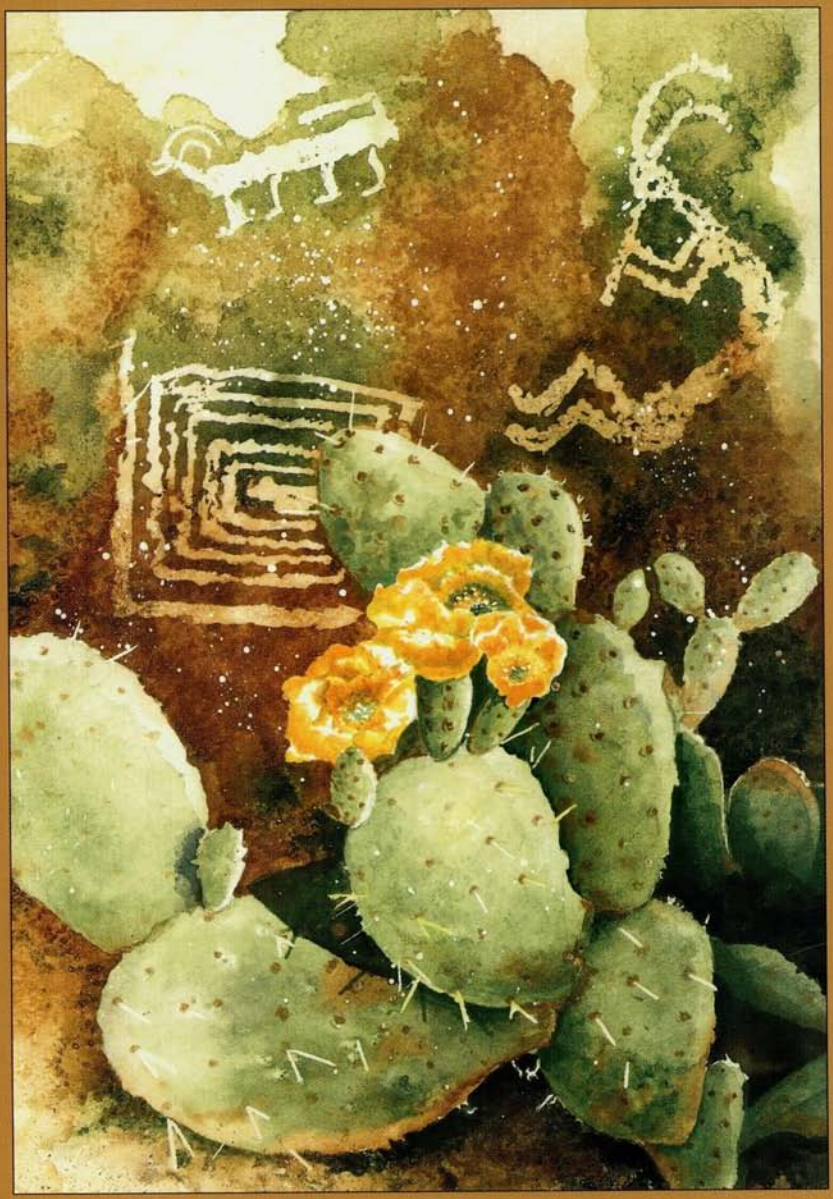
ROCK GARDEN *Quarterly*



Volume 61 Number 3 Summer 2003

Cover: *Opuntia polyacantha* with flute player and geometric petroglyphs from the American Southwest. Painting by Carol McLoughlin Kortnik.

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ROCK GARDEN *Quarterly*

BULLETIN OF THE NORTH AMERICAN ROCK GARDEN SOCIETY

Volume 61 Number 3 Summer 2003

Contents

How to enter the 2003 Photo Contest

There is still time to enter the Photo Contest! This year's prizes for first place in each category are one-year gift memberships in NARGS. The grand prize is a copy of Yoshida's *Portraits of Himalayan Plants*.

You may submit photos as prints, slides, or digital files on CD. This year you may enter digital images in any class. Digital and conventional *prints*, if submitted, should be "studio quality." Please write your name on each item sent (these will be masked during judging); if labeling prints, write the information on a paper label in pencil and stick it on the back, because ink is likely to bleed through the paper.

Each person may enter up to ten photos in each category. Include a list, with your name and address, of the images submitted with subject, location where photographed, class entered, and (if known) camera, lens, and type of film used. Technical details are not required. If you are submitting your entry on CD, please include a list on paper with the names of the files for each item.

Send all entries by post, FedEx, or UPS to the Editor: Jane McGary, 33993 S.E. Doyle Road, Estacada, OR 97023, USA. **Do not submit entries as e-mail attachments.** The deadline for receipt of entries (newly extended by two weeks) is **August 15, 2003.**

All materials submitted will be returned by October 2003, except for award-winners to be published in the 2004 volume of the *Rock Garden Quarterly*, which will be returned later.

By entering the contest, you grant NARGS the right to publish your photograph one time in the *Rock Garden Quarterly* and to post it on the NARGS website; however, you retain copyright on your work.

Classes:

Class 1: Portrait of a plant in the wild. Image should be centered on the plant, but extreme close-ups are less desirable than photos showing the entire plant.

Class 2: Natural scene featuring wild plants. The plants should be clearly visible but the perspective is wider than in the close-up portrait.

Class 3. Portrait of a plant in cultivation. Image should give a good idea of how the entire plant appears, rather than a tight close-up of single flowers. (Hint: Removing labels before taking the photo produces a more pleasing picture.)

Class 4: Rock garden scene, showing both landscape and plants.

Plant Choices for the Northeastern Climate

James L. Jones, Lexington, Massachusetts

As considered here, the southern limit of the "Northeast" follows a line that slants southwest from coastal New Jersey. North of that line, frost penetrates deeply enough in winter that many plants, particularly evergreen ones, are slowly dehydrated by the iron grip of frozen soil at their roots. The genus *Cyclamen* provides an illustration. *Cyclamen coum* and *C. hederifolium* start the winter here bravely green, then curl and thin and finally give up as week after week of snowless cold passes. In my sun-heated alpine house, conditions are more like those on the other side of that boundary line—say, the foothills of North Carolina—with a minimum temperature of 8°F (−13°C). In the greenhouse, cyclamen and many other good plants come through the winter in perfect shape, though they may sag a bit during bitter nights.

Though the Northeast is climatically diverse, I will refer to climatic conditions around my own home, about 10 miles (16 km) west of Boston, Massachusetts, to exemplify problems and opportunities that are typical throughout the region. A northeastern winter is long, cold, and without dependable snow cover. The minimum temperature at my place during the past 37 years was −13°F (−25°C); a typical low in recent years has been −5°F (−21°C). Just 5 miles (8 km) to the west, lows often reach 8°F (5°C) colder. The minimum temperature, however, is far from the whole story. The real killer is week after week of unrelenting cold, sending frost deeper and deeper into the soil. The visible result is a precious dwarf conifer fading away before one's eyes, finally dying in what can only be called vegetative exasperation.

To visualize the relative importance of low temperatures in different climates, consider Denver, Colorado. There, the thermometer sometimes dips to −20°F (−29°C), yet plants thrive in Denver that are winter-killed or retarded here. For example, *Euphorbia myrsinites* and *Acanthus longifolius* are vigorous to the point of weediness there; here, the first lasts through only two or three winters before being swept away, and the latter barely holds on. On the other hand, the Northeast's long-frozen ground permits the survival of a host of plants that would find a freeze-thaw cycle fatal, including many bulbs. In January we often have sunny days, lifting our spirits and awakening the solar-heated alpine house.

Winter is the major impediment to the choice of rock garden species in the Northeast. Spring is as variable as anywhere else, but it is dependable where it counts: the date of last frost in a given location is quite predictable. I have never had a frost after May 1, for example. The Northeast rarely experiences warm early spring weather that beguiles plants into tender new growth, followed by killing frost. Heat waves in March do occur, even exceeding 90°F (32°C), but they last only a few days, melting snow but not thawing the underlying soil. As a result, the plants that make it through winter are not likely to be destroyed by weather before summer.

Summers here are not as hot and humid as farther south, but there are enough sultry nights to rule out growing most true alpines. In particular, the Himalayan beauties extolled by British growers promptly turn up their toes in most of this region. Coastal areas can be more hospitable, though. Thus, summer is our second serious "bottleneck" in defining a range of suitable plants.

Fall is the Northeast's reliably glorious season. Frost may arrive toward the end of September or as late as mid-November, depending on year and location, but early frosts are usually light enough that the garden show goes on. Days can be warm, but nights are cooling. The sun is gentle, as is the breeze (aside from the occasional hurricane). It is time for thoroughgoing garden appreciation, and happily there are many fall-blooming plants to gild the scene—for example, *Allium thunbergii, Silene schafta*, and *Saxifraga fortunei*, all of which thrive in this climate.

Finding plant species that flourish in the Northeast is best approached by looking at some of the regions from which rock garden plants come. The future is bright for adventurous rock gardeners in the Northeast; enough compatible regions are being combed for their treasures by seed collectors that we hardly need pine over the ones that simply cannot adapt to our gardens.

Close to home is an obvious starting point, but not all that productive for rock garden plants, except for woodlanders like like *Dicentra, Hepatica, Sanguinaria,* and *Trillium*. The true alpines of New England's highest mountaintops—including the choice *Diapensia lapponica*—simply can't be coaxed down to the lowlands. More amenable are *Silene caroliniana* (photo, p. 178), native far north of its eponymous states, or the seashore composite *Pityopsis falcata* (photo, p. 178). *Opuntia compressa* can also be claimed as a native.

The Southeast acted as a refuge during the last ice age, so many of its species are hardier than they need to be to survive there—rich pickings, far from fully exploited by gardeners. Two for the rock garden are *Eriogonum allenii* (photo, p. 177), a tall, late-flowering yellow buckwheat, and *Senecio antennariifolius* (photo, p. 177), evergreen, also yellow, 10 cm tall, and blooming in May. For the woodland, two exceptional plants are *Houstonia serpyllifolia* (photo, p. 178), a perennial, spreading bluet, and *Spigelia marilandica*, with exotically shaped red flowers in July.

A degree of cold to match northeastern conditions occurs in the Southwest only at quite high elevations, but a number of species from the mountains and high deserts of that region have proven amenable. A particular favorite is *Arge-*

mone pleiacantha, a hardy prickly poppy. It sprawls untidily to 2 feet (60 cm), but everyone's attention is captured by the huge white blooms that keep coming until frost. Another spectacular sprawler is pink-flowered *Ipomoea leptophylla*. Both have deep taproots and can be propagated only by seed. *Penstemon kunthii* is considered rather tender, but it has done well here, doubtless a matter of provenance. It is short-lived but keeps going through self-seeding.

The plains of eastern Colorado through the Rockies and the Great Basin offer some of the most exquisite rock garden plants, but all too many of them are far from tractable in the East. The genus *Eriogonum* is relatively promising; *E. umbellatum* in at least some of its forms can be an enduring, flowering denizen of the garden. Penstemons without number can be tried from seed, and many enjoyed for a season or two; a longer-lived exception is shrubby, red-flowered *P. pinifolius*.

High enough in the West Coast mountain ranges, temperatures fall low enough to instill sufficient hardiness in the plants, but these species' adaptation to cool nights is likely to limit their success in the lowland Northeast. This suggests sites at higher latitudes and lower altitudes are more promising—Oregon and Washington, rather than California.

The low to mid elevations of temperate Europe would be an excellent source if there were only more plants of suitable habit there. Our best hunting grounds are the mountain slopes bordering the Mediterranean and extending into Turkey and eastward, which have given us such treasures as *Androsace villosa*. Few of Europe's true alpines do well here; an exception is *Vitaliana primuliflora*.

The very highest ranges of South Africa offer such prime rock garden plants as *Delosperma basuticum* (yellow; photo, p. 178) and *D. brunthaleri* (pink). The mountains of southern South America ought to be even more promising, but many of its plants seem somehow intrinsically ungrowable, probably because they never get very cold, even on Tierra del Fuego, owing to the proximity of the ocean.

The lower elevations of East Asia are more notable for woodland plants than for alpines. The upper slopes do not match our low temperatures until they reach at least 18,000 feet (6000 meters). At that altitude, the cool mists are the antithesis of our hot, humid summers, ruling out the vast, enticing array of Himalayan alpines. The real promise lies north of the Himalayas, a land relatively untapped for horticultural potential which has yielded such woodland stalwarts as *Adonis amurensis*.

James Jones, a former president of NARGS who has also been a stalwart with the Seed Exchange, is the author of the NARGS publication *Lychnis and Silene in the Garden*.

The Chilean and Argentinian Andes: Part II

David Hale

In Part I, published in the Spring 2003 issue, the author began describing a long loop trip beginning in Santiago, Chile, and stopping at many interesting botanical sites. Part II completes the series.

Arriving from a long drive over the dry pampas of Argentina to Bariloche on the eastern slope of the Andes is a very pleasant experience. Bariloche is a European-style town, much of it constructed with local stone, situated on the shore of the large, long Lake Nahuel Huapi, at about 1,700 feet (550 m) elevation and 41° south latitude. The climate is not unlike that in my home city of Portland, Oregon, though of course with the seasons reversed—making it possible for us travelers to enjoy two clear, cool summers.

Bariloche offers an escape for the inhabitants of the hot, humid Argentine capital, Buenos Aires. Other visitors form a cross-section of South Americans, with a scattering of other foreigners. The town is full of tourist amenities such as *confiterias*, which serve exotic desserts and snacks accompanied by an espresso coffee or a liqueur. There are many good restaurants and hotels, but you will probably need a reservation for a hotel room in the popular vacation month of February. All kinds of outdoor sports activities are available here, including skiing in winter, and tour companies take visitors to the pristine forest of native trees, the majority of which are species of *Nothofagus*. Meltwater from the Andes runs down to the lake in many attractive waterfalls and streams.

Hiking in the nearby mountains can be done, as in Europe, from hut to hut, so as to avoid carrying a lot of gear. Information and trekking permits are available from the Club Andino office in the administrative center area of the town.

A short bus ride from the center of town takes you to the crown jewel of the region, Cerro Catedral, with its summit at 7500 feet (2275 m). It hosts a major ski area at which the lifts run in the summer as well. The base and middle slopes of the mountain are covered with multicolored populations of ***Alstroemeria aurea***, generally growing in sparse *Nothofagus* woodland and forming an almost solid sheet of flowers as viewed from the lift.

In 1983, I made my first trip to this area and was overwhelmed by the variety and abundance of good alpine plants one sees immediately upon stepping off the lift at the top. For the first half-hour, I sat in one spot photographing, cataloging, and collecting seed from plant after plant. But lifting one's gaze from the ground from time to time discloses an equally stunning vista. Straight below to the north lie Bariloche and Lake Nahuel Huapi with its wooded shores and islands, and water of the deepest blue; in every direction extend other lakes and forests. The main snow-capped chain of the Andes lies to the west, but the principal peak looming to the southwest is Tronador, the highest peak of the region at 11,400 feet (3478 m). "Tronador" means "thunderer," referring to the groaning and cracking of its huge glaciers.

To return to the plants, a significant element in the floral community is a barrage of ***Senecio*** species, most of which I have never been able to identify. They come in many shapes and sizes. Most are tiny in stature with blue-green, often sticky leaves, and orange to bright yellow flowers; and if you're late enough to collect seeds, some are growable. There are several ***Calceolaria*** species, including the diminutive *C. laguna-blanca* with sticky, lanceolate green leaves and small yellow slipper flowers with a few red dots in the center. The similar but somewhat larger *C. lanceolata* usually grows tucked in a crevice. ***Empetrum rubrum*** is quite common: a low heathlike shrub bearing shiny red fruits, and quite growable. There are a couple of low-growing ***Gaultheria*** (formerly *Pernettya*) species worth trying in the garden as well; they feature hard, gleaming dark green leaves and colorful, relatively large fruits.

One of the most spectacular plants of the Andes grows in the steep boulder screes here, which are somewhat dangerous to walk on because rockfalls are frequent. This is ***Ranunculus semiverticillatus***, whose feathery, glaucous foliage forms mounds on the rocks. Luckily for me, the foliage is beautiful enough to be worth a photo in its own right: owing to my greed for seed, I have never been there early enough to see its spectacular flowers of white or pink—which may, however be seen as the frontispiece in the *AGS Encyclopaedia of Alpines*. ***Chaetanthera villosa*** (photo, p. 179), mentioned in the previous article in this series, also grows here, showing its woolly orbs with large daisies from time to time.

I have many photos of an ***Ourisia*** that is common in the small rivulets on the hillsides. Looking at one slide, I see that I have crossed out the name several times; the latest one is *O. ruelloides*. But that doesn't change the fact that it is lovely. Its large, shiny, heuchera-like leaves are usually laid against vertical surfaces, and the blooms hang out over the racing water, where the humidity must be 100 percent, and where they are often splashed with droplets. The flowers are long-tubular, flared at the tip, bright scarlet to maroon in color and velvety in texture. Invariably, the flowers are in bright sunlight and the foliage is in dappled shade—an impossible situation for photography. This is attested to by the fact that I have about ten slides, all representing failures to capture its real image.

