ROCK GARDEN *Quarterly*

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Front cover: *Aquilegia jonesii*. Painting by Cindy Nelson-Nold.

Back cover: Cliff at Bodega Bay, California. Photo by Dianne Huling.

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Contents

From the Editor

Our summer 2005 issue contains two clusters of articles. One group focuses on a plant family, the Ranunculaceae. Our contributors today have nothing to say about *Ranunculus* (buttercups) themselves—though we hope someone will address this topic soon. Marcel Jouseau's article on that "holy grail" of the rock gardener, *Aquilegia jonesii*, is a slightly abridged version of his report to NARGS on a project funded in part by a grant from the Society; it includes a somewhat challenging but highly interesting discussion of a technique for finding new populations of a given plant. Graham Nicholls discusses the *Clematis* species of the West. Joachim Langfeld offers careful instructions for growing *Hepatica* plants from their ephemeral seed. The "Plant Portraits" section includes two Ranunculaceae that are easy and beautiful additions to the rock garden: *Aquilegia bertolonii* and *Anemone nemorosa*.

The second cluster of articles deals with how we make rock gardens and continue to enjoy them through the years. David Hale's article should encourage the novice who may be feeling a bit nervous in the face of all the rules and regulations other writers have propounded in connection with building a rock garden. The other two articles come from very different gardens on opposite coasts of North America: the expansive Massachusetts garden of Geoffrey Charlesworth, and Irma Gourley's plot in a northern California mobile home park. Geoffrey, writing at age 84, considers how the garden can be adapted to the changing needs of the gardener; Irma, at 93, looks back on a half-century of rock gardening and ahead to discovering new plants. Rock gardeners truly build for a lifetime.

Corrections to Spring 2005 Issue

- We erred in captioning several photographs for "Romanian Mountain Flowers." *Ramonda nathaliae* (p. 102) was photographed in the Cluj Botanic Garden, not in the wild, and is not a Romanian endemic. The gorge (p. 103) is Gutanu in the Bucegi Mountains, not Cheile Turzi. Photos on p. 104 are from the Cluj Botanic Garden, and *Epimedium alpinum* is not native. *Saxifraga federici-augustii* (p. 105) is not a Romanian native. Our sincere apologies to the author, Răzvan Chişu, for these misunderstandings.
- The caption on p. 100 should be *Meconopsis integrifolia*, not *M. pseudointegrifolia*.
- In the author note for Gerald Taaffe, "Tiny Tumbleweeds," p. 118, we confused Mr. Taaffe with Gerard Taafe, the author of the recent Timber Press book *Garden Plants of Japan*. Our apologies to both of these excellent horticultural writers.

Aquilegia jonesii Threatened—Or Is It?

Marcel Jouseau

I have studied Jones's columbine (*Aquilegia jonesii* Parry) for three years with two objectives: first, to identify previously unreported populations by developing and using statistical models; and second, to ascertain whether the states of Montana and Wyoming were correct in their opposing the proposed status of threatened species for it. *Aquilegia jonesii*, famous among rock gardeners for its brilliant blue flowers huddled atop minute glaucous foliage cushions, is endemic to Wyoming and Montana in the United States and to southernmost Alberta, Canada.

In 1975, the Smithsonian Institution proposed that the U.S. Fish and Wildlife Service designate *A. jonesii* a "threatened" species, stating that the plant's limited distribution, together with commercial collecting and exploitation, threatened its survival. This position was reiterated by Ayensu and DeFilipps in 1978. The states, in particular Montana, argued that the species did not require special status because the remoteness of its known sites would provide sufficient protection (Lesica et al. 1984).

Aquilegia jonesii, the smallest of columbine species worldwide, was first described in 1874 by Charles C. Parry, the botanist on an expedition led by William A. Jones in summer 1873 to northwestern Wyoming and Yellowstone. Captain Jones, after whom the species was named, first saw the plant on Phlox Mountain in the Owl Creek Range, Wyoming. This original site, now within the Wind River Indian Reservation, is no longer accessible to anyone but members of the Shoshone and Arapaho tribes. (See site map, p. 177.)

