $1.95, 2 oz.

In this revised edition fifty species are shown in full color in their natural settings. It is an adventure in high altitude ecology and is to a large degree the product of Dr. Willard's personal research and appreciation.

Colorado Wild Flowers by Harold D. and Rhoda N. Roberts. Pictorial #8, Denver Museum of Natural History. Revised 1959, paperback. $2.50, 4½ oz. Out of print, but Mr. Worman has a few copies available.

This booklet has photographs of fifty plant species reproduced in color, each with a half-page description partly botanical and partly a record of personal experience and reactions. There are also pictures illustrative of the plant zones of Colorado and diagrams of details of leaf and flower structure.

Mountain Wild Flowers of Colorado by Rhoda N. Roberts and Ruth Ashton Nelson. Pictorial #13, Denver Museum of Natural History. 1957, paperback. $2.50, 5 oz. Out of print, but Mr. Worman has a few copies available.

Dedicated to the memory of Harold D. Roberts, this booklet contains reproductions of fifty species in color photographs, each with a half-page of descriptive material: botanical and delightfully personal. There is also a series of pictures of forest types and zonal vegetation.

Handbook of Rocky Mountain Plants by Ruth Ashton Nelson. Skyland Publishers, Estes Park, Colo. 3rd Edition (revised), 1980, paperback, $9.95, 10½ oz.

This paper-bound, revised third edition of the *Handbook of Rocky Mountain Plants* by Ruth Ashton Nelson

should be, as were its predecessors, of great assistance to the amateur botanist attempting to identify the plants he sees while wandering around in the Rocky Mountain area. It is primarily a field guide to the more conspicuous vascular plants to be found from Flagstaff, Arizona and Santa Fe, New Mexico north to the Canadian border at elevations between 5,000 and 14,000 feet. However, it also includes in Part I a brief description of the ecology of the area, giving some information about the geology and climate of the various life zones encountered and the adaptations of the flora to this area of low humidity, high winds, and extreme light intensity.

Part II, which deals with the identification of the plants themselves, is, in a sense, a compromise between a technical botany and a guide for the neophyte. The plants are arranged in botanical order in groups, beginning with the ferns and their allies and progressing through the conifers, the monocots (including grasses and sedges, along with such families as the lilies and orchids), to the Free-Petal Dicots (including plants with petalless flowers), and finally the United-Petal Dicots ending with the composites. These groups are given colloquial names: the Fern Family, which covers the horsetails and ground pines as well as the ferns; the Pine Family, under which spruces, firs and junipers are listed along with the pines. The groups are, in turn, broken down into families, usually also under a colloquial name, under which are listed the species.

A preliminary section explains, with the help of excellent schematic drawings, the characteristics of plants and how to use the keys. These are fairly simple and easy to follow. A general key leads you to the correct group under which your unknown plant is listed. Here another key guides you either to the individual plant or to the key for the family (where individual genera and species are keyed out) if the family is a large one.

The individual species are also listed under their common names. These are in bold print, followed by the botanical name in italics. A number in parentheses referring to the picture of the plant (usually to be found on the same page or the one opposite) follows the name and a brief, but adequate, description of the plant is given, frequently with some information about where it grows.

Of the more than 970 species covered in the book, over one third are delineated in skillful and exceedingly helpful line drawings by Dr. Dorothy Van Dyke Leake. It will be tempting to most amateurs, I am sure, to try to identify an unknown plant by leafing through the pages and comparing their find to these excellent drawings. This ploy might be successful, but reference to the keys would certainly cut down on the time involved in thus searching through the 259 pages of plant descriptions and pictures.

In addition to the drawings there are also, fascicled in the center of the book, twelve pages of color plates, six photographs per page. These, I feel, are less successful than the black and white drawings for identification purposes and, though the original slides were probably excellent, the colors are somewhat faded and washy in the reproductions.

The last fifteen pages or so are taken up by a comprehensive list of Useful References covering books about the geology and ecology of the Rocky Mountain area as well as local and state floras; a glossary (in addition to the pictorial glossary of plant parts in the front of the book); and an alphabetical index. In the last the families and genera are listed under their Latin botanical names as well as their colloquial names, but the species are listed only under their com-

mon names.