Loasa acanthifolia, with shiny green, prickly leaves, is a "stinger" like others of its genus, and has unimpressive creamy flowers; it is at its best when in seed, for the pods are beautifully twisted in corkscrew fashion, and decorative if not touchable.

There are two rosulate violas here, which are quite similar. *Viola columnaris* and *V. sacculus* grow on the upper hillsides in dry, loose, screelike soil. Both are neat rosette plants with white and bluish flowers.

Now, what shall we do to return to Chile? If we have a car, we can drive along excellent roads over several nearby passes; but it's also possible that we've flown into Bariloche. In the latter event, between Bariloche and Puerto Varas in Chile exists one of the most awe-inspiring journeys we've ever made: a bus-boat-bus-boat-bus-boat trip through a chain of alpine lakes, some small, others large. This trip takes ten hours, with an option of staying overnight in a rustic lodge at the midpoint, where lunch is served. The landscape through this part of the Andes, known as the "Switzerland of South America," is remarkably varied. There are many mountain vistas, and all the lakes are surrounded by forest. Except for the midpoint, there is no habitation; we see only the occasional fisherman, or a soaring condor. Some of the lakes are tinted emerald-green by the glacial silt carried down from the mountains; in fact, one is named Lago Esmeralda.

The grand finale, near the end of the journey, is the falls of Petrohue. These can also be reached by car from the Chilean side. They are formed by the outlet from the emerald lake mentioned above, and as a result the water of the falls varies in shades of blue and emerald. There is always a large volume of water, broken into myriad waterfalls splashing into pools of equally beautiful hues.

We are now entering the wetter, lower side of the Andes and a distinctly maritime climate. Here frosts are rare, and the flora reflects that. Still, some of the mountaintops are accessible; in fact, you can drive halfway up Volcan (volcano) Osorno, about 6000 feet (1800 m) high. Here and on the famous island of Chiloe exists an entirely different flora. You can search out the Chilean national flower, the copihue (***Lapageria rosea***), a climber with 4-inch (10-cm) red trumpet flowers, and the related and much smaller ***Philesia magellanica*** which is more mounding and has 2-inch (5-cm) red trumpets. Deep in the forest, hugging the moss-covered rocks and tree trunks, is the trailing ***Asteranthera ovata*** (photo, p. 180), a gesneriad with large, luminescent red-and-white flared flowers. These plants can be grown in milder areas of western North America and the U.K., outside or in an alpine house.

The region of Puerto Varas and Puerto Montt, Chile, on the Sound of Ancud, is a fishing center and also the home of Chile's salmon farms, so inexpensive seafood abounds. On the small island of Tenglo in the Sound of Ancud, you can enjoy the Chilean version of the luau, called a *coranto*. In this case, not just a pig is cooked in a pit, but also a large variety of meats, vegetables, fish, shellfish, and even bread. Rocks are heated and thrown in a shallow pit. The food is then placed in layers separated by wet sacks according to the amount of heat needed to cook each item. Finally, the last sack is topped with sod for insulation. For dessert on one visit, we were treated to a drowning rainstorm that dropped more than 3 inches of rain on our unprotected heads in the 30 minutes that we waited for the return boat.

Now we will return to Santiago, some 600 miles (1000 km) to the north. Along the way, we have the same type of options as we did in Argentina to penetrate to the alpine regions by way of gravel roads of varying quality. The isolated peaks of the south gradually give way to the giant uplift in the north. This side is wetter than the eastern slope, but as we return north, the coastal mountain range begins and stops much of the moisture, so the Andes to the interior become drier—and more suitable for our favorite alpine plants.

About 200 miles north of Puerto Varas are Lake Villarica and nearby Volcan Villarica (9300 feet/2840 m). This a popular vacation region, offering water sports and rustic lodges as well as modern hotels. Tour operators will equip and guide you to the summit of the fire-spitting volcano should you wish for a suicidal look down into the crater. We prefer to watch the red glow at night from the window of our hotel and confine ourselves to the lower slopes of the volcano. Here we find ***Viola cotyledon***, the most growable of the rosulates (photo, p. 181). It has blue flowers, larger than those of most similar species, and as usual, tucked into the interstices between the rosettes. John Watson has found a form with deepest purple flowers. Rick Lupp, a talented grower in the northwestern U.S., has grown and flowered a large specimen through four or five winters in his alpine house. *V. cotyledon* has survived for me for one or two winters outdoors in a trough, with overhead cover in the rainy Oregon winter.

Nassauvia revoluta can be quite diminutive here, forming mats up to a foot (30 cm) across. This is a composite with rosetted leafy stalks topped with heads of small white flowers. ***Rhodophiala andicola*** flourishes in large colonies at about 5500 feet (1667 m), studding the volcanic ash soil with brilliant magenta trumpets. It is overlooked by scattered *Araucaria araucana*, here called the "umbrella tree" because in its native habitat the lower limbs typically break off, leaving only the crown of the tree forming an umbrella shape over a mostly bare trunk. There are a number of ferns tucked into crevices; one small species we tentatively identified as ***Blechnum germanum***. ***Gaultheria (Pernettya) minima*** is here in abundance; it is small and stays so in the garden. As you can guess by the plants, this is still a moist area.

Sixty miles (100 km) to the north, as the crow flies, is the ski area of Llaima on the slope of Volcan Llaima. The road ends on lava fields occasionally dotted by floral treasures. ***Chaetanthera villosa*** (photo, p. 179) with red buds and large yellow daisies rises out of the lava like woolly tenpins waiting to be bowled over. ***Adesmia longipes*** (photo, p. 181) forms mats of tiny pinnate leaves topped by orange-yellow pea flowers looking much like an *Astragalus*; the genus *Adesmia* is large and varied in this part of the world and also includes some handsome bun-forming species. *Rhodophiala andicola* is also found here. As we drive back down, electric red ***Tropaeolum speciosum*** hangs out of the shrubbery over the road.

A hundred miles north, close to 37° south latitude, is Laguna del Laja. A fairly decent road leads to the lake, which is overlooked by two handsome glaciated peaks, Antuco and Sierra Velluda, about 10,000 feet (3000 m) tall. Along this road in 1981 we camped at a site by an unmistakable waterfall which, John Watson has calculated, marks a campsite of the early explorer and botanist Eduard

Friedrich Poeppig (1798–1868); among the Andean plants that commemorate him is the cactus *Maihuenia poeppigii*. On the cliffs above this site grows ***Ourisia microphylla***, its cushions of pink flowers spurting from tiny crevices. Below in the grass spread mats of ***Nierembergia rivularis*** (Solanaceae), with sessile, white, upward-facing bowls an inch (2.5 cm) across.

Fifty miles to the north, but 200 miles (300 km) by a side road east from the city of Chillan on the main highway, are the hot springs of the Termas de Chillan. The Chilean visitors lie about in their swimsuits, smearing themselves with a sulfur-silver clay mixture from the pools and inhaling a probably toxic cloud of fumes, all for their health. We do not pause to improve our health and hike on by to the alpines at about 6500 feet, crossing and walking up a snowmelt stream overhung with scarlet ***Ourisia poeppigii*** (photo, p. 184) and enjoying the sweet-pea fragrance of a bicolored *Lathyrus* (photo, p. 184). Many of the plants mentioned earlier repeat here; *Viola cotyledon* is especially abundant. Others include ***Loasa lateritia***, another stinging one with hairy leaves and orange-yellow flowers about 1.5 inches (3 cm) across, held in large numbers just above the foliage. We stop on the drive down to view large patches of ***Maihuenia poeppigii***, a mat-forming cactus with pale yellow sessile flowers 3 inches (7.5 cm) across. This is quite a good doer in the garden, surviving 0°F without protection, although a shy bloomer for us.

Another 100 miles north of the city of Chillan in the central valley is the city of Talca, and from here it is another 50 rugged miles east to Laguna de Maule at roughly 7000 feet (2100 m). The upper half of the road is very rewarding—at least for flowers, if not for the much-abused rental car. Near 5500 feet (1670 m), there is a roadside cliff covered with pink *Ourisia microphylla*, and in a sandstone road cut beside this cliff in 1981 we found an almost white one (photo, p. 182). I returned at a later time of year two years after that to collect seed of this plant, which produces about 50 percent pure white-flowered plants, and these tend to bear blossoms half again as big as the usual flowers of *O. microphylla*. Sadly, a few years later when I returned, this unstable road cut had collapsed and been bulldozed aside.

Just a few miles beyond the *Ourisia*, ***Viola congesta*** (photo, p. 183) grows in the hottest, most miserable sandy dust, its brown rosettes hard to distinguish at a glance from the dried cowpats scattered about. On closer examination, it is one of the loveliest species of the rosulate section, with tight, slightly fuzzy rosettes, the margins of which are punctuated at intervals with tiny golden drops of resin. It has small but attractive white-and-blue flowers. Nearby grow many ***Chloraea aurea*** (photo, p. 185). This genus of terrestrial orchids is widespread in southern South America, and this is the prettiest species that I have seen. It stands 8–10 inches (20–25 cm) high and bears a terminal cluster of brilliant orange-yellow flowers, each flower 1.5 inches (3 cm) in length.

At the lake itself we walked over a small rise into an alpine meadow, where we saw a dazzling display of ***Mimulus cupreus*** lining the small stream, showing the brightest red hues. This and its neighbor, *Olsynium junceum,* are good garden plants. Returning to Talca, there are good displays along the road of *Oxalis squa-*

mata, which forms green mats topped by large, bright rosy red flowers. In our garden it survives, producing only a few seedlings—enough to perpetuate itself past harsh winters, but not to become weedy.

We make one last side trip at Paso Vergara, east of Curicó, which is about 115 miles (160 km) south of Santiago. The road is daunting much of the way. In addition to many of the plants seen elsewhere, ***Calandrinia affinis*** in its absolute whiteness carpets the top of the flat pass, with acres of what appears from a distance to be snow. Just below grows ***Schizanthus grahamii*** in its most lurid form. Woody at the base, it forms branched plants up to 2 feet (60 cm) tall, with many brightly colored orchid-like flowers of magenta, electric yellow, and orange. Nearby is a *Mutisia*, probably ***Mutisia subulata***, with bright red 3-inch (7.5-cm) daisies sprawling on the ground or through shrubs.

Now to Santiago and home, or on to the coast for some R&R at Viña del Mar, a resort of condominiums and warm sandy beaches with other sorts of pretty flowers.

David Hale, a retired physician, is contributing this series of "Botanical Traveler" articles. He and his wife, Donna, travel several months a year and grow many of the treasures they discover in their two gardens in Portland and Arch Cape, Oregon. David presents many slide programs to NARGS meetings, especially on the Andean countries.

Western *Mimulus* for the Rock Garden

Mark Akimoff

The first time I noticed the smiling monkey face, I was casting an elk-hair caddis fly for trout on a small stream tumbling down a slope of Oregon's western Cascade Mountains. The face belonged to *Mimulus guttatus,* and its bright yellow, red-speckled flowers seemed out of place next to the pale purple blossoms of the giant helleborine (*Epipactis gigantea*), with which it often shares a streamside home. Although *Mimulus guttatus* was my introduction to the genus, it is better suited to an article dealing with bog gardens or streamside plantings. Adaptation to moist, boggy soils is a common theme among the 150-plus species in the genus, but there are also some fine rock garden mimulus, including some fully xeric species for the dryland gardener.

The genus *Mimulus* is widely distributed throughout North and South America, Asia, India, Australia, and South Africa. To illustrate the diversity of the genus, *M. nepalensis* var. *japonica* has been collected at elevations up to 10,000 feet (3030 m) in Sikkim, while the blue-flowered *M. madagascariensis* is known only from the tropical island for which it is named. Roughly three-quarters of the known species occur in western North America, and California claims more than 70 native species, more than 50 of which are endemic in the state.

Here I'll introduce a few of these North American species that should entice rock gardeners, following the descriptions with comments on their cultivation. Some are modest annuals, some herbaceous perennials, and some shrubby. The perennial species tend to be short-lived, reflecting their niche as "pioneer plants" in mobile soils and their heavy production of seed.

Mimulus cusickii

This species is closely allied with *M. bigelovii,* from which it was separated by Asa Gray based on material collected by William Cusick in the Ochoco Mountains of eastern Oregon in the late 1800s. This annual with reddish-purple, yellow-throated blooms is a true charmer, rarely exceeding 9 inches (23 cm) in height. It tolerates full sun and grows best in a sandy, grit-based soil kept quite dry. This

species ranges from western Idaho to eastern Oregon and into Nevada. Like many other annual mimulus, it is best grown in clumps or drifts, where the flowers will make a nice show from midsummer until the fall rains come. I do not rely on the xeric annual species to self-sow and collect seed to ensure that they keep growing where I want them.

Mimulus eastwoodiae

A denizen of dripping limestone cliffs and shady cave mouths from Utah to Arizona, this perennial species creeps along by means of stolons and often forms loose mats or sheets of woolly foliage not exceeding 3 inches (7.5 cm) in height. The crimson to scarlet corolla is narrowly funnel-shaped, with narrow lobes—a shape unusual in the genus and, to me at least, not resembling a monkey face. In the garden, this species is best sited in the shade of a small shrub where it can run through a peaty crevice among rocks, and where excess water will be kept off the leaves in winter. Unsurpassed for brightening a shady spot with its late summer blossoms, *M. eastwoodiae* is easily propagated from stolons treated as cuttings in midsummer or divisions in early spring.

Mimulus longiflorus

This (photo, p. 187) and other shrubby California *Mimulus* species have been the subject of some taxonomic shuffling by botanists, who have moved them in and out of the genus *Diplacus*. I like to refer to the *Monograph of the Genus Mimulus* by Adele Grant (1914). This monograph, although somewhat dated, is quite comprehensive and makes sensible arguments for treating *Diplacus* as a section of *Mimulus* rather than a genus. Ultimately, *M. longiflorus* is desirable to the rock gardener for its glowing salmon-yellow flowers. In habit a small woody shrub, it grows to a maximum height of 3 feet (1 m) in its native chaparral plant community, although it can be kept pruned lower. Suitable for the sunniest of rock gardens, this species relishes a sandy-gritty soil and a long dry summer. Its native haunts are the foothills of the Coast Ranges of southern California. Its winter-hardiness is questionable, and protection is advisable in cold climates. Consider a thick mulch, or take cuttings in midsummer to overwinter in the cold frame for planting the following spring. The species has three recognized varieties; probably the most desirable is *M. longiflorus* var. *calycinus*, differentiated primarily by its broader leaf blades and woolly, slimy-textured pedicels. This variety occurs in the southern Sierra Nevada range at altitudes up to 5,000 feet (1515 m), making it a better choice for the cold-climate gardener.

Mimulus aurantiacus

This is another species that has been tossed around between *Diplacus* and *Mimulus*. Peck, in his *Manual of the Higher Plants of Oregon*, placed *M. aurantiacus* into Subgenus *Diplacus*; however, both the *Jepson Manual* (the flora of California) and Hitchcock's *Flora of the Pacific Northwest* consider it in the genus *Diplacus*. This woody species (p. 187) ranges from southern Oregon to central California. It can make a nice accent on the rock garden, where its shrubby habit, shiny, sticky leaves, and variable yellow to peach-colored flowers can be admired in late summer. It is certainly an adaptable species; I have seen it growing alongside *Dudleya farinosa* on cliffs along the fog-shrouded Mendocino County coast in northern California. In contrast, populations on the arid eastern slopes of the Siskiyou and Klamath mountains grow with *Eriogonum* and *Keckiella* for companions. In the garden, it will grow well in sandy loam soil if given a sunny position. Where the ranges of *M. aurantiacus* and *M. longiflorus* intergrade, natural hybrids occur. Both these species have received the attention of breeders for some time, and many color variations are available in the trade, especially in California.

Mimulus primuloides

Truly unique among the monkey flowers, this is undoubtedly the finest western species for the rock garden. This charming little plant (p. 186) forms mats of small rosettes strung along stolons. The flower scapes rise from the rosettes bearing single blossoms of bright yellow with crimson-spotted lips. In the wild, this species can be found growing in wet meadows and mountain bogs, and alongside snowmelt rivulets. Very much an alpine species, it is seldom found at elevations below 4,000 feet (1200 m). In the Colorado Rockies, it is often seen above 10,000 feet (3030 m). It also ranges westward through the Oregon and Washington Cascades and south through the Sierra Nevada of California. *M. primuloides* var. *linearifolius,* which has hairy, linear leaf segments, seems to be the most abundant form in the northwestern California ranges. During the winter, the rosettes die down to small bulbils (unique in the genus) and the plant can be increased easily by planting these propagules just under the soil surface. At the Berry Botanic Garden in Portland, Oregon, a large colony can be admired growing in a raised, concrete-lined bog alongside *Drosera rotundifolia* and *Hypericum anagalloides*, both of which are natural companion plants. Lilla Leach, the Portland plant explorer for whom *Kalmiopsis leachiana* is named, was also credited with the discovery of *M. primuloides* var. *minimus* in the Wallowa Mountains of northeastern Oregon. After more review by botanists, this diminutive variety has since been reduced to synonymy, along with a hairier version, *M. primuloides* var. *pilosellus*.