In 2001 I applied for a grant from NARGS to model the distribution of *A. jonesii* to help meet the two objectives I've cited. The proposed approach was very simple. First, I would get information from herbarium specimens, and then precisely locate known sites by fixing each one's longitude, latitude, and elevation through a global positioning system (GPS). The second step would require collecting environmental information on scores of variables such as geology, soils, solar radiation, temperature, precipitation, slope, slope exposure, convexity and concaveness of slopes, elevation, and vegetation type and density. The third step would be developing a mathematical model using generalized linear model techniques such as logistic regression (Eastburn and Butler 1988, Noest 1994) or

artificial neural network (Payne 1999, Park et al. 2003) to determine the variables that best predict the presence of the species. The fourth and final step would involve using the mathematical model and geographic information system tools (GIS) to produce a map of Wyoming and Montana, attaching a probability of finding the species to every quarter-acre parcel of land, and then verifying in the field whether the model predicted properly. NARGS funded the proposal but also requested that the project provide information on growing the species.

I made hundreds of requests to university herbaria in Canada and the United States, state natural resources agencies, and federal agencies such as the National Park Service, Forest Service, and Bureau of Land Management for known sites of collection and information from labels of collected specimens. Then, in summer 2001, I hiked mountain slopes from the Wind River Range and the Absaroka and Bighorn Mountains to the Big Snowy Mountains and Glacier National Park to relocate plants at known sites and obtain GPS readings. Old records can be extremely frustrating in their vagueness about where the plant was collected. Additionally, there may be no recent record of the geographic name on the specimen label, such as Upper Marias Pass in Montana or Phlox Mountain in Wyoming. And *A. jonesii* sites can be less than 20 feet (6.5 m) square, so finding the plants is like looking for the proverbial needle in a haystack. Nevertheless, my fieldwork in late June and August 2001 was extremely successful.

Over winter 2001–2002, I acquired digital data and manipulated them to create maps of environmental variables. Staff of the Montana and Wyoming geographic information clearinghouses generously provided aerial photos and topography for the whole state as digital elevation models (DEM). Bedrock and surficial geology information was either purchased or obtained from the two states' Geological Surveys or the U.S. Geological Survey. Vegetation information came from various U.S. Forest Service districts. I am especially grateful to Bernie Bornong of Bighorn National Forest for information on known locations within it, and for lending me the soil survey report and maps. I purchased climate data at low cost through Climate Source, to which I am extremely grateful (the Climate Source, Inc., in association with Oregon State University's Spatial Climate Analysis Service [SCAS]).

I produced scores of digital maps—65 just for monthly climate variables. Imagine all these maps in a huge stack, perfectly aligned so that each stream or county boundary overlies the same in the map below; then push needles through that stack at the precise locations where the columbine was found. The result would be like shish kebabs of environmental variables on hundreds of skewers. Of course, all of this is done with the computer. For each site we now have the environmental data that are probably important in defining the habitat. But to calculate the probabilities of presence of the species, we also need to create "kebabs" for about an equal number of sites where *A. jonesii* has not been recorded. The data from both sets of sites, with and without the species, were used to develop the mathematical models using artificial neural network and logistic regression to predict where else the species could be found. The models were built with data from locations within the known range.

I then used one of the logistic regression models in spring 2002 to predict where *A. jonesii* might be found. In late June and in August 2002, I was back in the mountains to check the model results. During winter 2002–2003, I adjusted the model and applied it specifically to the Bighorn Mountains to limit the geographic area within which I would do field verification; this model assigns a probability for every quadrant 100 x 100 feet (c. 33 x 33 m) across the entire range. Verification began in late June 2003 but was interrupted by a 12-inch snowfall before the end of my first day out; it was completed in August. (Prior to field verification, I analyzed the model results using such accepted statistical techniques as Cohen's Kappa, normalized mutual information, and receiver operating characteristics curve. The first technique is extensively used in remote sensing; the last two are used in medicine, for example in determining the likelihood that signals on a mammogram indicate cancer cells.) The model performed well. In August 2003 it led me to several large populations that had been unknown until then.