This stress on common names throughout the book is, I think unfortunate though perhaps inevitable in such a work written as the author says in her preface: "for outdoor people who are neither botanists nor even natural scientists, but who would like to be able to identify the wildflowers they see on their mountain excursions." Such people are, I'm afraid, usually allergic to botanical names. How frequently one hears the exasperated comment, "Why can't you just call it a little blue forget-me-not?" Unfortunately that little blue forget-me-not could be either *Hackelia floribunda, Myosotis alpestris, Eritrichium elongatum* or *E. howardii,* which are not the same things at all, as every rock gardener knows. This, however, is a fairly minor carp as those who care to *can* find the correct botanical name in this book. Mrs. Nelson is well grounded in her subject and has done her homework and field work with care.

Her nomenclature is based primarily on the *Manual of Plants of Colorado* by H. D. Harrington, professor of natural history and curator of the Herbarium, Colorado State University, and on *Rocky Mountain Flora* and its predecessor, *Handbook of Plants of the Colorado Front Range,* both by William A. Weber, professor of natural history and curator of the Herbarium, University of Colorado Museum. In addition she has researched the herbaria of the Rocky Mountain region and botanized extensively for many years in the field.

— L.L.F.

Meet the Natives by M. Walter Pesman. Denver Botanic Gardens, Inc. 1975, 7th edition, revised, paperback with wire binder. $6.50, 13 oz.

An excellent book for the amateur, it is easy to use, well illustrated with line drawings, and convenient to carry in the field. It was reviewed in ARGS Bulletin, Vol. 38, p. 184.

Rocky Mountain Flora: *A Field Guide for the Identification of the Ferns, Conifers, and Flowering Plants of the Southern Rocky Mountains from Pikes Peak to Rocky Mountain National Park and from the Plains to the Continental Divide* by William A. Weber. Colorado Associated University Press, Boulder. 1976, 5th edition, hardcover. $12.50, 1 lb. 7 oz.

Considered the most comprehensive and valuable book for students of the native flora of the Front Range, this compact field guide treats over 1,600 species in its 498 pages. It is generously illustrated with line drawings by Dr. Charles F. Yocum and Ann Pappageorge as well as by a number of color plates of photographs by the late Harold W. Roberts. As is necessary in such a condensed format, descriptions tend to be brief, but the keys are excellent and not too difficult for the beginner to use. There is an index and a partially illustrated glossary, sections on plant zones and plant geography, instructions on making a plant collection, a list of useful references on Rocky Mountain flora and a discussion on the naming of plants explaining why Dr. Weber has changed the names of some of the plants described.

Dr. Weber, a professor of Natural History and curator of the Herbarium at the University of Colorado, has been studying the flora and its distribution in this area for many years. In his preface to this edition he warns his readers about the serious damage which has been and is being inflicted on the native flora by increasing urbanization and development of large areas of the Front Range. He discusses the subject of threatened and endangered species and draws attention to those species he considers endangered or threatened in Colorado.

Manual of the Plants of Colorado by H.D. Harrington. 1954, Sage Books, Denver. Out of print, it is presently available only on microfilm from University Microfilms International, 300 N. Zeeb Road, Ann Arbor, Mich. 48106.

Considered by many botanists and serious students of the Colorado flora as their bible, it is unfortunate that this book has been allowed to go out of print. It is very detailed and complete, covering the entire state. Though a technical book, not easy for the amateur to use except with help from the glossary, and with no illustrations, it has excellent keys and very accurate descriptions. Dr. Harrington was for many years a member of the faculty of Colorado State University and curator of the Herbarium.

Plants of the Rocky Mountain National Park by Ruth Ashton Nelson. Rocky Mountain Nature Association in cooperation with the National Park Service. Reprinted 1976, paperback, $6.50, 1 lb. 1 oz.

About 850 species found in Rocky Mountain Park are covered. There are 174 reproductions of photographs, mostly in color. The glossary is illustrated with line drawings. A topographic map with index of major localities in the Park is included.

Rocky Mountain Wildflowers by Kent and Donna Dannen. Tundra Publications, Estes Park, Colo. 1981, paperback. $2.95, 4 oz.

Although this 64 page booklet doesn't tell you everything you might want to know about the subject, it is a simple, lightweight starter for budding wildflower buffs. Color photographs are arranged in groups by flower color. It lacks specifics. However, the book is perfect for someone who wants a painless wildflower education spiced with trivia and humor.

The following miscellaneous books may also be of interest to members planning to visit Colorado. They should be ordered as indicated.

Land Above the Trees — A Guide to American Alpine Tundra by Ann H. Zwinger and Beatrice E. Willard. 1972, Harper and Row Publishers, New York, N.Y. Hardcover, $17.50. Order direct from publishers. Add $2.25 postage and handling.