I have found that plants can be quite variable from seed, and once a good form is found, the grower would be well advised to keep some stock on hand for vegetative propagation. Here is a good trick to getting this species established in the rock garden: line a 10-inch-deep (25-cm) trench with black poly-

ethylene film, fill it halfway with well-moistened peat moss, and then top this with a mixture of peat, pumice, and compost (see "Cultivation and propagation," below). Disguise the top of the plastic with a gravel mulch or larger rocks. Frequently flood the trench throughout the hot summer months to keep the roots cool and moist.

Mimulus lewisii

The great purple monkey flower is fairly common at higher elevations throughout the western mountains. It is found most often growing alongside snowmelt creeks or in rocky meadows with subterranean water movement. The large pink or purple flowers are marked with a yellow throat and are displayed quite prominently above slimy, bright green leaves. This species often appears on seed exchanges and can bloom the first year from seed. It tends not to be long-lived in cultivation unless provided with ice-cold water constantly flowing around its roots. A few of the early western plant collectors introduced forms with white and pale yellow flowers, although, to the best of my knowledge, these are quite rare in the wild and almost never seen in cultivation. For the best chances of success, give it a cool root run and a moist, rich soil. I have tried seed collected in Colorado, and, oddly enough, these have performed better perennially for me than plants grown from seed collected on Mount Hood, Oregon, only an hour away from our garden.

Mimulus tilingii

This species (p. 186) is often a companion of *M. lewisii*, preferring the same high-altitude creeks and snowmelt gullies. It is very similar to *M. guttatus,* which occurs at lower elevations. The large yellow corollas feature a densely bearded throat spotted throughout with red dots. This alpine species forms thick, tight mats of winter foliage that give rise to the summer flower scapes. The species was confused by early botanists. The story goes that in 1869, Dr. Tiling sent seed collected near Nevada City, California, to Eduard Regel, the superintendent of the St. Petersburg Botanic Garden. Regel grew the plants and described *Mimulus tilingii* in *Gartenflora*. The next year Regel noticed a different plant growing in the same pots from what appeared to be the roots of *M. tilingii*. He subsequently described this different form, and the confusion began. We now know that Dr. Tiling had also sent Regel seed from *M. guttatus* collected in Alaska, and it is believed that some of this seed contaminated the pots of *M. tilingii* and led to the confusion.

Mimulus cardinalis

The scarlet monkey flower (photo, p. 186) ranges from Arizona west through California and north into southern Oregon. The flowers vary from brick red to

deep scarlet; the narrow corolla shape, like the color, seems particularly attractive to hummingbirds. Perhaps a bit large for the rock garden—it can reach 5 feet (1.6 m) in optimal conditions—this species is quite drought-tolerant and can make a nice "backdrop" plant. I have observed smaller, light-red-flowered forms along southern Oregon's Umpqua River growing in very dry, pure sand. Baldassare Mineo of Siskiyou Rare Plant Nursery has introduced a fine yellow-flowered form from the Kalmiopsis Wilderness Area in the same region. Interestingly, *M. cardinalis* can be artificially hybridized with *M. lewisii,* and, since *M. cardinalis* is hummingbird-pollinated and *M. lewisii* is pollinated by bumblebees, the progeny are being studied by university researchers interested in floral morphology and breeding types.

Mimulus nanus

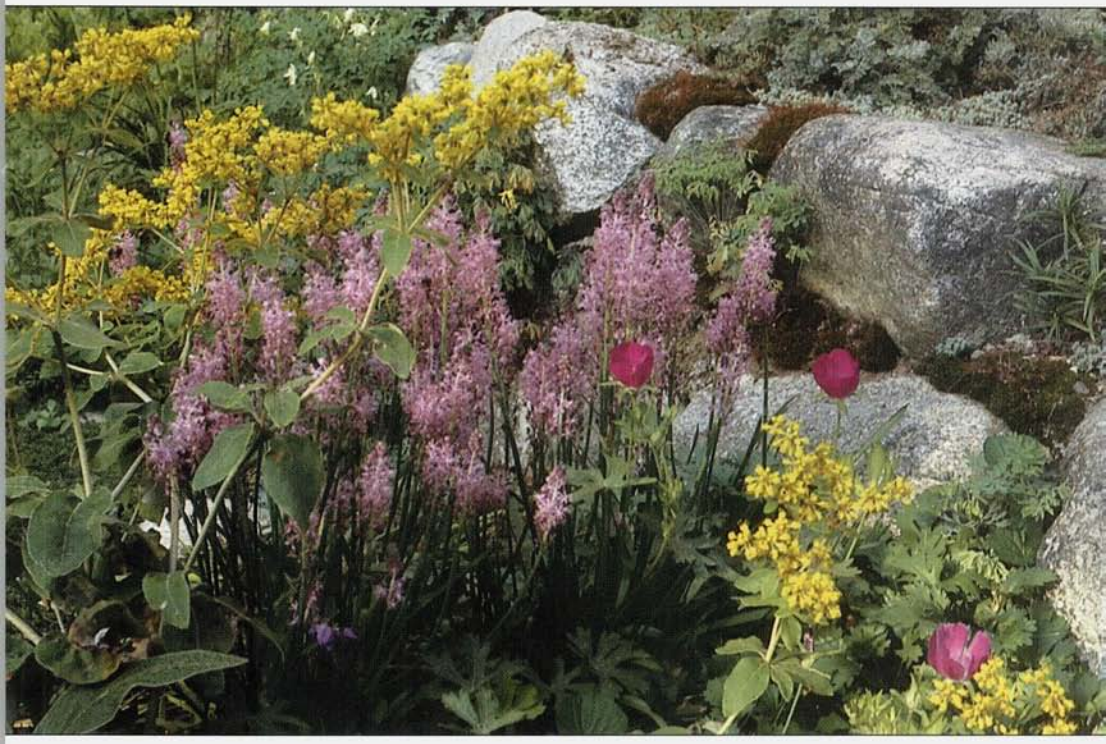
A true xeric species, this dwarf annual (photo, p. 186) resides in the hottest, driest portions of the western mountains. Great swaths can be seen inhabiting the crushed red lava rock along road shoulders throughout eastern Oregon. Usually blooming in July, the bright pink to deep purple flowers can be up to an inch (2.5 cm) across; thus, although the individual plants are diminutive, the show they put on en masse is very impressive. The plants produce an abundance of fine seed, which should be sown directly into the garden in a dry sandy or gravelly spot.

Other Species

California hosts a great array of rock garden candidates, a good many of which are small, showy annuals. One of the finest is *Mimulus bigelovii* from the Mojave Desert, with reddish-purple flowers (illustrated in our Spring 2002 issue, p. 134). The calico monkey flower, *M. pictus,* is unusual for its red-and-white, reticulate-veined flowers. *M. puniceus* is another of the shrubby type, featuring brick-red flowers.

While there are a great many species worth experimenting with, there are a few that warrant a word of caution. *M. moschatus* has been a popular garden subject for the past hundred years, and if you have the space, the small tubular, yellow flowers and spreading carpets of hairy, slimy leaves are very attractive. However, the plant can be quite rambunctious and, if given a moist, rich soil, it can spread *very* rapidly. The chickweed monkey flower, *M. alsinoides,* is one of the smallest-flowered of the genus and, although the native range extends only from British Columbia to California, it has earned quite a reputation for getting around the garden. I have seen this little species seeding into nursery pots and cracks in pavement, and even growing in thin sheets of moss clinging to house foundations.

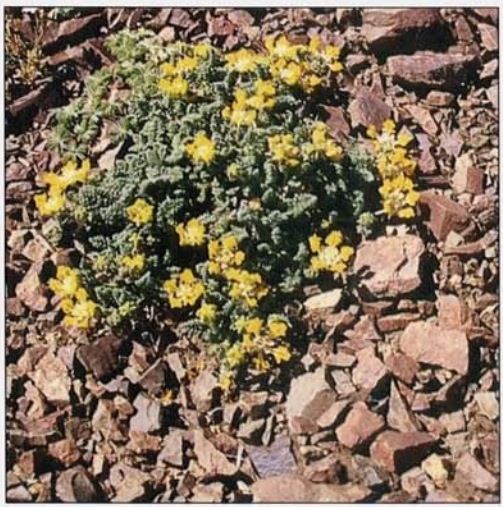
Small perennials blend with rocks in the Massachusetts garden of James Jones (p. 163). Above, airy yellow *Senecio antennariaefolius* against a background of yucca and iris foliage and shrubs. Below, yellow *Eriogonum allenii* (p. 164) from the U.S. Southeast, magenta *Callirhoe involucrata* from the central U.S., and lavender *Scilla scilloides*, a fall-flowering bulb. (photos, J. Jones)

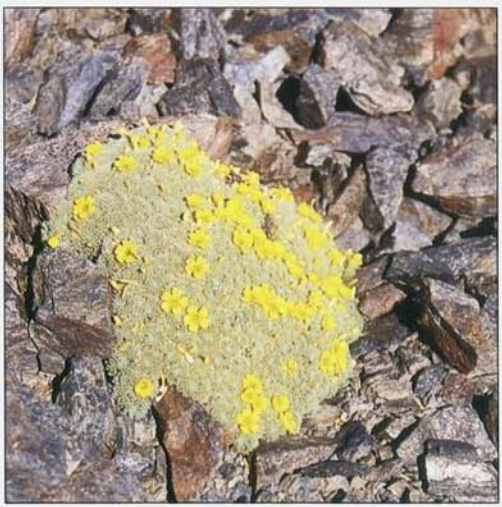


Plants selected from around the world to thrive in the difficult climate of the maritime Northeast. Above left, *Silene caroliniana* subsp. *wherryi* (p. 164); above right, *Pityopsis falcata* (p. 164) with pink *Silene schafta*; below left, *Houstonia serpyllifolia* (p. 164); below right, *Delosperma basuticum* (p. 165). (J. Jones)

Above, *Chaetanthera villosa* (p. 167) on Cerro Catedral near Bariloche, Argentina. (photo, D. Hale)

Below, two more denizens of Cerro Catedral: left, *Loasa nana* grows on stable scree; right, *Oxalis erythrorhiza* is found on ridgecrests. (photos, J. McGary)





Asteranthera ovata (p. 168), an epiphytic gesneriad, in the moist woodland of Chile's Lake District. (D. Hale)

Ample moisture nourishes large-scale cliff-dwelling plants in the Lake District; *Gunnera tinctoria* (syn. *G. chilensis*) mingles with grasses. (J. McGary)

A rich color form of *Viola cotyledon* on Volcan Villarica (p. 169). (D. Hale)

Below left, *Adesmia longipes* (p. 169) on Cerro Colorado near Volcan Llaima.
Below right, *Mutisia subulata* near Paso de Vergara. (D. Hale)

Two color forms of *Ourisia microphylla* (p. 170) are found growing on cliffs near the road to Laguna de Laja, Chile. Above, unusually large plants of the typical pink form; below, a robust white form. (D. Hale)

Above left, *Viola congesta* (p. 170) in flower near the road to Laguna de Maule, Chile, at 5700 feet elevation; right, the same species in seed, camouflaged in its barren habitat. (D. Hale; J. McGary)

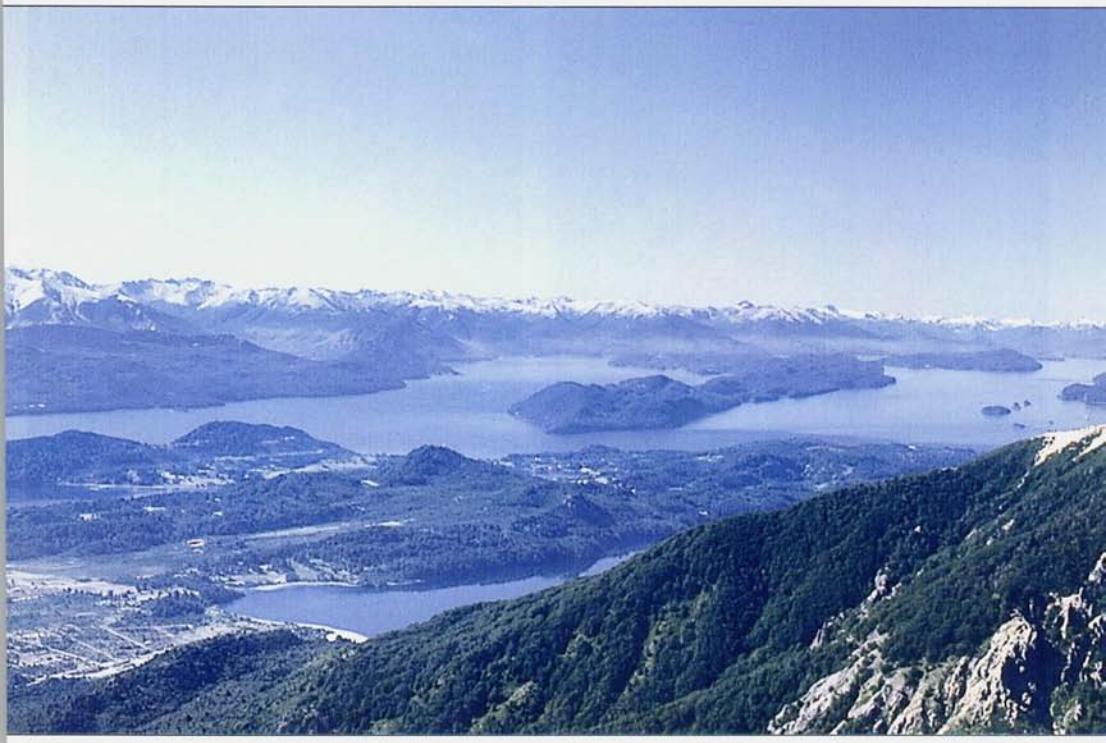
Below, *Viola rosulata* at Paso de Vergara. (D. Hale)

Donna Hale enjoys a snow-melt stream dashing down a slope above the Termas de Chillan, Chile (p. 170). (photos, J. McGary)

Ourisia poeppigii (p. 170) grows on rocks overhanging the stream's spray.

The terrestrial orchid *Chloraea aurea* (p. 170) above falls at Laguna de Maule, Chile
(J. McGary, D. Hale)

Lake Nahuel Huapi (p. 168) from Cerro Catedral, among the floral wonders of the southern Andes.
(D. Hale)

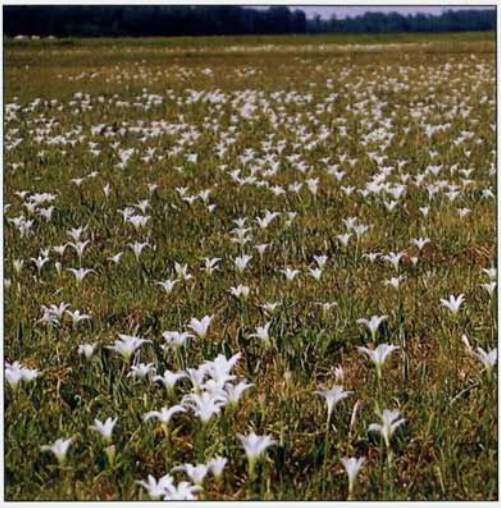


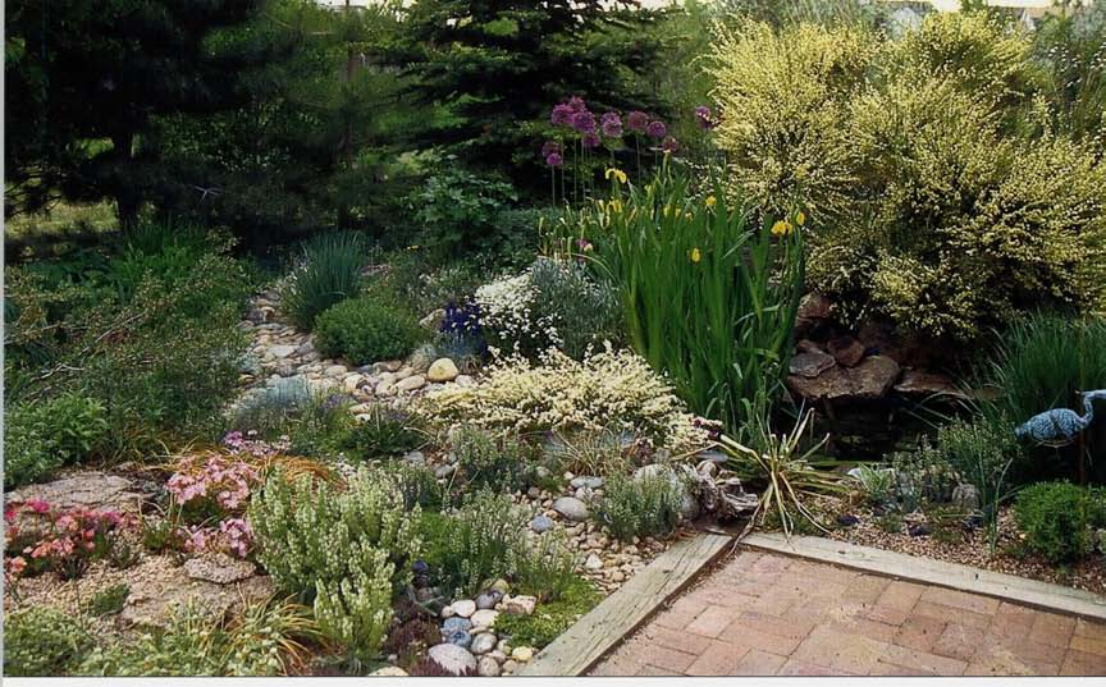
Above left, *Mimulus tilingii* (p. 175) in a typical site next to a wet boulder. Above right, *Mimulus nanus* is a xeric species (p. 176). (photos, J. Hammond)

Below left, the flower of the tall-growing *Mimulus cardinalis* (p. 175). Below right, *Mimulus primuloides* (p. 174) is a good container subject.