During my fieldwork, I encountered deer of various species, wolves, bears, coyotes, mountain goats, eagles, and grouse, all of which gracefully accepted my intrusion. But the most rewarding aspect of this work was finding the new sites. Seeing acres of *A. jonesii* at locations previously unknown has been exhilarating, a sweet reward for hundreds of miles hiked and well over 100,000 feet climbed. I submitted plant vouchers from these new populations and information on the locations to the Herbarium of the University of Wyoming in Laramie and sent information to the Wyoming Natural Diversity Database.

Although *A. jonesii* occupies a highly specialized mountain habitat, it is clear now that it is not rare. In the Bighorn Mountains alone there are now six known large populations, some extending over several miles, and three smaller ones. There are several other populations in Wyoming in the Wind River Range, Owl Creek Range, Rattlesnake Mountain, Dead Indian Pass, and Bald Ridge. In Montana there are numerous populations from near Red Lodge to Glacier National Park. The species has also a foothold in Alberta, primarily in Waterton Lakes National Park and a known site just north of it.

Many of these populations, except for several in the Bighorns, are fairly remote and require strenuous walking to reach. This isolation affords the plants some protection. However, *A. jonesii*'s habitat is extremely sensitive to disturbance, either anthropogenic or natural. Moreover, many areas, such as in the Bighorns and Montana, are grazed and trampled by cattle and sheep. In fact, all the populations known to me in the Bighorns are in grazing allotments. Encroachment by tree species that are expanding their range upward could also threaten the existence of *A. jonesii*. On Dead Indian Pass, one population has been reduced to just a half-dozen plants because of shading by conifers and the acidification of the soil through decomposition of fallen needles.

Vagaries of the weather that affect flowering and seed production can quickly affect the survival of a population as well. In a 2003 experiment, I collected soil samples and presumably the existing seed bank that could be expected in the first inch or two of soil from within several populations of *A. jonesii*, and obtained ger-

mination of just a few seeds of it, suggesting a very limited seed bank. Over three years of close scrutiny of many populations, I rarely saw any seedlings. During the past six years, Wyoming and Montana have experienced drought conditions that may have affected *Aquilegia* reproduction. Another phenomenon I observed is seed predation. In August 2003, in one of the newly delineated populations where the plants had flowered particularly well and many had 8 to 15 follicles (the individual "containers" in a columbine seedhead), I found not a single seed; every follicle had holes at the bottom, evidence of small rodents feasting on the seeds.

The predicted higher temperatures resulting from global warming and altered precipitation patterns likely will affect the distribution of *A. jonesii*. Trees and grasses will push into existing habitats. Since *A. jonesii* lives at the top of high-altitude limestone/dolomite ridges, global warming may push it into oblivion: once the ridges are more densely vegetated, it will have nowhere else to go. Its habitat is also seriously constrained by its need for calcareous rock formations or coarse soils derived from them. So while the states may have been correct that the plant is not rare now, they did not anticipate the possibility that human activities together with global warming may bring about its demise in the future.

Aquilegia jonesii has long been one of the most sought-after rock garden plants. In the three tallies of requests for seeds to the NARGS Seed Exchange compiled for 1979–1998, it was the top vote-getter in 1979 and 1988 and finished a close second in 1998. However, it is reported to be very temperamental and short-lived in cultivation. My observations of numerous wild populations indicate that many of them did not bloom at all during the three years of the study, proving as temperamental in the wild as in cultivation. Others bloomed profusely one year and had hardly any flowers the other two. Much written on *A. jonesii* in the rock gardening literature is of doubtful quality, if not outright wrong, so let's look at the environmental conditions under which this species actually grows.