This delightfully written and beautifully illustrated book about the ecology of the alpine tundra of the United States covers in detail the Colorado Rockies, the Sierra Nevada of California, the White Mountains in the Great Basin on the Nevada-California border, Mt. Hood and Mt. Rainier in the Cascades of Oregon and Washington, the Olympic Mountains of Washington, and Mt. Washington in the White Mountains of New Hampshire. Illustrated with numerous delicate pencil drawings by Mrs. Zwinger and color photographs by Herman Zwinger and Dr. Willard, this book is eminently readable. It was reviewed in the ARGS Bulletin Vol. 31, p. 124.

Mrs. Zwinger is a professional artist and author of a number of books. She was a featured speaker at the Interim International Rock Garden Plant Conference in Seattle in 1976. Dr. Willard, formerly president of the Thorne Ecological Institute in Boulder, is now on the faculty of the Colorado School of Mines. She has written extensively on alpine ecology.

Roadside Geology of Colorado by Halka Chronic. 1980, Mountain Press Publishing Co., Missoula, Montana. Paperback, $6.95. Order direct from publisher. Add $1.75 postage and handling.

A simplified description of the

geology of Colorado for those of little or no geologic training. Contains maps, cross sections and stratigraphic diagrams as well as photographs.

Colorado West – Land of Geology and Wildflowers by Robert G. and Joan W. Young. 1977, Wheelright Press, Grand Junction, Colo. Paperback, $7.50. Order directly from publisher. Add $1.25 postage and handling.

A guide to the more widespread and showy wildflowers and general geology of that portion of Colorado west of the Continental Divide, this book includes drawings and photographs of plants and geologic features.

Mount Evans Above Timberline by Stanley C. Mahoney. Johnson Publishing Co., Boulder, Colo. Second printing, 1975. Available from Mr. Mahoney, 8844 Princeton St., Westminster, Colo. 80030. Paperback, $2.50. Add $1.00 for postage and handling.

A hiker's guide to the mountains and lakes above 11,000 feet in the vicinity of Mt. Evans, Colorado.

Roads and Trails and Timberline Snails by Stan and Martha Mahoney. 1972, Johnson Publishing Co., ooоulder, Colo. Available from Mr. Mahoney, 8844 Princeton St., Westminster, CO. 80030. Paperback, $2.50. Add $1.00 for postage and handling.

Written for people unfamiliar with the Front Range of the Colorado Rockies, this little book explores the foothills, timberline and tundra on good hiking paths and scenic back roads.

Guide to the Colorado Mountains by Robert M. Ormes. Revised 7th edition 1979. Published by the author, 22 East Del Norte, Colorado Springs, Colo. 80907. Paperback, $9.95. Add $1.00 postage and handling.

Covers the mountain areas in a wind ing sequence starting north of the Colorado River, from thence south through Rocky Mountain National Park and other frontal ranges to the south end of Sawatch Range, through the Elk, West Elk, Sangre de Cristo and Culebra Ranges, then west through the great San Juan area with a final turn eastward near the state's southern Border.

A Dwarf Cranberry

For those blessed with acid soil there is a most attractive, neat evergreen shrub fairly newly introduced by the Arnold Arboretum. It is a non-vining form of the American Cranberry, named *Vaccinium macrocarpum* 'Hamilton,' and is a real treasure. In sandy soil into which a generous dollop of peat has been mixed, it forms a slowly enlarging cushion about six inches tall, covered in spring with typical pale pinky-white, beaked cranberry flowers. Ours has never set the red berries (perhaps it needs a friend of another clone), but in some gardens it does fruit.

Though normally a bog plant, the American Cranberry does perfectly well with normal rock garden moisture. Though not yet easily obtained in the trade, *V.m.* 'Hamilton' comes readily from cuttings, so if you have a friend lucky enough to have this enchanting little shrub, beg a snippet or two. L.L.F.

SYNTHYRIS AND BESSEYA

Roy Davidson
Seattle, Washington

In the years since the paper on synthyris appeared in the ARGS Bulletin, it has been possible to complete searches of that clan except for the Alaskan member. The prior article (Synthyris Today, Vol. 30, p. 14-25; 1972) was an attempt to make popularly known the correct identity and status of some of the garden confused names. The line drawings of the leaves hoped to show that it was quite possible to identify the plants from their foliage, but, when it comes right down to it, this is helpful only if one knows where the plants have come from and if he can note the descriptions to ascertain such details as texture and substance.