Above, blooms of two shrubby *Mimulus* species: left, *Mimulus aurantiacus* (p. 174); right, *M. longiflorus* (p. 173). (photos, M. Akimoff)

Below, *Zephyranthes atamasca* (p. 220), a showy amaryllid of the U.S. Southeast, with a colony growing in grass in Hertford County, North Carolina. (photos, Bobby J. Ward)





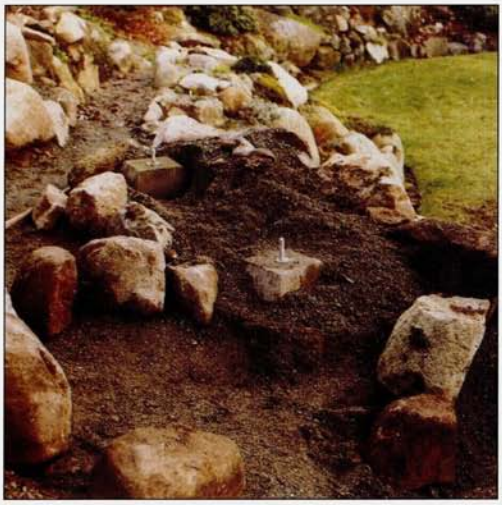
These two views of the Colorado garden designed by Marcia Tatroe (see p. 194) show how she has integrated groups of rock plants with beds of larger perennials in a setting where the house and other structures must also be taken into consideration. Paths combining gravel mulch and sandstone slabs tie the many small gardens together. (photos, Randy Tatroe)

Paths in the Tatroe garden (p. 194) are edged with used bricks and the border "erased" with low-growing perennials that flow gently toward the stone surface. (photos, Randy Tatroe)

One of Marcia Tatroe's low mounded rock gardens features gray foliage and lavender hues.

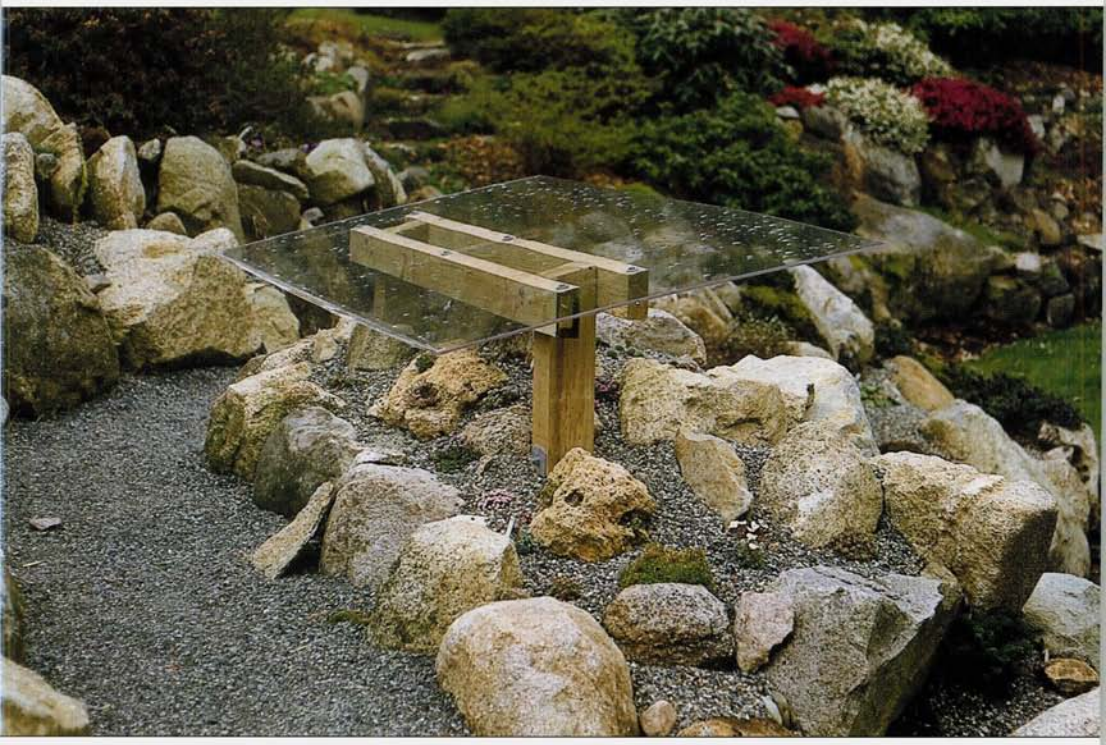
A crevice garden workshop at Wrightman Nursery in Ontario (p. 199). Above, Josef Halda demonstrates selection and placement of tufa pieces on a prepared base of scree mix. Below, workshop participants place tufa on the "pavement" side of an artificial outcrop, using a board to maintain the line of the strata. (photos, Juliet Mattila)

Two views of crevice gardens designed by Josef Halda and built by him and Harvey Wrightman several years ago (see p. 200). Above, Harvey Wrightman (center) shows the garden to workshop participants; below, conifers give winter interest to the crevice garden, which imitates uptilted limestone strata. (photos, Juliet Mattila)



Above left, David Sellars's single-post rain shelter, with the early-flowering stem of a saxifrage bumping its head. Above right, Sellars buried the base blocks and bolts for the two-post rain shelter in this scree bed during construction (see p. 208).

Below, the two-post rain shelter set up for winter on the completed scree garden.



Cultivation and Propagation

The seed of the western monkey flowers is tiny and should be sown thinly on the surface of a sterile seedling mix. I have germinated all the above species in a mix of half finely ground pumice and half coconut fiber (peat moss works just as well). All of them respond well to cold stratification of at least 4 or 5 weeks at 40°F (5°C). With the exception of *M. primuloides,* the species described here can be grown in a mix of three parts screened ground pumice, one part peat moss or coconut fiber, and one part garden compost (I use well-rotted maple leaves because they drop all around the nursery in the fall). *Mimulus cardinalis, M. lewisii,* and *M. tilingii* can be heavy feeders and benefit from a balanced slow-release fertilizer in the mix and a yearly topping of bone meal. *Mimulus primuloides* grows well in a mix of one part pumice, two parts peat moss (coarse, if you can get it), and one part garden compost. Keep in mind that it greatly resents drying out and should be kept quite moist through the growing season. Setting pots in shallow trays of cool water can help the primrose monkey flower survive a hot summer. All the perennial species mentioned can be propagated by summer softwood cuttings under mist, and the use of a weak rooting hormone is beneficial. Division of the perennial species is best done in early spring. Potted plants should be kept well watered until established.

Mark Akimoff is propagator at the Berry Botanic Garden in Portland, Oregon. After study at Montana State University, where his interest in alpine plants began, and earning a B.S. in horticulture from Oregon State, he worked for the USDA in plant breeding research. In addition to gardening, he is an avid hiker in the mountains of the West.

Sources

Theodore Payne Foundation: California native species seed catalog available online at www.theodorepayne.org.

Northwest Native Seed, Ron Ratko, 17595 Vierra Canyon Road #172, Prunedale, CA 93907.

Berry Botanic Garden catalog of seeds: A good selection of western natives and South American species. To request a catalog go to www.berrybot.org.

Siskiyou Rare Plant Nursery offers *M. cardinalis* and *M. cardinalis* 'yellow'; see their ad in this issue.

Garden and Rock Garden: Evolving a Design

Marcia Tatroe

A well-known garden writer once told me that rock gardens and conventional gardens are inherently incompatible. At the time of that conversation, my garden had one foot in the traditional English style—long mixed borders surrounding a small but central expanse of lawn—and the other in the rock garden realm, with mounds of soil and rock rising here and there out of the borders for no apparent reason. I had done my best to make the rock gardens blend in, arranging them in the overall scheme three-dimensionally, as if they were large shrubs. I varied their sizes, in some cases putting a small mound slightly in front of and off to one side of a large mound; and I took care that the profiles of the mounds were irregular, asymmetrical, and not too cone-shaped.

For all this, I couldn't deny that there was neither an obvious nor a logical geologic explanation for these piles of soil and rock on an otherwise flat plane. I've visited a number of rock gardens, and the best, from a traditional design standpoint, are those built on natural rock outcrops, perhaps enlarged and enhanced to expand the garden space. Another effective artifice is converting a steep slope to a rock garden; the stone doubles as a retaining wall and provides an ideal habitat for a collection of rock-loving plants.

When converting a flat lot to a rock garden, two methods stand out. One is to create a series of freestanding raised beds, arranged somewhat like large troughs within the context of a conventional, more formal garden. The second is to grade the entire property into a series of berms and swales so that it imitates a naturally rolling landscape. The first abandons any pretext of naturalism, while the second eliminates clashes of differing garden styles.

At the time of this mental exercise, my garden was well on its way to being established, with many of the trees and shrubs approaching maturity. Grading was out of the question. It didn't make a lot of sense to start over at this point. In any case, the naturalistic arrangement I prefer would stand out in stark contrast against the suburban backdrop of fencelines and rooftops. I'm just not capable of suspending disbelief at the property line. And, since neighborhood covenants ban privacy fences, that wasn't an option either.

For a time I tried the cottage garden approach, allowing self-sown seedlings and invasive perennials a free hand throughout the garden. Paths disappeared under swaths of flowers, and the distinctions between the rock gardens and the borders did soften noticeably. Things got fairly wild and woolly at this stage. But when the rock gardens began to disappear under California poppies, larkspur, and Queen Anne's lace, it became clear that I could have cottage plants or rock garden plants in one spot, but not both. (I'll be paying for this indiscretion for the rest of my life—pulling up thousands of seedlings out of the rock gardens as penance.)

A few years back, while still in my cottage garden phase, my husband, Randy, and I removed the last of the lawn in the backyard and built rock gardens in its place. I was fanatically careful to keep self-sowing annuals and biennials out of these areas. The tailored look that resulted led to another epiphany. Instead of attempting to blur the transitions, this time I would outline each area boldly. What the heck: if the various parts of the garden weren't going to blend together anyway, I might as well highlight their dissimilarities.

I started with the new rock gardens, the three mounds that replaced the lawn. Originally, these gardens were mulched with the same gray and pink pea gravel as the path surrounding the mounds, because, at the time of construction, I was still in my "blur the edges" phase. To establish a hard outline for the entire area, I ran an edging of used brick along both sides of the path, but there still wasn't enough contrast between the areas, so I replaced the pea gravel mulch in the gardens with orange-toned decomposed granite. Now there is no mistaking path for garden. (Photos, pp. 188–189.)

One garden design recommendation is first to establish hard edges and then to "erase" the edges in places. Following this advice, I "erased" the brick edging, literally by removing bricks, wherever two paths intersect, so that there was no longer the psychological barrier of stepping over a line to go from one path to another. Where a path goes through the center of the new garden, for example, I pulled some of the stone out from the garden and placed it in the corners where the paths cross to hide the exposed ends of the brick.

Then I continued the brick edging another 50 feet (16 m) into an adjoining section of the garden, stopping it when it ran into a brick terrace on one side and into a brick path to a work area on the other. The effect is now logical to my mind, since no part of the edging starts or stops in the middle of nowhere. Admittedly, the whole arrangement is artificial, but the various parts no longer fight against one another. The brick provides a measure of continuity, tying several unrelated parts of the garden together.

In other areas, paths became the dividing lines between various parts of the garden. After a couple of years of path-building, every "goat trail" once nearly hidden in the borders and around the rock gardens had been widened and made into a proper path. Even though most of these are still too narrow for any but the most sure-footed, they do allow better access to the garden for maintenance. And visiting children and dogs get a kick out of following the labyrinth of paths that run throughout the garden.

Whenever I had to purchase stepping-stone material, I used flat pieces of our locally abundant sandstone, sold for wall construction. These make the sturdy steps that go down a slope at the back of the property and up again on the other side as stairs that lead through a small grove of aspen trees. The stairs are laid on top of a French drain, which carries overflow from the pond off the property after heavy rainfall. Here I was going for the look of a cascade with river rock and boulders of various sizes flanking the stepping stones. At the top of the stairs, the dry streambed becomes the path that goes past the pond and out onto a brick terrace.

I never throw anything away, so I've always got piles of material I've saved until I can figure out where to use it. Much of what I'd saved for years ended up in paths throughout the garden. In one corner, I recycled scrap wall stone into a path that circles behind the largest berm, putting two or three irregular but flat and somewhat rectangular pieces together to form each step. The steps are placed slightly out of alignment to one another for a casual, jaunty effect. In the vegetable garden, I made square steps of eight leftover bricks each laid in a basketweave pattern. Landscape timbers recycled from a child's play area, cut into 3-foot lengths and laid in pairs, make a path from the brick terrace to the work area.

The stepping stones that form the center path in the newest rock garden are off-white tumbled flagstones. This path lines up with two existing paths on either side, one through a flowerbed to a faucet, the other leading out to the back gate. Those paths were made with the regulation sandstone. In my path-building frenzy, I decided to replace the sandstone with tumbled flagstone to coordinate with the steps in the rock gardens. It's a minor change, but now a path of the same material leads from the house wall across several different parts of the garden and exits out the back gate rather than changing materials three times along the way.

When all of these paths were completed, the backyard had been divided into a couple of dozen individual gardens. Each garden is contained within a strong outline and could stand on its own. The borders have been broken up into a series of adjoining flowerbeds, the largest approximately 10 by 10 feet. But instead of appearing chopped up, the garden as a whole resembles a patchwork crazy-quilt in which each block is random in size and shape and different from all others, but cohesive within the rigid rectangular frame of the property boundary.

The patchwork quilt arrangement also facilitates plant collecting. Gertrude Jekyll's main flower borders at Munstead were a third the size of my entire property and held only eighty different species of plants. Traditional border design requires some repetition along the length of the border for balance. My small garden holds several thousand different plants—there just isn't room for more than one or two of any one species. It's easier to display an assortment of individual species within a small area, treating each block as if it were a large container, simply because there are fewer elements to coordinate.

Each flowerbed is planted in a classic florist's asymmetrical triangle with a tall perennial, an ornamental grass clump, or a small shrub forming the peak of

the bed. The plantings in the flowerbeds echo the shapes of the rock garden berms, lending a measure of uniformity. An unexpected result was the rhythms this arrangement has created. Looking across the peaks and valleys of these individual gardens gives the illusion of a series of waves, foothills, or sand dunes. Now, the mounds make perfect sense in relation to the flowerbeds.

As a finishing touch, I planted many of the paths with low-growing thymes and veronicas, sempervivums, iceplants, phloxes, *Leptinella perpusilla*, *L. squalida*, and *Teucrium rotundifolium*, which can weave together between the steps. In open gravel paths, I plant a few well-behaved annuals like gazania, miniature Fantasy petunias, and portulaca against the edges for bright spots of color in the summer months when the rock gardens are quiet. Tucked into the crannies where the stairs meet river rock are several varieties of carpeting *Phlox, Campanula portenschlagiana* 'Aurea', and *Symphytum grandiflorum* 'Goldsmith', which appreciate the sharp drainage and protection the rocks afford.

This isn't a style for everyone. Like a labyrinth, it's complex, but the complexity is now in the overall design, not in the plantings. Within each individual garden, order reigns: no more California poppies mugging tiny eriogonums. And, since the arrangement is completely artificial anyway, I've been free to experiment with diverse materials and artwork without worrying that I'll ruin a naturalistic effect. Best of all, the rock gardens no longer stand out like frogs on a log.

Marcia Tatroe of Centennial, Colorado, is the garden columnist for the *Denver Post* and the author of *Perennials for Dummies*. She finds a sense of humor essential to gardening in Colorado, where hail, blizzards, torrential downpours, hurricane-force winds and untimely freezes occasionally occur—in a single week (see "How To Grow Eritrichiums" in this issue).

Perfect Drainage

Robin Magowan

How do you grow alpines that require perfect drainage? Is it even feasible? At a recent NARGS Eastern Winter Study Weekend, Vojteč Holubeč tantalized us with a vast spectrum of Caucasian and Tien Shan beauties, most of which required seemingly impossible conditions. I had never been able to figure out why a *Dionysia, Paraquilegia*, *Draba mollissima*, *Physoplexis comosa*, or *Raoulia* invariably bit the dust within a week of my acquiring it. Other gardeners in far more inhospitable situations were growing them; how on earth were they succeeding when I couldn't?