First, *A. jonesii* tends to grow exclusively in limestone-dolomite or soils derived from such rocks. On Duncum Mountain in the Bighorns, we can notice the sudden appearance of the plant as we go from the shale of the Deadwood formation to the Bighorn Dolomite formation. At the far end of the western ridge beyond the radar station on Medicine Mountain in the Bighorns, we witness the same pattern. As we go down into a dip in the ridge, the bedrock changes from the Bighorn Dolomite to Deadwood Shale, and *A. jonesii* disappears abruptly; it reappears just as suddenly on the next high point of the ridge where we cross from shale back to dolomite. Analysis of some 40 soil samples from more than two dozen different sites where the species lives in Wyoming and Montana shows a clear preference for soils high in calcium and magnesium. Extractable calcium concentrations in those soils ranged from 1100 parts per million (ppm) to 7800 ppm, with a mean concentration of 4500 ppm—the equivalent of 9000 pounds of calcium per acre (10 metric tons per hectare). Limestone-derived soils in Minnesota have calcium concentrations around 200 to 500 ppm. Soils hosting *A. jonesii* gave pH measurements in the field at more than 50 sites that ranged from 8.2 to 9.4. Translating this into cultural practice, one will obtain better results in at least slightly alkaline soil. I experimented by sowing seeds in two different areas:

in one the medium was primarily made up of small pieces of cement rubble with traces of loam mixed in, pH 8.6; in the other, leaf compost mixed with granite grit in a proportion of 1 to 4, pH 6. Three months after germination, plants in the alkaline soil were four to five times larger than those in the granite grit mix. In its propagation protocol for *A. jonesii,* the Native Plant Nursery at Glacier National Park (DeSanto 2001) recommends transplanting the seedlings in a sharply drained mix of equal parts sand, gravel, and "potting soil" with added lime.

Soil texture appears to be quite important to the growth of this species, despite reports that some gardeners grow it successfully in pure clay. My observations of more than 40 populations led me to conclude that it does best in soils mixed with copious gravel. Though it is sometimes seen growing on gentle slopes practically devoid of coarse components, these plants are always extremely small and usually do not bloom, or have only one flower. Data from several 100-foot-long transects which I collected in the Bighorns clearly show that plants growing in coarse medium were more vigorous—on average four times larger, with ten times as many flowers, as plants growing in finer soils. Some of the best specimens grow along a forest road just past Duncum Mountain, Wyoming, where limestone/dolomite gravel is added to the road regularly. The plants grow directly in a layer of gravel about 15 inches (42 cm) deep. Their mean size (until August 2003, when a road grader uprooted many plants) was 6.4 inches (16 cm) in diameter. They averaged eight follicles per plant. By comparison, while all other environmental conditions appeared equal, plants on a transect in a clay soil only15 feet (5 m) from this gravel area averaged 1.8 inches (4.5 cm) in diameter and had fewer than 0.2 follicles per plant.

It seems that a gravel mulch provides many benefits. *Aquilegia jonesii* grows mostly on top or just off the top of ridges where the wind can be ferocious. The gravel mulch reduces evapotranspiration and holds water from snowmelt and rain in the soil. Snow on ridges can be thin and melts very early, and summer rainfall can be far less than the evapotranspiration potential. Li (2000), in an investigation of an arid to semiarid region in China, found that the evaporation rate for areas covered with gravel averaged about 2.6 times less than that from bare soils. Second, the gravel mulch moderates fluctuations in soil temperature, reducing high temperatures at the root level and releasing stored heat later. Soil and air temperature measurements I made (as well as those by other authors) show that temperatures under a 4-inch (10-cm) gravel layer can be significantly lower than temperatures at the same depth in loam or clay soils during the hot part of the day. Moreover, temperatures in early morning are slightly warmer under the gravel than at the same depth in ordinary soils.