Several of the subjects previously unknown to me personally are now familiar in the wild and in the garden. It has been pleasant to review those prior statements as having been accurate, but I would correct one error in the caption p. 17: "All leaves are approximately half natural size except *S. schizantha*" was intended; *S. stellata* was somehow stated there.

The late Dr. Carl Worth took me to task for what he considered an inaccurate rendering of the Wasatch species, *S. laciniata*, allowing however "that it must have been made from an herbarium sheet;" it had been. However, when in 1973 I was able to invade the high Wasatch and to see for myself, all seemed very much like the drawing. In autumn of 1978 it was my pleasure at last to reach the Montana *S. canbyi* after four prior tries. This grows in trackless subalpine terrain where there are few roads or trails. After struggling up a very steep slope thatched with bear-grass I came onto a stony bench near the summit to find it plentiful. The mature leaves of the plants showed an almost constant resemblance to one another, and in my opinion Dr. Pennel was stretching a point in taking an elongated leaf rachis as evidence of relationship to the high alpine *S. pinnatifida;* only one plant here showed any inclination to a pinnate look, and that was not really very distinct.

In March of 1977 I was in Las Vegas, not for the shows nor the casinos, but because the Charleston (Spring) Mountains are nearby. There I had read "on ledges among pines" one could expect to find the tiny *S. ranunculina*. So we hiked up Lee canyon over drifts of snow until pines on ledges did appear, and then standing on a snow-bridge over a frozen waterfall I brushed the snow away from a ledge until the unmistakable leaves of a very small Synthyris were disclosed; although I found but the one, its leaves were like my drawing. It remains just as small and just as slow as it must be there. I have the Yukon *S. borealis* to look forward to.

At this point I look back and consider that it would be easier to understand this genus if the taxonomists had not searched with such zeal for the "important" distinctions on which to base "new" species. In my opinion they seem related as follows: *S. borealis* seems likely to be closest to the Pacific Coast *S. reniformis* (in Pennell's subgenus Plagiocarpus). The two fringed species are also similar to one another in foliage characters; *S. platycarpa* of Idaho and *S. schizantha* of Washington's Olympics, each narrowly endemic. Also centered in Idaho but ranging widely, almost to British Columbia in eastern

Washington, through Oregon's Blue Mountains and to a disjunct occurrence in northern-most California is *S. missurica*, and deployed in all mountainous directions from it are small populations separated by distance and ecological conditions. They are similar in firm, evergreen leaves and their very blue flowers, and their distinctions seem mainly in size and the detail of the leaf margins; Montana has *canbyi*, Utah has *laciniata*, and Nevada has *ranunculina*. All seem quite reminiscent of depauperate forms of *missurica* such as one encounters as crevice plants in Oregon's southern Wallowa Mountains.

In Oregon's Columbia Gorge can be found plants called *S. stellata*, so similar to *S. missurica* that the name really must be submerged. The name "Major" was attached to certain large individuals of *missurica* in Idaho and these have proven to have doubled their chromosomes. As horticultural clones we have two fine variants of this species going as *missurica* 'Rosea' and *stellata* 'Alba.'

Easily distinct is the high alpine *S. pinnatifida* with three forms defined on the basis of their degrees of hirsuteness and its relative permanence. All are charming, not easily flowered. A dry sunless winter might preserve the flower buds.

Just how the allied genus *Besseya* can be related and recognized as being distinct from synthyris is not easily explained, and Cronquist expressed the opinion they are best restored to the genus: *Synthyris*. They are usually rather less refined, with coarsely hoary leaves, and many are apetalous. But certainly to see the lovely little amethyst *B. alpina* on the high screes of Colorado is to be convinced that it is a synthyris. There are as many as nine or as few as

Besseya (Synthyris) alpina Paul Maslin

Besseya (Synthyris) ritteriana Anthony Taylor

seven species of besseya, mostly of the Rocky Mountains, one extending to the Great Lakes region *(B. bullii)* and one to the prairies of eastern Washington *(B. rubra)*. There is a diversity of floral color in their numbers; *B. ritteriana* is a striking butter yellow at the edge of snow in stony banks in southwest Colorado, lovely in flower but lacking in comportment afterward. The late Dwight Ripley actually hooted at his first sight of *B. rubra;* the leaves at flowering are velvet but the long silky spikes of stamens and no petals, colored a curious cinnamon-chocolate color did not meet his expectations, although he quite idolized the similarly colored *Trillium petiolatum* as "silky chocolate ribbons in a triumvirate of paddles." Other species I do not know first-hand: the northern Rockies has *wyomingensis* and the southern Rockies has *arizonica*, and there may be one or two others, similar to *rubra*.