I was mulling this over when Harvey Wrightman telephoned, inviting my wife and me to attend a crevice garden workshop Czech plant-hunter and rock-garden builder Josef Halda was giving at the Wrightman nursery in Kerwood, Ontario. I had long admired the crevice garden Josef had constructed at the Siskiyou Nursery, where chest-high cracks or fissures surprise the viewer when the path veers close to the steep central pile of boulders. Outside my studio, I had made a rough imitation of the ledge garden Halda improvised for Geoffrey Charlesworth—rough, because the garden was really a series of small terraces within which androsaces, drabas, and saxifrages spoke and glimmered. But the weeds penetrated too, as did the killing winter wet. All the same, I liked the stonework that kept plants cool in summer, yet sunlit and thus warm in winter, and the backdrop that made miniature plants visible in an open garden. When the opportunity arose, I built two more of what I thought were Halda-like crevice gardens outside my new home.

So there we were at the Wrightman nursery on April 6, part of a little group who had driven from as far away as Ohio, northern Ontario, and southern Quebec. I recall a startling hoarfrost on the trees as we drove across the flat landscape of bare fields lightly touched with snow, the pink clouds glowing in the vapory morning light. There was a chilling wind blowing as well. It was not an ideal day to be on hands and knees working with cold stone.

Waiting for us in the corridor between the seedling hoop greenhouse and the Wrightman home were three conical mounds of loose, gravelly sand, the ideal

foundation material because it compacts so easily. To one side of the sand were large piles of travertine, a porous tufa-like limestone imported for the occasion from Ohio. The great virtue of travertine is that it can absorb a lot of sun without scorching plants nestled beneath or within it. But it is a material better suited to Mediterranean gardens than to a climate in which the water that fills it in winter is continually expanding and contracting. Still, travertine is a lovely pink stone that weighs only a third of what the same volume of many other rocks would weigh, so any of us could heft it without danger of injury. Ideally, the rocks should be sorted into two piles—big ones and little ones.

While we stood around stamping our feet and admiring the *Leontice darwasica* in full bloom and a brave *Adonis* dancing in the lee of winter heather, Harvey Wrightman explained the theory behind crevice garden construction. The technique falls between that required to lay flagstones to form a pavement and that required to build a vertical drystone wall. With the stones set back so they overlap one another, it is easier for plants to settle in and be watered.

By "crevice," we normally mean a pocket between rocks. But the Halda-Wrightman crevice garden is more like a series of fissures, with as much protecting stone as possible and minimal earth—just enough for the root run.

But it is more than a set of soil conditions that a crevice garden strives to approximate. There is also a look that, in its overlapping parallel layers, recreates an outcrop. Geologically, a limestone outcrop is a sedimentary formation thrust out of the slope at an acute angle—anything up to 45°—one layer of sediment deposited on top of another. In reproducing a series of thrusts, the builder has the choice of fanning the stone in horizontal layers parallel to the slope, or placing the layers perpendicular to the slope. Working vertically confers a more rugged look, as if the plants were caught in a fall of tumbled stone. A horizontal calmness is harder to achieve because you must layer precisely, using a long plank to make sure the same thrust is being maintained in row after row all the way across the slope. (Photos, p. 190.)

Our class's three mounds required three teams, who immediately set about reducing them to shapes suited to a garden. Normally, in choosing the orientation, the grower of alpines should pick an axis that would subject the fewest possible plants to the desiccating afternoon sun. In a crevice garden, however, it's not the light that is paramount but the combinations the plants make among themselves.

After the front and back sides of the slope are angled, there comes the crucial step of laying the keystone; crucial because, as in an automatic poem or an abstract expressionist painting, everything has to flow from the first gesture. Before committing yourself, it helps to walk around and look at the spot from as many angles as possible. Once you have put the keystone in place, out comes the plank to establish the transverse line. *Consecutive, parallel, thick side up*, are words you hear as you layer in slabs of irregular rock, building in rising, overlapping waves, but always, always on a line, rock upon rock, row upon row.

Once the angle of the line has been determined, the first couple of rows must be consistently parallel, to give yourself (if no one else) an impression of struc-

ture. Thereafter, the spacing between rows can be more flexible. It helps to vary the size of the rocks composing a row. But each should thrust out at the same angle, the thicker side exposed so it looks more natural. Much of the rock, of course, is buried, but there should be enough protruding to reveal the grain. The layers can be then adapted to your material. In this connection, it pays to insert the bigger plants, such as conifers and daphnes, as you build, because they help direct the construction.

In assembling the crevice garden, try to pick flat rocks, as they are less likely to shift about. Smaller rocks should be at the bottom, where the weight will wedge them in. Whatever the underlying support, you are exposing rocks to make lines that will create the illusion of overlapping strata; only instead of long lines with corresponding great blocks of stone, the strata are fractured to allow pockets for individual plants. The smaller the rocks, the more crevices that can be planted. Boulders can work in an open garden, but even there they are taking up precious space that could be planted. If you have to use them, Halda suggested, keep the flattest side on top to avoid a "bowling ball" effect.

"What about the top of the mound?" we asked.

"You have a choice," Halda replied out of his lifelong mountaineering observations, "of either a spur-pinnacle, or a group of small rocks paved together to simulate the kind of mesa that often occurs."

Halda began the afternoon session by adding a back slope to the new garden he had been constructing for the Wrightmans. He worked silently, for the most part, improvising from a general conception he carried in his head. It was a bit like watching a puzzle being pieced together from elements that must fit perfectly, bend, blend, into the surrounding rockscape and sky. We asked why he chose to start on the top and work downward. When the slope is a gentle one, Halda replied, by starting on top you can take advantage of the sight lines that radiate out. His descending rows were about 10 feet (2.6 m) long, with the second stepped back slightly from the first, and the third row flat back. The thicker rocks he placed in the middle, tapering at the ends to give an effect of natural erosion. Then, when the angle permitted, there was room for cuts, recesses, and a minuscule valley widening as it descended.

"What happens when you turn a corner?" we asked.

"You may need to reinforce the rocks," he said, "but the construction follows the same principles, maintaining the same set of planes and the same descending angle. In a small garden, the design, for the sake of coherence, must be very strict. In a larger garden, you have more freedom to improvise and change the orientation."

With each response I came to see a little more clearly the extraordinary extent to which Halda was putting himself within the mound—the imitation mountain—that he was building, steeped in its angle, sheltered in its wind.

As for the plant choices, Halda advised Wrightman to insert mat-forming species that would spread, drape, and cascade over the stone. Halda's preference for *Genista, Dracocephelum, Scutellaria* and their like need not exclude other options. Fissured pockets allow you to vary the soil to suit individual needs: a rich mixture for daphne and primula; a peaty acid one for the granitic *Incarvillea* or *Soldanella*; or pure stone, laced with fertilizer during the growing season, for a recalcitrant *Penstemon acaulis*.

A fissure that is sufficiently vertical allows a plant's leaves to shed rainwater before it reaches the vulnerable crown. Since the overlapping stonework does not permit terraces where water can collect, you have perfect drainage. Best of all, you have re-created in miniature that absolute mix of plants and rock which naturally occurs high on a mountain. Only now, instead of a few choice plants, there is an entire pantheon to which you can minister.

Robin Magowan gardens in Connecticut. His *Memoirs of a Minotaur* appeared from Story Line Press in 1999, and a volume of poetry, *Lilac Cigarette in a Wish Cathedral*, from the University of South Carolina Press in 1998. His collected travel writings were published as *Improbable Journeys* in 2002 by Northwestern University Press.

Corrections

We are still having a few glitches in our photo section, and here are two more, from the spring 2003 issue. Thanks to Mark McDonough for pointing these out.

On p. 116, the wrong photo was printed as the large item, but the species are named in the right order. The caption should read: "Above left, *Primula egaliksensis* in the wild; above right, *Primula mistassinica*; below, *Primula laurentiana*.

The plant illustrated on p. 119 and captioned "*Crocus sieberi*" appears to be the form sold as "*Crocus sieberi* 'Violet Queen'," but it is probably not really *C. sieberi*.

Winter Protection

Most alpine plants live naturally where a blanket of snow protects them through their winter dormancy, fairly dry and considerably warmer than the air temperature above. Most rock gardeners, however, dwell at lower elevations where even the northern United States and southern Canada can experience snow-free periods in winter, sometimes with rainy or sunny weather interspersed with severe frosts. Bringing garden plants through those conditions is perhaps the greatest challenge rock gardeners face. The articles present solutions devised by two gardeners in the relatively mild but wet Pacific Northwest. Elsewhere in this issue, James Jones approaches the problems of the cold maritime New England climate in terms of plant choice.

Protecting Small Plants Against Winter Wet

ERNIE O'BYRNE, Eugene, Oregon

Rock gardeners in Pacific Northwest winters contend with wet—lots of it! Rain and more rain, swollen streams, soggy soil for months on end, and moisture-laden air predominate from November until April or May. This surfeit of water goes hand in hand with a scant summer supply. Although considered a temperate rain forest on biome maps, British Columbia and the northwestern corner of the United States in fact have a "cool Mediterranean" climate.

Many plants of interest to alpine gardeners are well adapted to these conditions, and with maritime influence bringing generally cool summer temperatures, some alpines grow to perfection here. This is one of the few areas in North America where the blue Himalayan meconopsis (*Meconopsis betonicifolia, M. grandis,* and their hybrids) flower reliably, although they would appreciate less rain in winter. The evergreen *Meconopsis napaulensis* often must be protected through winter to come through unscathed, except in areas in the rain shadow of the Olympic Mountains that receive only about 25 inches (58 cm) of rain per year. Many plants from the more arid parts of the West, the Great Basin, and the high

desert of eastern Washington, Oregon, and California also need specialized growing conditions in order to succeed here: perfect drainage and protection from winter wet.

The best defense against the vagaries of the climate in any region is to choose plants suited to that climate. Plant addicts, however, are perverse by nature: we all want to grow exactly what is most difficult, perhaps just for the novelty of seeing something different than what everyone else has in the garden (but more likely for the snob value). There is also the challenge posed by "experts" who claim a plant is ungrowable—to the keen gardener, this is like waving a red flag at a bull.

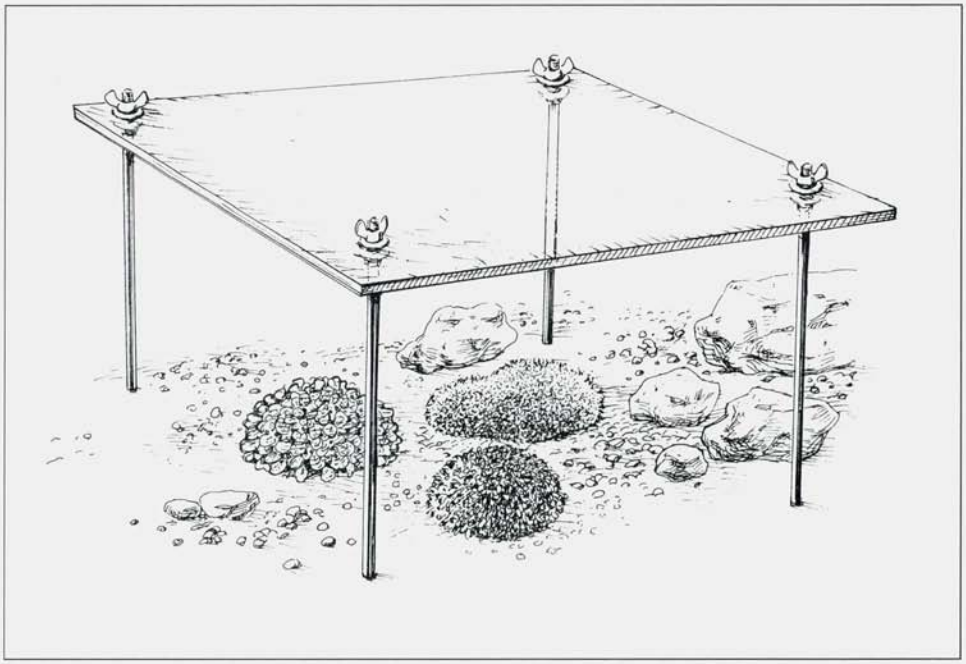
The easiest second step in attempting to cheat nature is special siting—for example, in the "rain shadow" of a house under the eaves, or under an evergreen tree that can take up excess water in winter. In the latter case, alpines should be planted on the south side after the tree has been limbed up. Cyclamen do especially well in this situation, as do *Lewisia tweedyi* and the miniature peony *Paeonia cambessedesii*.

In the earlier years of our nursery display garden, we were a little embarrassed when visitors began discussing Mediterranean or other summer-dry plants, because we had no area of the garden that we did not irrigate in summer. Finally, we decided to install such an area. There we now grow such plants as eriogonums, penstemons, many types of bulbs, some conifers, yuccas, and cistus. It gets no summer water whatsoever, and the plants are thriving.

To develop this area, we covered our native soil, a sandy loam, with 4–8 inches (10–20 cm) of quarter-inch gravel mulch. The gravel we used has a little silt in it, which we worried about, but that seems to have washed through. We are still experimenting to discover what plants need further protection in winter, even on the deep gravel. Failures have included the silver-leafed, purple-flowered *Verbascum wiedemannianum* and the "skyrocket" of eastern Oregon, *Ipomopsis aggregata*. *Eriogonum umbellatum* selections are all very happy, as well as some other eriogonums from the eastern Sierra Nevada of California.

If Northwesterners really want to get serious about wet protection, though, we have to bring out the plastic. The options are either to protect individual plants, or to cover group plantings with a "roof" over part or even all of the alpine garden. These can be quite simple, such as the slanted covers on legs that David Hale of Portland uses, or even a wire frame with a plastic bag on it. They can be elaborate, such as the well-constructed bulb frames at Jane McGary's home in the western Cascade rain belt, or the polycarbonate-covered growing area built by Betty and Ned Lowry in Seattle. The Lowrys have benches for potted plants under their structure, but a similar gazebo-like structure in another Seattle garden has been erected over planted beds of the most sensitive alpines.

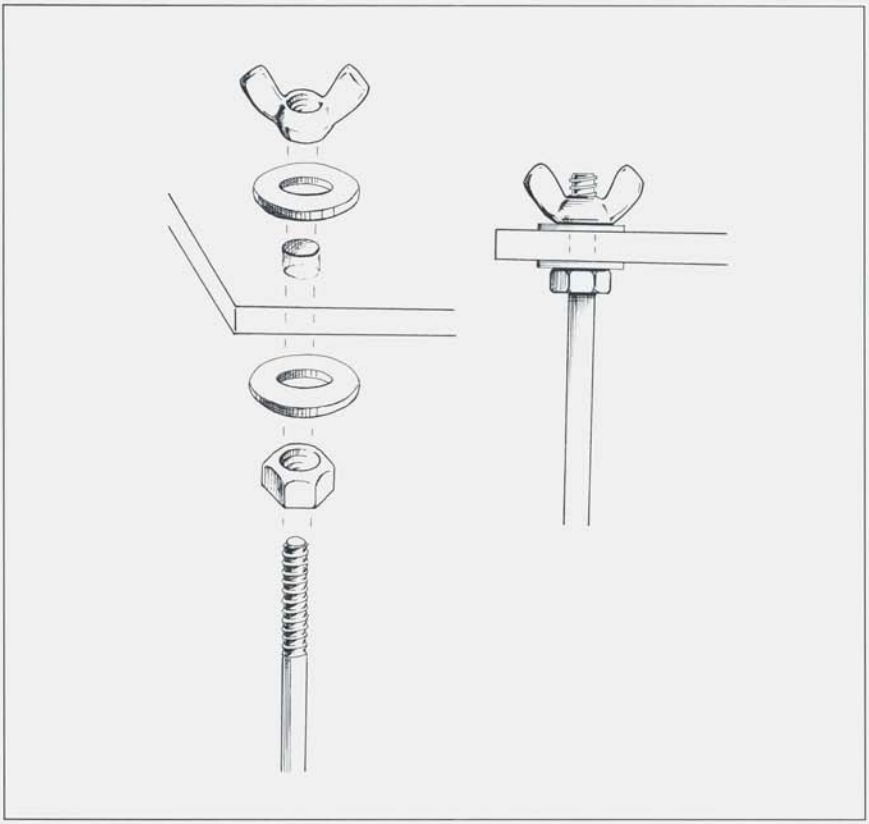
A major consideration in planning any protective structure in the garden is the effect of wind. At Arch Cape on the Oregon coast, where David Hale has a second garden, his rain protection must resist winds of nearly 100 miles per hour. Inland, at our garden in Eugene, Oregon, we sometimes get gusts of 70 mph, usually from the southwest.



Drawings by Sukey McDonough

In response to local conditions, I have developed plexiglas covers based on a design I originally saw in the rock garden of the late Jane Platt of Portland. They are most economically made with a full sheet (4 by 8 feet) of 3/16-inch plexiglas, which can generally be cut to any size by the supplier. Use a 4-by-8-inch piece of paper to lay out cuts for the most efficient use of the sheet, and give that guide to the person doing the cutting. We use larger sizes, from 2 by 3 up to 3 by 5 feet, for our troughs, and smaller sizes for individual plants. The larger sizes have four legs, and the smaller ones usually have only one, or sometimes two or three, depending on size.

Here is how they are made. First, when the plexiglas is cut, have the supplier leave on the adhesive-coated paper to protect the surfaces while you work with them. The legs are made from ¼-inch galvanized metal rods, cut to the desired length with a hacksaw. The rods are easily obtainable in 4-foot sections, so I make either four 1-foot or two 18-inch and one 1-foot legs per rod. The rods now have to be threaded on one end. Buy a ¼-inch die and die handle to make the threads; it is also helpful to use a bench vise. First, grind or file the end of the rod a little to help it get started in the die. Place the rod in a vise, or at least a vise clamp tool, to keep it steady while cutting the thread. Put a little cutting oil (or even 30-weight oil) on the end and start cutting with the die. Cut about ¾ inch



to make enough thread for a quarter-inch nut, a washer, the plexiglas, another washer, and another nut.

Next, make the holes for the legs. It is not a good idea to drill the holes, because minute, invisible cracks are produced which then become longer cracks if the plastic is ever stressed (for example, by a fat, 15-pound cat deciding that the cover makes an excellent drinking station). The best way is to burn the holes. This is not an environmentally friendly process—it produces nasty fumes—so someone may be able to devise a better way (e.g., drilling at very high or perhaps very low speed, or drilling through with a tiny grinding wheel). Do this work outside because of the fumes, preferably on a breezy day. Mark the paper covering or the plexiglas itself with a felt-tip marker to show where you want the holes. Heat the end of one of the metal legs to glowing red on a stove or with a small gas torch, then just burn through the plexiglas with the rod. You can usually do a couple of holes before reheating the rod. There is a little bubbly debris that will come free when the paper is removed, or it can be gently scratched off.

Once the holes are all made, cooled, and cleaned, attach the legs by screwing a nut onto the threads as far as it will go; put a washer on top of that; put the leg

through the plexiglas; then apply another washer and another nut. Do not overtighten the nuts, or you may crack the plexiglas; just a little more than fingertight is fine. That's it! Your sensitive plants will thank you.

We generally put the covers on around the first part of November, when the heavy winter rains begin. We remove them when the weather starts to improve in March or April. They could also be used to protect plants that do not like summer water in an area that is irrigated, or in a climate with summer rains.

Ernie O'Byrne and his wife, Marietta, are the proprietors of Northwest Garden Nursery in Eugene, Oregon. Their large, exquisite garden is a favorite stop for travelers from near and far, with thousands of plant species from minute alpines to specimen conifers. Ernie is a former NARGS Book Service manager, board member, chapter president, and organizer of study weekends and a national meeting.

A Rock Garden Rain Shelter

David Sellars, British Columbia

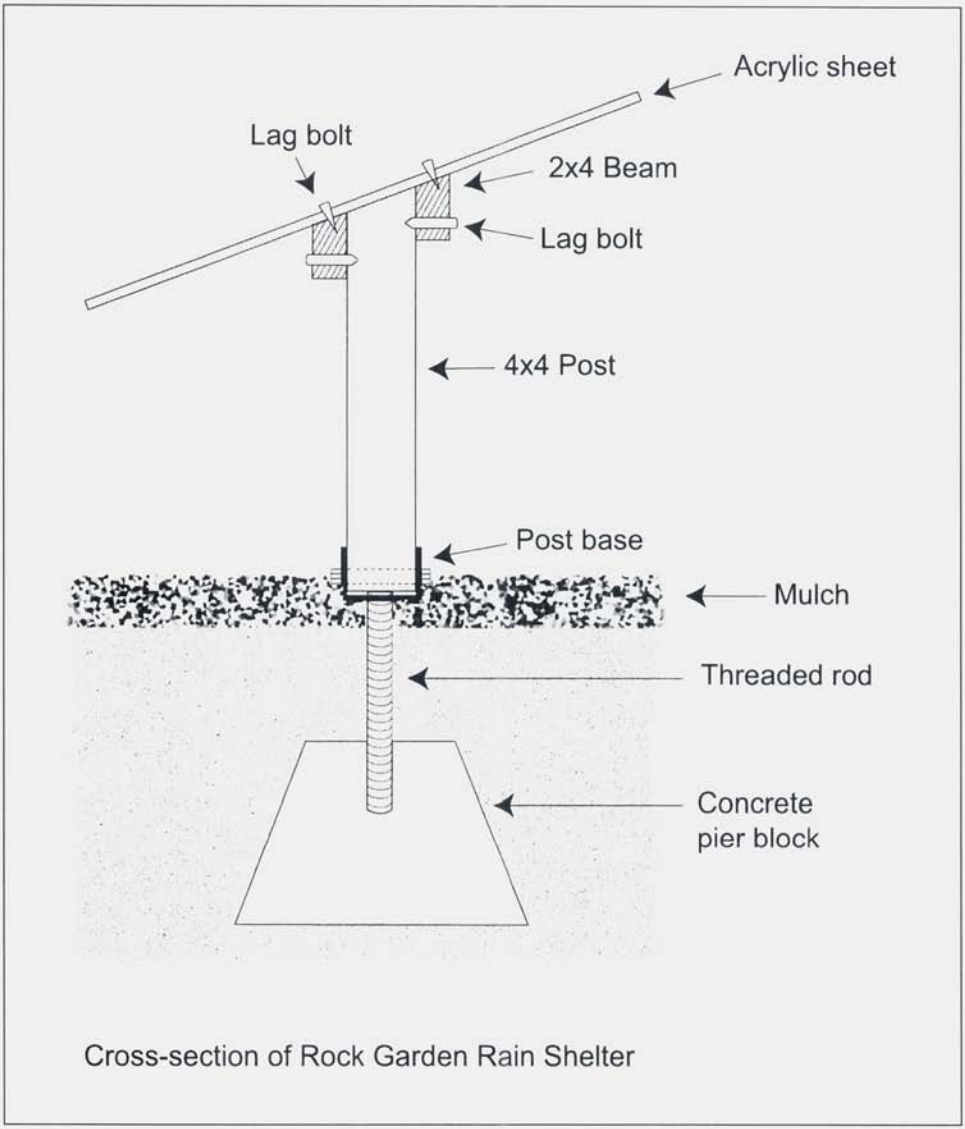
The "Pineapple Express" is the local name for a warm winter storm that originates in the Pacific Ocean near Hawaii and roars through the Pacific Northwest like an express train. These huge storms bring incessant rain and high winds, sometimes for weeks on end. The winter storms are sometimes followed by freezing outflow winds originating from high pressure over the Arctic sweeping down the mountain valleys and out onto the coast. Our rock garden plants do not appreciate being alternately soaked and then frozen, and so some form of rain shelter is required to grow many high alpine species in the open garden in the Pacific Northwest.

Even though a rock garden rain shelter is a simple concept, there do not seem to be good examples in the literature. My first step was to develop design criteria:

1. The shelter must be strong enough to withstand snow and wind loads. In our area we can get 12 inches (30 cm) of wet snow in a day, followed by rain that increases the weight of the snow on the roof.

2. The roof must be transparent to let in light, and high enough to allow free air movement. The roof should be impact-resistant to avoid breakage.

3. Because many select alpines bloom early in the year, the shelter should not restrict the ability to view the plants. The high end of the roof should be oriented toward the most frequent viewing area, and the low end should be over a path or over plants that will not be harmed by water dripping off the roof. If possible, the roof slope should also be oriented toward the direction of the most frequent wind-driven rain.



Cross-section of Rock Garden Rain Shelter

4. The shelter should be easy to set up in October and simple to remove in April. Once removed, there should be no evidence that a shelter was used during the winter.
5. Because the winter garden should be an attractive environment, the shelter should be aesthetically pleasing to the extent possible.

Good foundations are an essential component of any structure. We used two precast concrete pier blocks, readily available from hardware stores. Threaded 5/8-inch rods were grouted into the hole in the top of the pier blocks, and the blocks were buried into the rock garden during garden construction (see photo, p. 192). The rods were set so that the top would be just below the top of the mulch when the rock garden was completed.

Two 4-inch by 4-inch treated wooden posts support the roof structure, as shown in the cross-section drawing. Each post is attached to the threaded rod using a metal elevated post base, available from hardware stores. To attach the post to the elevated post base, I drilled a hole through the post and used a 4½-inch galvanized carriage bolt. The elevated post base has a threaded 5/8-inch hole and can be screwed onto the fixed threaded rod, which gives the post a strong, rigid footing. The threaded rod supplied with an elevated post base is about 6 inches long, but it can be replaced with a longer rod for a deeper concrete footing, which would interfere less with planting.

The roof is a 72 by 32-inch sheet of 1/8-inch transparent acrylic, available from a hardware store or a plastics retailer. We wanted the roof to cantilever from the frame on all four sides to improve the aesthetic effect, and this required acrylic at least 1/8 inch thick to provide the required strength. The roof frame is formed with two supporting beams of treated 2-by-4-inch lumber, each 56 inches long. The beams are bolted on either side of the two posts, one set slightly higher than the other in accordance with the planned roof slope. The posts are fixed to the supporting beams with lag bolts 2½ inches long. The top of the post and the edges of the supporting beams are cut on an angle so that the acrylic sheet is flush with the edges.

The acrylic sheet is fastened to the top of the beams with six galvanized 1½-inch lag bolts with washers. The sheet tends to crack slightly when drilled so a safer alternative is to burn holes through the sheet using a soldering iron (for this technique, see Ernie O'Byrne's contribution in this feature).

In the spring, the shelter can be easily dismantled by unbolting the roof beams from the posts and lifting the roof, including the two beams, off the top of the posts. The posts, with the metal bases attached, are then unscrewed from the threaded rods. The top of the rod remains hidden in the mulch during the late spring and summer. The tops of the threaded rods should be greased before covering them with stones to ensure that the shelter is easy to reassemble in the fall. After experience with the first season of operation, we decided to raise the roof a few inches to improve the visibility of the plants, and it was a simple matter to make longer posts.

Some plants that have been noted to be reasonably tolerant of the open garden, such as *Androsace carnea,* do not survive our winter rains, at least in our garden, but they love it under the rain shelter. We also find that *Androsace sarmentosa* performs much better under the roof. We have a couple of blocks of tufa under the shelter, and among the plants that have been quite happy there are *Androsace villosa* var. *arachnoidea*, *Androsace muscoidea, Arenaria tetraquetra* 'Granatensis', *Gypsophila aretioides*, and *Petrocallis pyrenaica*.

We have a collection of forms of *Saxifraga oppositifolia*, some of which started off in life under the shelter. Because they flower very early in March and are tolerant of the open garden, even in our rain, we have moved them all to unprotected locations for better viewing and to make space under the shelter for less robust plants.

To cover smaller areas, it is feasible to use a single post with a cantilevered roof using treated 1-by-4-inch lumber for the acrylic roof support. The top of the post is cut on an angle to provide a slope, and the 1×4 piece is screwed to the top of the post. The photo (p. XXX) shows *Lewisia tweedyi* and a number of *Saxifraga federici-augusti* subsp. *grisebachii* protected by a small cantilevered roof.

David Sellars, a civil engineer, gardens with his wife, Wendy, on their one-acre property in South Surrey, British Columbia. His particular interests are pond, stream, and rock garden construction, alpine plant propagation, and integrating rock gardens into a landscape that also includes specimen trees and rhododendrons.

How to Grow *Eritrichium nanum*

Robert Nold, Denver, Colorado

For the benefit of visitors to Colorado who would like to duplicate its wonders in their own gardens, Bob Nold offers a few hints.

The weather is sunny, with a light breeze from the west. No clouds spoil the perfection of the deep blue Colorado sky. Half a dozen earnest pilgrims slowly make their way to the home of the fabled plant *Eritrichium nanum*, the most ungrowable and coveted of all alpines.

Even though the air temperature is pleasant, at this elevation the sun's heat is intense, and the glare is considerable. Many members of the party are so covered with sunscreen that they look more like a procession of headhunters than like serious rock gardeners. One member, who failed to put on sunscreen, mutters something about his skin feeling more and more like deep-fried pork rinds.

All of a sudden, the procession rounds a corner, and the person in front falls to his knees in adoration. There they are: woolly cushions studded with sky-blue flowers.

"Look, the King of the Alps!" cries the first in line.

"The king of all alpines!" says the second.

"The Elvis of alpine plants!" adds another.

"I don't see anything at all," mutters a fourth—for by now, the plants are covered with snow. The cloud had materialized in a matter of seconds, and with a ferocious blizzard in progress, the pilgrims stumble over one another trying to find the way back. When they've gone just a few feet from the home of the glorious alpine, though, the sun comes out, the snow melts instantly, and the party returns to the shrine.

"Wonderful!" is the almost universal exclamation.

"I'm freezing," says one. The temperature has suddenly dropped to below freezing. The pilgrims are pelted with graupel, tiny pellets of ice.

The sun comes out again. The temperature rises. The graupel melts away. "It's too hot here now. How can the poor plants survive?"

Cameras are produced, and people assume various postures trying to get the best photographs. "I can't focus in the rain," complains one, for, in fact, it is now raining.

"What rain?" says another, for now the sun has come out again.

Two members of the party rush to the aid of a third, who has been knocked to the ground by a violent gust of wind. Eyes fill with tears, personal effects are blown away, and noses run.

The clouds dissipate. The hot sun comes out again. Drops of perspiration fall on the eritrichiums. Shutters click, until the peaceful moment is shattered by a thunderclap.

It starts to hail.

"We should leave," says the hiker who was earlier knocked to the ground.

"No, wait," advises another.

It starts to rain in sheets. The sun comes out in a few minutes. The sky, swept clean of clouds, is now the beautiful shade of eritrichium blue.

"Imagine being a plant and having to grow under these conditions!"

"Imagine being a *human* and living in this awful climate!"

"Practically no one does, you know."

It is now snowing. The wind is up, the sun is gone, the snow flies. The pilgrims case their cameras and trudge back to their starting point, which by now is entirely obscured by swirling snow. Teeth chattering, the procession plunges on through the snow.

"If anyone wants coffee, I just made some. It's in the house," I say as the frozen pilgrims make their way back. The wind is howling now, the snow blowing horizontally.

The sun comes out. The clouds disappear. The sky is intensely blue. The eritrichiums are in bloom.

Bob Nold, an active member of the Rocky Mountain Chapter and a frequent contributor to newsletters and the *Rock Garden Quarterly*, gardens in Denver and plant-hunts through the neighboring mountains in all weathers. He is the author of *Penstemons* (Timber Press, 1999) and of a forthcoming book, *Columbines*.

Remembering the Color of the Month

Geoffrey Charlesworth

Months don't really have a color, but the mental image of a "typical" day may bring back a predominant or characteristic color. January, of course, is white—but is there a color "becoming white" (*albicans* in botanical Latin)? That is what we see in a snowstorm when even the wind is quiet and all the familiar sounds of birds, people, and cars are dimmed down to the last degree before the sound is on mute. You cannot capture the color on film. The eye has to see first snowflakes melting on eyelashes, tickling sensitive skin, then the flakes that surround you in a maelstrom of busy ill-defined directions. Beyond this personal storm is the ghostly gray (*albidus*) of indeterminate distances stirring up an eerie psychology of excitement and fear. Still further and the surfaces are whitening into *niveus* as the insubstantial, powdery residue thickens. You must focus rapidly near and far to grasp the color and retain your balance. But the color is almost tangible.

When the snow stops, the white (*virgineus* or *niveus*) becomes a confusing disguise and a piquant pleasure. Paths have disappeared, geography has changed. Eyes are assaulted with a light too fierce to bear. From a window indoors, the white is pure, perfect, universal. When the door is opened, it is clear that beauty must be destroyed. Where footsteps break the surface there is a gray gash (*cinereus*). Even a mouse desecrates the perfection, and before long snowplows will transform the mysteries of an unfamiliar landscape into the comfortable banality of civilization. Now the white (*albus*) recedes to distant objects—trees and hills—which will hold their burden until wind and sun work another transformation. Then the deep green of pines and hemlocks emerges, but only emphasizes the shining white (*candidus*).

February is blue. Not the deep blue of *Gentiana acaulis* (the color *cyaneus*) or the heavenly blue of *Gentiana verna* (*caeruleus*), but the subtle reflection of blue sky on ice and snow (*caesius*). The sun is now more than a month old, and though it fails to warm us or melt the snow completely, it fills the air with expectation. Our eyes see the ground frozen as though for eternity, and it is the light itself that sends the message. Even on a blue day the wind disturbs snow on the barn roof and the blue sky is seen through a whirl of powder. Melting and freezing

make walking treacherous or at best an adventure. Strong winds dry the snow and plow it into ruts across the lawn. The blue becomes grayish (*cinerascens*).

March, by contrast, is brown. The grass, which went into the winter still growing as the first snowflakes fell, is now fully dormant. If you are concerned only with superficial appearances or resentful of the slow progress of the seasons, you could call this ugly. But once your imagination soars beyond the chestnut brown mud (*castaneus*) and the yellow-brown grasses underfoot (*fuscus* to *ochraceus*) and reflects on the hidden life in each square inch of exposed earth, a partial thaw becomes a magnificent promise—even a threat—that everything that was, will be again. Among the dead leaves new shoots are visible. The earliest alpines are either in bud or opening the first few flowers. They have no impact on the overall scene, and it needs a close inspection to grasp their significance: the inevitability of growth. The evergreen mats and buns are showing a new brighter green (*luteoviridis*), and the dull winter brown (*badius*) of *Silene acaulis* is specked with this new color. The trees are still brown, but with a wet lively range of tertiary colors. The willows especially are urgently on the move, and the purplish browns of hellebores, which might look somber in July, are almost revolutionary in March.