I have always liked horticulturists, people who make their living from orchards and gardens, whose hands are familiar with the feel of bark, whose eyes are trained to distinguish the different varieties, who have form memory. Their brains are not forever dealing with vague abstractions; they are satisfied with the romance which the seasons bring to them, and have the patience and fortitude to gamble their lives and fortunes in an industry which requires infinite patience, which raises hopes each spring and too often dashes them to pieces in the fall.

They are always conscious of sun and wind and rain; must always be alert lest they lose the chance of plowing at the right moment, pruning at the right time, circumventing the attacks of insects and fungus diseases by quick decision and prompt action. They are manufacturers of a high order, whose business requires not only intelligence of a practical character, but necessitates an instinct for industry which is different from that required by the city dweller always within sight of other people and the sound of their voices. The successful horticulturist spends much time alone among his trees, away from the constant chatter of human beings.

— David Fairchild

ROCK GARDENING IN ARID CONDITIONS

Ray Williams
Watsonville, California

The conditions under which I maintain my personal garden, only eight miles inland from the coast of central California, is one of mild wet winters extending roughly from November to April and dry, but not necessarily hot, for the other six months of the year. The same fogs that have made San Francisco famous are just as prevalent here on Monterey Bay one hundred miles to the south. Our yearly rainfall recorded by the city water department for the last one hundred years shows a normal 21.54 inches per annum. This is extremely variable from year to year of course.

Just across the abrupt one thousand foot ridge, which is the southern end of the Santa Cruz mountains and separates our little valley from the adjacent Santa Clara Valley only some twenty-five miles inland, is found a very different climate indeed. This is where much of my garden work has occurred. I have no exact record of rainfall here but it is usually well below the twenty inch level and winter temperatures are lower and summer temperatures are higher often staying in the ninety to one hundred-ten degrees range for weeks on end, whereas the coastal temperatures tend to stay in the seventies and only reach up to the eighties at rare intervals in late summer.

Rock gardens here, such as they are (for they are far from being as popular as in the Northwest), are largely devoted to Mediterranean flora, which is generally more tolerant than our natives to variations in culture and relish and sometimes demand help from the garden hose. Our own natives, which so aptly decorate our summer dry coast ranges, and many of our coastal wild flowers will tolerate no noticeable summer moisture at all and are becoming more and more rare. This caused by a number of circumstances, all man made: overgrazing, cultivation and the reckless and often unnecessary use of herbicides along roads and highways which, though perhaps necessary to our way of life, is devastating to wild life.

Those natives mentioned include *Oenothera ovata, Dodecatheon clevelandi, Salvia sonomensis, Trichostema lanatum, Calochortus* in variety, *Allium peninsulare* and a host of other native plants and bulbs that resent a change in growing conditions; even the California poppies and lupins once so common are becoming scarce. It must also be noted that our native succulents are getting scarce indeed and I suspect the plant collector is largely responsible for this. Our dudleyas are truly saxatile and tend to be short lived when planted in the ground in a well watered rock garden and, unless the garden has a natural rock outcrop, which is seldom, it is hard to establish them with much hope of permanency. An outcrop or cliff may be built if the garden site is steeply sloping but this is an expensive and laborious project; on level ground such an artifact runs the risk of becoming a monstrosity rather than an asset.

My rock garden dates back nearly forty years and has never been an arid garden although I have been successful

with some desert plants despite some summer watering. But there are some spectacular plants that would have no chance at all under such circumstances. *Dodecatheon clevelandi* and *Delphinium cardinale* are two natives I find almost impossible to grow except under conditions of utter summer drought. Their roots when dormant are extremely brittle. When broken they appear as dead and lifeless as last year's cornstalks; yet they are far from dead and come to life amazingly quickly after the first fall rains.

I have an arid strip of garden along the northern border of our nursery growing ground in which I have been experimenting with plants that should grow and thrive in our climate without irrigation — once established. These at present include *Nolina parryii,* which grows in the arid ranges that rim the southern end of the San Joaquin Valley and eastward into the Mojave; also *Nolina microcarpa* from farther east; *Isomeris arborea* from like places with its strange pungent fragrance, liked by some and detested by others.