Gradually March's points of color expand to April's yellow. Yellow (from *luteus* to *citrinus*) is the color of drabas, alyssums, *Vitaliana*, crocuses, daffodils, and dandelions. It dominates the purples and blues of the other crocuses, the first irises and scillas, and the prim heaths. It exploits the whites of *Arabis, Schivereckia*, and *Iberis* to set itself off. Any attempt to subdue the color of joy is thwarted by ubiquitous dandelion beacons adorning all the grass in the rest of the world outside the garden, and by the forsythia that everyone wants to see in somebody else's garden. *Cornus mas* also opens after a month of swelling buds, and the creamy white (*eburneus*) *Daphne mezereum* 'Alba' adds its perfume to the heady mix of spring smells. You could almost describe it as the smell of yellow. There are a few reds and pinks from saxifrages, *Petrocallis*, and *Androsace* trying to compete, but yellow is totally victorious.

Near the end of April, many colors join the competition. The yellow-greens of the budding trees give way to full-bodied green (*viridis*). The violets and purples of *Pulsatilla, Phlox,* and *Aubrieta* assert themselves from substantial mounds and mats of color. The powerful reds of species tulips, the strong blues of gentians, and the continuing yellows of alyssums provide vibrant primary colors. The clean white of *Iberis* shines among the motley, keeping peace among its clashing neighbors. Pinks and near-reds of phloxes, silenes, and daphnes grow in number and variety. Among all the brightness, the subtle colors of *Calyptridium* and shrubby penstemons ask to be admired. Only strong orange is missing from this spectrum. But it is more than a rainbow: there are mixed-up tertiary colors, diluted colors, and speckled, striped, and blotched palettes that no rainbow can reproduce. The colors of irises alone would defy reproduction by prisms and light boxes. May is a pointillist painting up close: *pictus, maculatus, variegatus, tessellatus, zonatus*.

The grass is new green, and after the first mowing the dead brown ends, twigs, and dried leaves have been replaced by a smooth green (*smaragdinus*, like an emer-

ald) varied with patches of antennarias, violets, *Houstonia*, and dandelions. Much of the bare earth and rock in the rock garden is now exuberant with the color of May. The woodland garden has lost the brown and tan of last fall's leaves and winter's withered residue and is now as colorful as the rock garden, with trilliums, primulas, bloodroot, *Synthyris*, and the near-lilac of *Jeffersonia dubia*. In the lawns are the blues of scillas and all the yellows of narcissi diverting our attention from the fading crocus leaves.

As the early yellows fade, a new wave sweeps over the rock garden. June is magenta (*purpureus*)—that is, if you want to subsume all the bluish pinks and pinkish blues, along with the not-quite-violets and cool reds, into this catch-all color. Dianthus, peonies, and penstemons join with armerias, thymes, lewisias, asperulas, delospermas, incarvilleas, silenes, and a host of other plants in a mixture of blue-red hues (*porphyreus, purpurascens, atropurpureus, roseus, sanguineus*) that drowns out its competitors. The blues and near-blues of campanulas and the almost invisible colors of eriogonums recede. But there are whites, too, to cool down the vibrant magentas: minuartias and arenarias in mats and mounts; asphodels, anthericums, and *Paradisea* in spikes.

But by June every garden has its own color, and every gardener his or her own mental color image. Some gardens are almost into the rich green of conifers now, and some rock gardens are eclipsed by flowering shrubs and perennial borders. It isn't until September that yet another color asserts itself—or rather, two colors. The blues are those of late summer gentians and the lilacs of colchicums (*speciosus* 'showy' describes the power of their colors, though not the hues). Then golden (*aureus*) October drowns out the attempts of all flowers to attract. Only the bees, now a little sated but still on the lookout for the remnants of the garden's bounty, pay attention. Finally the leaves are down, and late October and early November are deep purple. In the woodland *Vernonia*, and on the roadside New England asters flower; and then arrive the oddball primulas and finally fall crocuses, in all the varied shades of fall's purple: *violaceus, lilacinus, tyrius, vinaceus.*

November has the same light as February, but it is more earthy and greener because the snow hasn't really arrived and the soil is still warm. The moist warm earth and the cooling air give us the mists and fogs of November, and that is how we can remember it if we want, but on a warm sunny day November is also the color of freshly dug soil pied with rich brown leaves. It is nearly time to stop gardening for the winter.

Geoffrey Charlesworth, a retired Professor of Mathematics and university dean, lives in Sandisfield, Massachusetts, where the complex and beautiful gardens he and the late Norman Singer made have long been a site of pilgrimage for NARGS members.

A Plant-Lover's Camera Bag

Anna Leggatt

Most rock gardeners love exploring the wilds to see plants in their native habitats, and many of us photograph them. Toronto botanist and gardener Anna Leggatt, whose photos have appeared in past issues, describes the kit she has put together to face the special challenges of capturing images of the small plants we love.—Ed.

I bought my camera bag from Eddie Bauer some years ago. It is officially 21 cm long, 9 cm wide, and 17 cm high (about $8\frac{1}{2} \times 3\frac{1}{2} \times 6\frac{3}{4}$ inches). It has a thin front compartment with a zipper, and a larger, see-through pocket in the top. The main part has walls provided with Velcro™ to separate and protect the equipment.

Here is what I keep in it:

- My camera, with a macro lens
- A wide-angle lens
- A telephoto lens
- A miniature tape recorder—you can now buy very small ones
- A mini-tripod (see below)
- A small cable release
- A polarizing filter
- Lens cleaning cloths
- A supply of my gummed address labels
- Clothespins (clothes pegs) to hold extraneous stems and leaves out of the way
- A small comb for the same purpose, and to position delicate stems and leaves
- Safety pins, also for "posing" plant parts
- A shower cap to protect the camera on wet days
- A backpacker's wind protector, a flexible piece of aluminum with three spikes to stick into the ground; designed to shield camp stoves, it keeps the wind off photo subjects and reflects light too.
- A small professional reflector—a circle about 30 cm across that folds down to 10 cm—to improve lighting on the subjects

- Spare batteries
- Two extra rolls of film (more are in my rucksack)
- A 25-cent coin that opens the camera
- a ×20 hand lens on a bootlace, useful for counting stamens and an emergency string too

I'd like to use a large tripod with a sturdy base and an expensive head, but this would be very heavy, and I carry enough on my treks already. My mini-tripod works very well, though. It's 19 cm long and 3.5 cm wide, and weighs less than 200 grams (8 ounces). The top has a good screw clamp and swivels to about 30° from the vertical. The three flexible legs will bend into any position. Even with my heaviest lens on the camera, it's steady. I've used this tripod on rocky slopes to get down to tiny flowers, and on the back of a pew to photograph medieval church frescoes. It's quite a trick, though, to contort your body to look through the viewfinder, and a cable release is essential. I got this tripod from Japan in 1991, but better camera shops now offer several types.

I don't have room in my backpacking camera bag for my spare camera. I can't fit in a piece of dull black velvet for eliminating background, but that is not really appropriate in the wild, anyway. Another useful item that has to go into the rucksack instead of the little camera bag is a telescoping umbrella, useful to make shade behind a plant and thus highlight it.

Remember to pack the tripod, the metal sheet, and anything else that could possibly have a sharp edge in your checked luggage, not the carry-on. I have had to empty everything out in the past, even before tightened airport security. I take rolls of film out of their containers and put them in a zip-lock plastic bag. I'm told the airport x-ray machines are safe, but I ask them to hand-check the film anyway, because x-ray exposure is cumulative. When I was in San Diego recently, the guards checked my film with a hand machine for explosive dust!

Anna Leggatt, a botanist, lives and gardens in Toronto, Ontario.

Small Snowflakes: *Leucojum* for Rock Garden and Trough

Jane McGary

The genus *Leucojum* (Amaryllidaceae, though some older books assign it to Liliaceae) is one of many bulbous genera centered on the Mediterranean region. The best-known members, not the subject of this note, are *L. vernum* and *L. aestivum*, commonly known as the spring and summer snowflake (though both flower in what I would call spring); they are large, leafy plants best suited to moist, retentive soils in the border or woodland margin. All the other *Leucojum* species, however, are good choices for pot culture in the alpine house or bulb frame, and for the rock garden in climates warm enough for them.

Leucojum autumnale is undoubtedly the most familiar to gardeners. Native to the Iberian Peninsula and nearby islands, it grows 4–8 inches (10–20 cm) tall, forming a clump of dark green, threadlike leaves that emerge mostly after its late-summer flowering and persist through the winter. The flaring conical flowers are borne one to four per stem, dangling and swaying in the breeze. The scape (flowering stem) is usually red-tinted, and the flowers often are red or pink at the base. In *Dwarf Bulbs* (1973), Brian Mathew wrote, "There are at least two distinct clones in cultivation in Britain, one increasing rapidly by vegetative means, producing clumps of bulbs, and the other reproducing slowly vegetatively but setting seed freely." The form I have, from bulbs originally purchased from Siskiyou Rare Plant Nursery, does both, offsetting a great many bulbs that can be divided in early summer (or really, at any time without much risk) and self-sowing enthusiastically. In my garden, cold winters restrict its invasive tendencies; it seems not to survive temperatures below about 20°F (–6°C), at least in our wet winters.

Slightly less hardy and familiar, but still within the reach of North American gardeners, are ***Leucojum nicaeense*** and ***L. trichophyllum***, both of which flower in late spring here though earlier in the wild. The former, from the south of France, does well in my bulb frames, surviving temperatures in the mid-20°F range, but struggles in the open rock garden. It has dark, shiny, lax leaves, flat rather than filiform (threadlike), and small but sturdy pure white flowers with "points" like those of the large snowflakes. *Leucojum trichophyllum* from Iberia and North Africa seems equally hardy. Its filiform leaves (the name means "hair-leaved")

lie almost flat, and its thin but sturdy stems bear conical flowers that open almost flat in hot sun. The typical form has white flowers, but there is also a pink-flowered form that seems more robust than my white ones. Another small spring-bloomer, which I haven't flowered yet, is *L. longifolium*. The rare *L. tingitanum* from Morocco is growing here in the frame but has not yet bloomed either.

There are also additional fall-blooming snowflakes. ***Leucojum roseum*** is a tiny thread-leaved one with mid-pink flowers that are sweetly fragrant. It is said to be very tender, so I keep it in a pot in a frost-free solarium. Hardy enough for the bulb frame is ***Leucojum valentinum*** from Spain, Greece, and the Ionian islands. It is like a somewhat taller *L. nicaeense* and bears white flowers of exquisite purity in September.

All these species are fairly easy to grow from seed, flowering in 3 or 4 years, and take happily to life in clay or plastic mesh pots plunged in sand. They would also be ornamental in troughs that could be protected from severe frost, or, of course, on the rock garden in USDA Zones 8–10. They don't seem to require summer drying but tolerate it well. A liquid feed in fall and spring keeps them vigorous. I repot them every other year and obtain plenty of vegetative increase from all but *L. roseum*.

Sources

Seed is often available from society exchanges. Bulbs can be purchased from Potterton & Martin (see advertising section of this issue) or from Jane McGary, janemcgary@earthlink.net.

Plant Portraits

Opuntia polyacantha

Rod Haenni, Littleton, Colorado

Opuntia polyacantha (Haworth) is the most variable of the United States' dry-fruited prickly pears, both in the spination of the cladodes (the "pads") and the variation of flower color. Typical *O. polyacantha* on the eastern plains of Colorado forms clumps 1 to 2 feet (30–60 cm) across and 6 inches (15 cm) high, forming large-diameter "fairy rings" over decades; individual pads are about 4 inches (10 cm) across at their greatest dimension and densely furnished with white and gray spines. Near-alpine forms of *O. polyacantha* approach 10,000 feet (3030 m) elevation in Colorado; these can be rhizomatous and produce clumps 6 inches across, with individual pads less than 1 inch (2.5 cm) across. Five varieties are recognized in the most recent publications, but, of course, the actual number of varieties is subject to constant reinterpretation. The varieties are *O. polyacantha* var. *polyacantha*; *O. polyacantha* var. *arenaria* (Engelmann) Parfitt; *O. polyacantha* var. *erinacea* (Engelmann & J.M. Bigelow) Parfitt; *O. polyacantha* var. *hystricina* (Engelmann & J.M. Bigelow) Parfitt; and *O. polyacantha* var. *nicholii* (Benson) Parfitt.

Opuntia polyacantha begins blooming in mid to late May and continues to mid-June. Flower color is typically sulfur to lemon yellow, with yellow filaments and a green stigma. Flower size averages about 3 inches (7.5 cm) across but is variable. Purple-flowered specimens can often be found growing scattered amid acres of yellow-flowered plants. Other flower colors include various shades of red, pink, orange, very pale "chiffon" yellow, and near-white. Red filaments occur in at least one cultivar, 'Crystal Tide' originally selected by Hazel Grape from large populations in the "panhandle" of western Nebraska. Claude Barr, the famous nurseryman and Great Plains plant explorer, selected numerous *O. polyacantha* forms, both for flower color and for spination. Several of these cultivars are illustrated and described in Barr's book, *Jewels of the Plains*.

O. polyacantha is native to the western Great Plains from North Dakota to Texas, adjoining portions of southern Canada, and throughout much of the western United States. It is a dominant plant on hundreds of thousands of acres

of rangeland. Known as the "starvation cactus," it thrives on 7 inches (175 mm) or less of precipitation per year, growing even where range grasses cannot survive. *Yucca glauca, Opuntia fragilis, O. cymochila, Escobaria vivipara, E. missouriensis*, and *Echinocereus viridiflorus,* and in higher elevations *Pediocactus simpsonii*, are common habitat companions, all among the most cold-tolerant of all succulents. Hybrids between *O. polyacantha* and *O. fragilis* are locally common and are characterized chiefly by reduced pad size and variable spination. Claude Barr's 'Claude Arno' is a good example of such a hybrid.

Rock gardeners have traditionally shunned opuntias as unsuitable for alpine gardens. I agree that the typical *O. polyacantha* from the Great Plains is out of place in a traditional rock garden, but I maintain that the high-altitude forms of *O. polyacantha* look right at home with lewisias, sempervivums, sun-loving saxifrages, hardy mesembs, and other hardy cacti. Dryland or xeric gardens welcome the addition of opuntias, where the many flower and morphological variations of *O. polyacantha* are quite desirable.

Zephyranthes atamasca

Bobby J. Ward, Raleigh, North Carolina

I wouldn't choose the glide path of a municipal airport to search for wildflowers: Who would count on seeing blossoms there? In late April each year, however, thousands of "atamasco lilies" spring forth in a mowed field that stretches like an apron from the end of an asphalt runway in rural northeastern North Carolina. Their appearance gives an unexpected pleasure to those who notice the large,white, funnel-shaped flowers for the few weeks they are in bloom.

Although the atamasco lily (*Zephyranthes atamasca*; photo, p. 187) belongs to the group of about 60 species of plants known collectively as "rain lilies," they are members of the Amaryllidaceae rather than the Liliaceae. The atamasco (its name derives from a Native American word) became known to Europeans with the publication of John Parkinson's *Paradisi in Sole, Paradisus Terrestris* (1629), where he called it the "Virginia narcissus." It is native to the southeastern United States., ranging from Virginia to Florida and westward to Alabama. It has the most northern distribution of all the species of *Zephyranthes*.

Nurseryman Tony Avent has traveled throughout the Southeast observing populations of atamasco lilies. He has noted two distinct ecotypes: one that grows in bogs and another in dry uplands. He has seen "high and dry populations growing atop tall rocky cliffs with hepaticas and trilliums," near Tallahassee, Florida, and "in flat roadside ditches that are regularly filled with standing water" a few hours' drive to the east. To his keen eye, both populations have the same appearance. There are two other species of *Zephyranthes* in the Southeast that are closely allied with *Z. atamasca*: *Z. treatiae* and *Z. simpsonii*. A population in southeastern North Carolina of another rain lily is currently described botanically as *Zephyranthes* sp. 1. Some consider it a variant of *Z. simpsoni*; I and others

ally it with *Z. atamasca*. It grows among remnant maritime forest habitat in dry, sandy soil along roadsides and in lawns just inland from the Atlantic Ocean.

In North Carolina, atamasco lilies produce broad grassy foliage in late winter—earlier farther south—and the white flowers may be 5 inches (12.5 cm) across, supported on pedicels up to 10 inches (25 cm) long. They grow best in sun but tolerate the shade of deciduous trees. They become dormant by early summer. The atamascos adapt easily to pot culture and cool greenhouse conditions and are hardy to USDA Zone 6b (in the eastern United States).

Generally, atamascos are easy to grow from seed. They germinate in a few days after sowing and produce flowers by the third or fourth growing season. Some viability is lost if seeds are not sown immediately after harvesting in the spring. The plants can also be increased by dividing a clump of bulbs. They grow best in well-drained soil with a good application of organic material or a slow-release fertilizer, and they tolerate some drought. Atamascos naturalize easily, as evidenced by the extensive population described above near an airport. Like most rain lilies, *Zephyranthes atamasca* has few disease or pest problems.