Another dry land suffrutescent plant of dubious fragrance is *Tagetes lemmoni,* which grows to a height of some four feet and as wide and, throughout most of the year, covers itself with such a cloud of fierce gold yellow marigolds that it appears as a great golden dome. It comes from Mexico and is reported as crossing the border at only one place in Arizona. It may freeze back and defoliate if temperatures drop much below 25°F., but comes back with vigor with the advent of spring. *Rhus trilobata* is established here and *Rhus standleyi* will be tried. it is reputed an arid land plant and so far has given promise of being a shrub of great beauty. It appears to be quite frost tolerant even as small plants in four inch pots. *Salvia leucophylla,* another native of dry coastal hills; *Lycium barbarum* from like places in Morocco; and *Widdringtonia cupressoides,* a South African conifer of great beauty and somewhat dwarf stature share this area. *Yucca shedigera* and perhaps other species will also find a home here.

This project is only started and at present is knee deep in grasses, which will have to be eliminated. A layer of sand with perhaps some humus added and tilled in (redwood sawdust is perhaps the best material available for a humus additive here) will form the basic soil. A two-inch layer of sharp sand and gravel will be added on top of this to retain trace moisture in summer and insure drainage in winter to prevent crown rot in water sensitive plants. Well placed stones would no doubt add to the attractiveness but are not an absolute necessity for the well being of most plants. It will be noted that I am not a builder of mountains or deserts but try hard to duplicate small areas found within such places and, thus, more or less bring them into the garden. Neither am I a purist when it comes to flora and I am not at all averse to sparking up a planting with exotics so long as they are compatible with existing surroundings.

Here in the southern two-thirds of our state that lie between the Sierras and the Pacific we have a definitely Mediterranean climate, which we share with Australia and South Africa as well as the Mediterranean basin itself. We have drawn so freely on some of those floras that I have found that some not too well informed persons express surprise when told the widely planted eucalyptus tree is not a California native. The Australian acacias too have gone native in a few favored localities along with certain other exotics much to the concern of some environmentalists. *Cytisus* in variety and *Genista* have naturalized and the widespread *Cortaderia,* the Pampas Grass from the Argentine, is evident along our coastline and spread-

ing inland. However, I suspect that protecting our flora and silva from the developer, the arsonist, the off the road vehicle enthusiast and the commercial plant collector is of more prime concern at the moment.

My own concern and enthusiasm centers on plant introduction rather than exclusion and with all the sources of seed both native and exotic from at home and abroad I should no doubt feel that my cup floweth over. But I have just noticed in an old (1970) issue of "Australian Plants" a most intriguing announcement. It seems there is an *Isophysis* growing in the quartzite ridges and crags, from sea level to the highest peaks in the southwest of Tasmania, a dry area in an otherwise chill and moisture soaked land. A tufted, grassy leaved plant from two to twelve inches in height with star shaped, six petalled flowers from one to three inches across of the most brilliant purple to burgundy red. Would it do for me — I wonder?

. . . of Cabbages and Kings . . .

Those of us fortunate enough to attend the International Rock Garden Plant Conference put on by the Alpine Garden Society of England and the Scottish Rock Garden Club couldn't help but be impressed by the outstanding talks on a wide spectrum of horticultural subjects and the friendly good fellowship that prevailed in every corner of the Nottingham University campus that week. Rock gardeners, on the whole, are very pleasant people.

The two British societies put on a fascinating affair. In addition to the talks, there were many exhibits to enjoy: booths set up by rock garden societies from all over the world, collections of floral stamps, wonderful displays of paintings, drawings and photographs, and some exquisitely embroidered portraits of alpine plants, to name a few. But, as was proper, it was the living rock garden plants themselves that stole the show.

The competitive plant show was set up in a large hall adjoining the conference room (both used for sports when the University is in session). It was stunning. Row upon row upon row of tables were laden with every possible rock garden treasure from the humblest semp and sedum to rare Himalayan primroses. Pans of tiny ground orchids from Japan, Europe, and the Middle East invited the closest inspection of their intricate flowers. Dionysias and androsaces, solid hemispheres of perfect bloom ten to twelve inches across caused gasps of wonder and envy from American gardeners. Recently introduced rarities brought back by plant hunting expeditions from the far corners of the world could be examined in the flesh. Dwarf ericaceous shrubs, laden with blossoms, evoked admiring exclamations. It was a gorgeous display and beautifully mounted.

Each clay pan or pot, carefully cleansed of all algae stains and lime deposit was surfaced with stone chips or leaf mold carefully selected to enhance the particular plant displayed. In some cases carefully placed pieces of stone or tufa added a hint of the natural habitat of a plant normally growing in a cliff or ledge. A white card, neatly hand printed and taped to the bare wood of the table top in the class space gave the class number and the requirements for that class. Another small white card placed next to each entry gave its botanical name, which was also displayed

on a stamped lead label curled flat on the soil surface against the inner rim of the pot, inconspicuous but easily legible. There were so many plants to see that everyone returned again and again during the conference to examine, take notes and photographs, or simply to admire them.

It is interesting to note that many of these beautifully grown specimens had not been coddled in alpine houses but raised in cold frames or in the open garden. It was pointed out in one of the lectures that cold frames have a number of advantages over the alpine house, among these that it is possible to open the top completely to give the plants the full benefit of salubrious weather or God's rain when wanted, yet, when closed, afford protection during inclement weather. Many of the more difficult plants do better in a cold frame than in an alpine house, according to this speaker. Those plants raised in the open garden had frequently been so planted in clay pots plunged to the rim in the soil. These had then been lifted, more or less intact, and repotted in clean pots (as had been most the show plants) for display.

In addition to this feast of competitive plants there was, just outside the main entrance to the conference building, a large marquee filled with exhibits put on by several botanical gardens and commercial nurseries. In most cases each exhibit included a small table top or floor level display garden as well as (in the commercial displays) pot after pot of rock garden plants for sale. What a trove of treasures for both viewing and buying and, needless to say, registrants took full advantage of the opportunity to acquire otherwise difficult to obtain specimens for their own gardens.

We did not go on either the pre- or post conference tours; reports received since have been that they were both outstanding. Instead we visited some nurseries and gardens we had not seen on previous trips to Great Britain. We did, however, make a repeat visit to the Royal Botanic Garden at Kew to see the new alpine house.

What a fascinating construction. Approximately forty feet square, the glass sides are about nine feet high and these are surmounted by a pyramidal glass roof that rises to approximately twenty-seven feet at its apex. Over half the area of this roof is constructed of panels, which, when fully open, stand nearly vertical. These are automatically controlled by a computer to open and close according to the temperature, wind velocity, and precipitation; if rain falls they close to a little below horizontal to shed the water; if a gale comes up they close entirely. Heating pipes are also installed to dry the air during cold, damp periods in winter and raise the temperature slightly in extremely cold weather.

In addition to the roof ventilators the alpine house has another feature which is both practical and architecturally attractive. A wide, deep trough, which acts as a catchment for rain water running from the roof surrounds three sides of the building; the overflow runs into an underground storage tank for use in watering. This moat serves a double purpose. The back and sides of the alpine house project several feet over the moat and are supplied with ventilating louvers on their underside. Through these openings, as the inside temperature rises, cooled moistened air is drawn to help create a buoyant atmosphere inside the alpine house even when the air is stagnant outdoors. We were interested to see that no allowance had been made for side ventilation, except through the open door, and one would like to know how the plants will fare without air movement at plant level. Perhaps this is not as essential in the English climate as it would be in the United States.

A sloping raised bed of blocky sandstone is built against the approximately four foot high outer wall of the moat. This bed is about eight feet wide and three feet high and, depending on the exposure, is planted with a wide selection of rare and unusual plants, ranging from cacti, succulents and other xerophytic plants from such places as southwestern U.S.A. and Mexico, to plants which need a cool moist atmosphere such as *Campanula piperi* from the Olympic Mountains in the state of Washington. A wide stone path with ground level beds on its far side surrounds this entire planting.

Inside the alpine house a full fledged rock garden, complete with a small stream, waterfall and pool, a peat gully and a scree, has been built against the inner wall. This, like the bed outside, has been constructed of large blocks of sandstone and slopes from about four feet high at the back to floor level. The plantings inside have also been segregated according to their needs, which range from dry, well drained conditions in the southeast corner to moist areas surrounding the stream and pool. Thus special homes have been made for all kinds of treasures. These appeared to be thriving except for those few planted in the narrow space between the lowest rocks of the garden and the flagstone floor of the house. A number of these had been trodden on by the eager feet of those pressing close to examine the fascinating flora.

Perhaps the most innovative feature of the alpine house is the refrigerated bench. This has been especially constructed to provide two different miniclimates in each end. One end houses arctic alpines accustomed to permafrost, the other compartment is for plants from high elevations in the tropics where above ground portions of the plants usually undergo freezing temperatures at night and warm temperatures during the day though the soil in which they grow, though cooled, does not freeze.