Sources

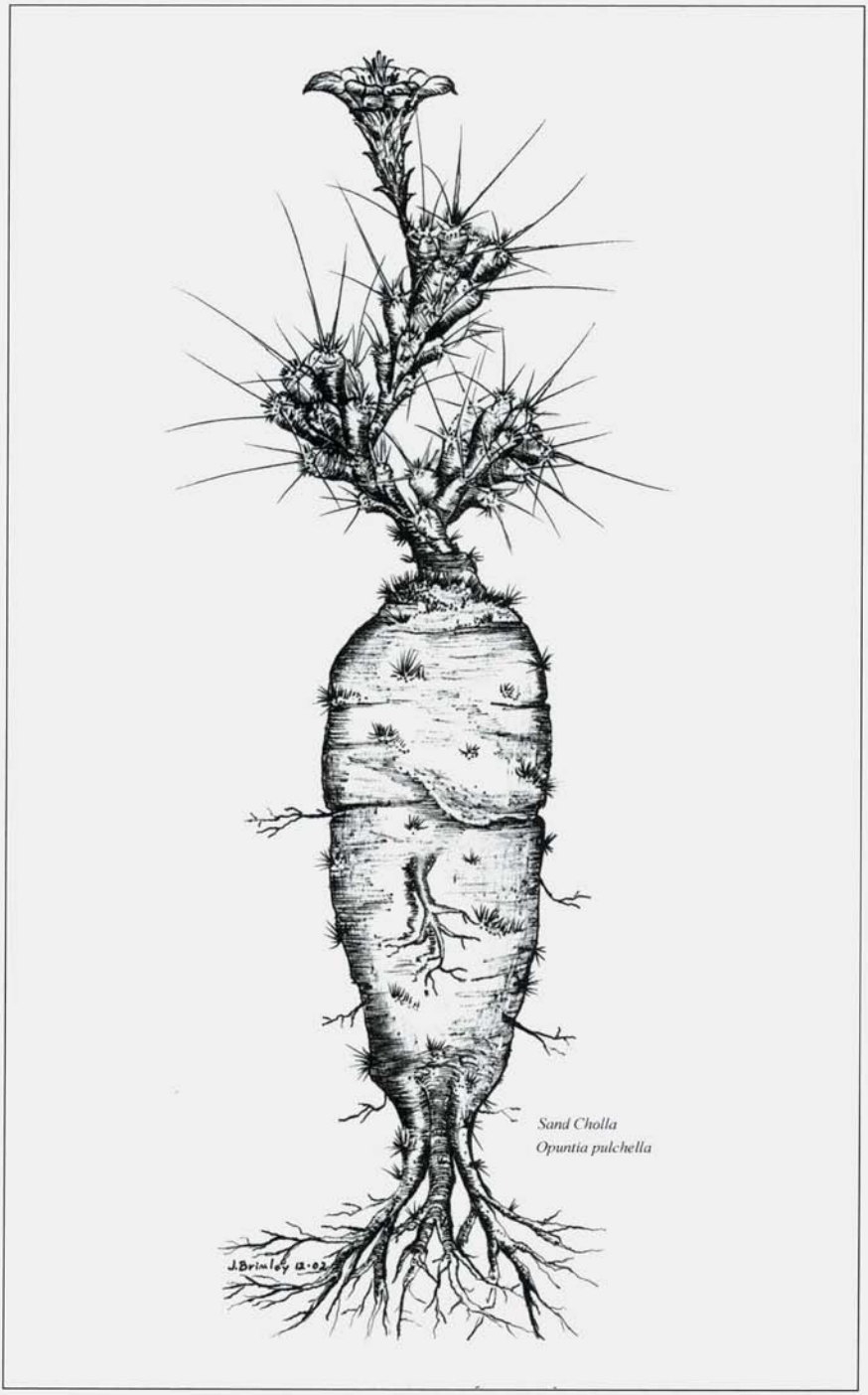
Brent and Becky's Bulbs, 7463 Heath Trail, Gloucester, VA 23061. Catalog free.
NARGS Seed Exchange
Plant Delights Nursery, 9241 Sauls Road, Raleigh, NC 27603. Catalog, 10 first-class stamps, or a box of chocolates.
Woodlanders, 1128 Colleton Ave., Aiken, SC 29801. Catalog $2.
Yucca Do Nursery, Rt. 3, Box 104, Hempstead, TX 77445. Catalog $2.

Opuntia pulchella: The Smallest Cholla

Jeff Brimley, Bountiful, Utah

One of the more exciting aspects of gardening with cacti is finding the extremes. On the large end of the scale is the saguaro cactus (*Carnegiea gigantea*) of Arizona: some specimens reach a height of 15 meters (48 feet) and weigh more than 8 metric tons. A smaller plant is *Escobaria sneedii* var. *leei*. This cactus grows in clumps, with each head about 2.5 cm (1 inch) high. As my garden matures, I'm finding that the large, dramatic plants take up a lot of space. This has given me an appreciation for the smaller species. One of my favorite small cacti is *Opuntia pulchella*.

Opuntia pulchella is an inconspicuous clump-forming "cholla" that produces a tuberous root 5 to 7 cm (2–3 in.) in diameter and 12 to 15 cm (5–6 in.) long. The tuber and roots both have glochids (clusters of short spines) on their surfaces. This large tuber stores water and sets this species apart from other opuntias. The joints—the segments of the plant above ground—grown to 4 cm (1½ inches) long and are 0.5–1.2 cm in diameter. The spines can reach 5 cm (2 inches) in length and vary in color: white, gray, brown, or pink. The purple or rose-pink flower is 3–4 cm (1–1.5 inches) in diameter and 3–4.5 cm long.



Opuntia pulchella (drawing by Jeff Brimley)

This rarely seen cactus has a large native range. It can be found in western Utah from Gold Hill to just north of Milford. It grows all the way across Nevada from east to west. On a trip last summer to Great Basin National Park, I found some on State Road 466, a quarter-mile west of Baker, Nevada.

Opuntia pulchella can be very hard to spot in the wild because of its small size and its color. It blends very well with neighboring plants in the desert pavement. Unlike other opuntias, it prefers to grow in desert flats rather than on rocky slopes. Its usual soil is silty sand covered with small weathered stones. In the spring, given adequate soil moisture, the joints are plump and dark green. The flower buds appear on the tops of the joints and can be as big as the joint itself. The intense color of the flowers can be seen from a long distance. In the fall, the plant dehydrates, becomes purple in color, and shrinks in size. If the flower has been pollinated, it produces a fruit which dries to a tan pod 1.5 cm long, with small hairlike spines.

In a garden setting, this species is very cold-hardy if there is good drainage. It needs no supplemental water in my garden on Utah's Wasatch Front.

Sources

Intermountain Cactus, 1478 N. 750 E., Kaysville, UT 84037 (plants)
Mesa Garden, www.mesagarden.com (seed)

Books

Geology and Plant Life: The Effects of Landforms and Rock Types on Plants, by Arthur R. Kruckeberg. University of Washington Press, 2002. ISBN 0-295-98203-9. 362 pp., black and white photos, glossary, bibliography, and index. $35.00 Available from NARGS Book Service at a discount.

Reviewed by LOUISE PARSONS, Corvallis, Oregon

As a longtime NARGS member, the botanist Arthur Kruckeberg has shared his talents generously over many years, speaking at study weekends and to individual chapters. He opened one talk with the statement, "The plant world exists by geologic consent, subject to change without notice"—his version of historian Will Durant's oft-quoted "Civilization exists by geologic consent." Those who attended Kruckeberg's recent talks were treated to a preview of his latest book, *Geology and Plant Life*, the product of a lifetime spent among areas of geologic and botanic interest. His talents are truly diverse: Emerald Chapter members in Eugene recall an impromptu woodwind duet by Kruckeberg and Ernie O'Byrne on the occasion of his geology-plant slide talk.

Author of *Gardening with Pacific Northwest Native Plants* and *Natural History of Puget Sound Country*, Kruckeberg has also published a raft of professional papers over more than fifty years. He is professor emeritus of botany at the University of Washington. The garden that he and his late wife, Mareen, created is a remarkable assemblage of mature trees and rarely cultivated plants. A foundation has been formed in order to preserve the Kruckeberg land and plant collections "in trust in perpetuity, as a garden, open space, and horticultural learning center, for future generations." The Kruckeberg Botanic Garden Foundation has a webpage at http://www.kruckeberg.org/ with photos and a detailed history of the garden.

Though Kruckeberg is a devoted gardener, this is not a book likely to make its way out into the garden and to endure dirtied pages, nor is it likely find a home on the popular gardening bookshelf. It has none of the typical splashy color photos of bloom, though the black and white photos are excellent. It is a provocative work with a detailed and fascinating perspective for the serious student of nature, including any enthusiast of plants and their rocks. It is appropriate for

anyone who wishes to delve deeper into the mysteries of why plants grow in the places that they do.

Kruckeberg makes a seemingly bold statement in declaring geology an essential and predominating factor in numerous aspects of plant life such as ecology, distribution, evolution, and morphology. However, by the time you finish the book, you also find that he views geology as part of an intricate net of influences such as climate, geography, and geomorphology, the study of landforms.

When I was a geology student, vast bands of *Phlox hoodii*, with fragrant June flowers, once aided me in mapping basalt dikes. In that central Oregon study area, they sometimes protrude from the volcanic ash like unearthed bones. At other locales, they are buried beneath younger ash. Somehow, the phlox always seems to "find" them. I puzzled over why phlox has such a marked preference for the dikes. Was it simply a general affinity for rocks in bulk, with the dikes providing the best local outcrop expression? Or did the phlox require a special soil chemistry better provided by the basalt than by the overlying soils derived from more siliceous volcanic debris? Were the dikes perhaps a conduit for water? Or an avenue for drainage? The geology-plant interrelation fascinated me even more when I once prepared a thin section of granite for microscopic examination and found roots of a moss or fern that were delicately channelled along crystals of feldspar. The geology-plant connection reveals itself with equal drama when I fly over places where plant life highlights an amazing geometry of bedrock. When I was a student, we had a friendly rivalry with geography students: in fun, we dubbed geography "The intense study of the obvious." But geologists are prone to criticize biologists that way, too.

Kruckeberg artfully fends off the criticism that the "geology is destiny" approach is obvious. The supposedly obvious is also likely to be taken for granted. When botanizing, either amateur or professional finds it all too easy to get so stuck in the minutiae of the plant world beneath the feet and to forget to look at the larger setting adequately. Like a good artist, Kruckeberg steps back away from the canvas to take long looks at the greater picture. His view encompasses a rich variety of time, place, circumstance, and species.

Of what value, then, is this book to the gardener? Can looking at the fascinating and complex relationship of plants to their geology help us to be better gardeners? After all, we know of several species of serpentine endemics that adapt readily to more mundane garden conditions. They do not seem to require either rocks or soils derived from serpentine (ultramafic rocks) in the garden. *Dicentra oregana* thrives in ordinary rock garden soils and retains its distinctively serpentine-related glaucous leaves. The fern *Cheilanthes siliquosa* (*Aspidotis densa*), frequent on serpentine, grows in andesite grit and fir duff between two slabs of concrete in my garden. Many of the plants that exhibit strong geoedaphic character are well known and beloved rock garden plants. "Geoedaphic," a term that Kruckeberg coined, encompasses topography and lithography as well as soil.

At times the lessons for the gardener may be indirect. *Muscari muscarimi*, a wonderfully fragrant bulb treasure with a modest rate of increase, we learn, is a Turkish limestone endemic. But does this muscari, with its lovely ice-blue and

lavender-tipped white flowers and curled basal foliage, *require* a limey soil for good cultivation? Not at all, though it definitely does require the dry summers of its homeland.

Rock gardeners, in a very direct way, create geoedaphic environments. With an awareness of geology, the rock gardener will pay special attention to subtle aspects such as the thermal properties of rocks. The placement of rocks and the trials and errors of siting seedlings in various "little spots" in the rock garden to discover that perfect place are a form of hands-on geologizing in the garden. On a larger scale, rock and woodland gardeners can take a natural site such as a canyon and plant it with exquisite attention to rock expression and aspect. The Foster garden, "Millstream," and the southern Oregon garden of Jeanne Mehl are but two of numerous examples.

Studying the geologic foundation and surround gives us a host of important clues about species diversity that are helpful to those who hunt for appropriate wild seed and material for introduction to the garden. In chapter 7, "Geoedaphics and Biogeography," Kruckeberg discusses geologic causes for plant diversity that are relevant to gardening. For example, he predicts that species diversity will be greater on a scree with a fine-textured component. Diversity, he expects, will peak at midslope on a scree. Higher slopes will be more active and unstable, while lower ones may have a predominance of boulder debris. For the rock gardener turned plant collector, the high scree often presents the greatest temptation for some cradle-snatching. However, this is the area of greatest ecological fragility, where plants are just gaining a foothold. We could easily conclude that plants that endure these conditions must be tough survivors; however, we learn that without detailed knowledge of high scree conditions, they are often the most vulnerable in cultivation.

Read this book not for straightforward "how-to's" of gardening, but for subtle pointers for either finding or placing plants in harmonious sites. The geoedaphic perspective Kruckeberg presents is also enjoyable as a "thing unto itself." In this work you will thoroughly explore a unique concept that will enhance your appreciation for the natural richness of the earth's landscape.

Portraits of Himalayan Flowers, by Toshio Yoshida. Portland and Cambridge: Timber Press, 2002. 124 pp., 108 color photos, map. Hardbound, $39.95.

Reviewed by JANE MCGARY, Estacada, Oregon

Too seldom in recent years have good books on alpine plants featured photographs that truly do justice to the beauty of their subjects. Toshio Yoshida's work does much to correct this problem. Almost every one of its large-format pages is nearly filled with an exquisitely detailed, artistically framed portrait of an entire plant, true in color and well reproduced. Moreover, the great depth of field attained in many of the photos permits an evocative depiction of the plants' habitats.

Yoshida took his photographs over a period of ten years in Bhutan, Sikkim, Nepal, northern India, Kashmir, Pakistan, and southern Tibet, thus visiting most regions of the great Himalayan chain. The habitats represented, therefore, are greatly varied: nearly barren rocky slope, lush alpine meadow, sparse grassland, overgrazed pasture, cliff face, riparian zone, heath, and fine scree. Even the climatic conditions, described in Yoshida's brief introduction, are apparent in the background mist and beads of moisture on many plants; low light conditions probably contributed to a certain degree of dullness and darkness that mars some otherwise wonderful images.

Many of the plants shown are well known to rock gardeners (if not always well grown by them), such as *Delphinium brunonianum, Paraquilegia microphylla, Meconopsis horridula, Bergenia purpurascens,* and even *Geranium pratense*, nicely perched in a rock crevice. Others, however, will be new to most readers, and some of these are seductive jewels: *Corydalis inopinata* with big yellow-and-blue flowers over tiny succulent leaves; the minute, leopard-spotted *Saxifraga punctulata*; delicate pink *Primula megalocarpa*; *Gentiana emodi* "looking like purple jewels in the gravel"; or *Chionocharis hookeri*, a cushion displaying its yellow-eyed violet flowers at 5200 meters (16,900 feet).

Each photo is accompanied by a brief text describing the plant, its habitat, and the site where photographed. Yoshida often adds subjective descriptions about the beauty and tactile impression of the plants, bringing the reader closer to his experience of them. Botanical details are mentioned that should help the reader identify plants seen on a trek, though it is hard to imagine taking this book along in a backpack.

Supplementary material includes a Foreword by Daniel Hinkley (a mercifully brief sample of his well-known purple prose); "A History of the Study of Himalayan Plants" by Hideaki Ohba, professor of botany at the University of Tokyo, whom the author also thanks for verifying the plant identifications; Yoshida's Introduction, a graceful description of a typical day during his travels and a few comments on the process of photographing the plants; a useful brief bibliography; and an index of plant names.

Any plant-lover will treasure this book and be inspired by it. The price is quite reasonable considering the sumptuous production, and a surprising amount of information is packed into the minimalist text. The review copy, incidentally, is to be the Grand Prize in the 2003 *Rock Garden Quarterly* photo contest (see the Spring 2003 issue for details), so plant photography enthusiasts should review their images immediately and send in their best efforts.

NARGS Coming Events

Eastern Winter Study Weekend: "Special Gardens for Special Plants," January 30–February 1, 2004, at Raddison Hotel, Valley Forge, Pennsylvania. Host: Delaware Valley Chapter. Contact: Jim McClements, 50 South Prestwick Court, Dover, DE 19904-2334; tel. (302) 734-2836; <JimMcClem@aol.com>.

Western Winter Study Weekend: "Braving the Elements," March 5–7, 2004, at Valley River Inn, Eugene, Oregon. Host: Emerald Chapter. Contact: Holly Helton, 110 E. 31st Ave., Eugene, OR 97405; tel. (541) 345-9103; <hhelton629@aol.com>.

Annual Meeting: May 5–8, 2004, at Sheraton Imperial Hotel & Convention Center, Research Triangle Park (Raleigh-Durham), North Carolina. Host: Piedmont Chapter. Contact: Karen and Dave Duch, 1422 Lake Pine Dr., Cary, NC 27511; tel. (919) 467-0653; <dduch@bellsouth.net>.

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