The bench is really a large metal box, rather resembling the open topped freezer cases common in super-markets in this country. It stands more or less centered on the stone floor and is about breast high. In its base are coolant pipes which are covered with a foot depth of sand into which the pots containing the plants have been plunged. Above this bench are suspended a bank of lights, which, thanks to a time clock, control the day length. Thus the hours of "daylight" gradually increase as spring passes into high summer, at which time they reach an optimum of twenty hours, decreasing thereafter as autumn approaches.

The pipes in the portion of the bench reserved for arctic plants are thermostatically controlled to keep the sand between 34° and 48°F. (to simulate permafrost) from April to October at which time the plants are removed from the bench and transferred to winter quarters for a period of darkness and cold storage at 22°F.

The pipes under the compartment used for alpine plants from the tropics keep the sand temperature in this end of the bench between 41° and 69°F. year around. As these plants are apparently less affected by daylength (which in their native homes is a relatively constant twelve hours of sunlight), they are able to endure the light schedule intended for the arctic plants. Here have been successfully grown for a number of years plants from such diverse localities as Chile, Patagonia, Mt. Kenya, and the Falkland Islands.

In the interest of aesthetics one might wish that it were possible to enclose the metal refrigerator case with walls of stone or at least weathered wood of a neutral shade; however, despite the rather too surgically sanitary frame in

which they were housed, the plants are stunning in both appearance and apparent health. It is a fascinating display and short of climbing up mountain peaks in every range on earth, one is not likely to see such a wide selection of high alpines as are housed in the new alpine house at Kew.

One is perpetually astounded when visiting gardens in Great Britain or marvelling at the plants on the show benches there or, for that matter, perusing the pages of the publications of the Scottish Rock Garden Club and the Alpine Garden Society at the tremendous variety of plants grown by the gardeners of this one, rather small island not only in such salubrious quarters as the new alpine house at Kew, but in simple shelters, be they alpine houses or cold frames, and in the open ground of the garden proper. A new or difficult plant is a challenge to British gardeners and they will go to endless trouble in an attempt to produce growing conditions in which such plants not only live but thrive. "Oh, yes," we say, "but consider the British climate; it is spring there year around — no wonder they can grow anything."

This may be so, but the climate of the British Isles is a chancy affair. True, they do not suffer the extremes of temperature most of us in the United States must put up with, but with their perpetual spring they must accept strong March winds, continual April showers, unexpected frosts, and day after day of lowering clouds and fairly weak sunlight. Some plants, such as many native to the East Coast of the United States do not do well in Great Britain. They tend to pindle and do not flower with the same exuberance as in their native haunts. Undoubtedly they miss our much reviled muggy summer heat and bitter winter temperatures and, perhaps, also our more intense sunlight at the time they are preparing to set flower buds.

Be that as it may, the British do succeed and succeed very well with an extraordinary range of plants from very varied habitats. Many of our Western plants, such as lewisias, excel themselves under British weather conditions as do plants from the Himalayas, New Zealand and, surprisingly, from the sun-baked Mediterranean Basin. Why?

Perhaps it is because most British rock gardeners are imaginative plantsmen — and nothing seems to daunt them. They rush out to put panes of glass over their plants if the weather turns frosty or wet. They build sheltering walls to deflect the winds and reflect the weak rays of their northern sun. They construct foundations of drainage tiles, old bricks, clinkers, rubble, rocks and sand under their beds to ensure the quick drainage needed by most alpines and plants that grow in hot, dry climates. (E. B. Anderson grew his Onocyclus iris in soil placed on top of a high unmortared wall of Costwold limestone.) They build beds of peat blocks to house their Himalayan rhododendrons, primroses and meconopsis, and tufa walls roofed with glass for their dionysias and Aretian androsaces. What they cannot grow in the open they shelter in alpine houses and cold frames — and they are willing and eager to try new plants no matter how difficult. As a result they grow and grow well the most extraordinary plants from every quarter of the globe.

Given such an example by our British confreres and by a few of our own more adventuresome American plantsmen, let us all become more daring so that we, too, will experiment with unfamiliar plants and more imaginative ways of creating suitable growing conditions for them. The world is so full of wonderful plants we could be growing that it is a pity to furnish our rock gardens only with the same old reliables.

What a man needs in gardening is a cast-iron back with a hinge in it.
—Charles Dudley Warner

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