Some authors have written that *A. jonesii* requires heat to grow, but there is absolutely no evidence that this is so. After all, it grows at elevations from 11,200 feet (3400 m) in the Wind River Range at the southern end of its known range to just below 7000 feet (2100 m) at the northern limit in southern Alberta. In the Bighorns, all known populations grow between 9100 and 10,400 feet (2800–3180 m). Air temperature measurements I took next to the species on three mountains averaged from 51° F (10° C) at 7:00 a.m. at 9,856 feet to 67° F

(20° C) by noon on sunny days in August. During the same period, soil temperatures at 4 inches depth averaged from 58° to 62° F. Jones's columbine is truly an alpine, or from the highest part of the subalpine vegetation zone, and certainly does not require to be baked. A comparison of two similar habitats 40 miles apart in the Wind River Range, Little Horse Peak where the species is found and Limestone Mountain where I did not find it, shows that higher temperatures and lower rainfall during the growing season likely preclude it from inhabiting Limestone Mountain. In southern Minnesota, where July and August air temperatures are often in the upper 90°s F and surface soil temperatures up to 120° F or more, *A. jonesii* does better in a part of the garden with some light, high shade and cooler temperatures.

While *A. jonesii* grows better where soil moisture is constantly available, as in deep gravel layers, it grows neither in wet soils nor where snowdrifts linger. Concave slopes facing east, northeast, and north, where snow drifts and remains long past the start of the growing season, tend to accumulate fine soil particles that remain too wet for the columbine. Besides, *A. jonesii* requires a longer growing season than exists on those concave slopes—unlike *Ranunculus adoneus,* which I observed springing up and blooming the third and fourth weeks of August as the last remaining snowdrifts finally retreated on the Bighorns. *Aquilegia jonesii* grows in an area that tends to receive limited rainfall from June through August, relying on snowmelt moisture and occasional thunderstorms. In cultivation, it does best where moisture is readily available but the soil is deeply drained.

In the mountains, *A. jonesii* tends to be more frequent on bare slopes and ridgetops and to grow best when not in close proximity to other plant species. It is probably a poor competitor—slow-growing, very dwarf, and non-spreading. Soil analyses for available phosphorus and total nitrogen show that soil fertility is extremely low in its sites. The mean concentration of available phosphorus in 40 soil samples was 5 ppm, corresponding to approximately 10 pounds of available phosphorus per acre (11 kilos per hectare). This very low availability of phosphorus partly explains the low density of vegetation. For comparison, a good garden soil in Minnesota has a phosphorus concentration around 25 to 50 ppm.

In the garden, where we can control plant competition, *A. jonesii* responds well to regular fertilizing. Watering over three months with a weak solution of a fertilizer with high phosphorus concentration about every other week resulted in seedlings four to five times larger in diameter than those that were not fertilized. More leaves were produced without substantially increasing the height of the plants, therefore generally maintaining them in character.

A. jonesii grows well in pots, though its very long taproot means it does best in deep pots. I grew several seedlings in pots 6 inches (15 cm) tall; some adult plants are in fluted clay pots 9 inches (23 cm) tall. The plants have survived –25° F (–32° C) with a polystyrene cone for winter protection.

The erratic germination of *A. jonesii* concerns many growers. Norman Deno (1993) has shown it to be very responsive to a constant supply of gibberellic acid (GA3) to break dormancy. Deno reported 95% germination after 4 weeks when seeds were kept at 70° F (21° C) on paper towels soaked with GA3 at a concen-

tration of 1000 ppm, and only 20% germination without GA3. It should be noted that one should follow his method carefully if one expects rapid results. Two tests, one by myself and one by Jerry DeSanto at Glacier National Park Nursery, in which seeds were soaked in gibberellic acid at concentration of 1000 ppm and then sown on a soil mix, resulted in delayed and erratic germination over a period of several years. DeSanto achieved 40% germination after 1.5 years, whereas I achieved nearly 80% in a little over 2 years. These treatments provided no apparent gain in germination rate or speed over those without GA3 treatment. In another experiment, I sowed untreated seeds kept for three months in a container at room temperature between 70° and 75° F (21°–24° C). Seeds were placed on top of soaked moist perlite; the flats were covered with a sheet of acrylic and kept at about 70° F, indoors under lights. After three months the flats were put outdoors, where temperature varied between 41° and 97° F (5°–37° C). Seedlings began to appear 5 months after sowing and continued to appear until just before the first frosts, eight months after sowing. The undisturbed flats were then brought indoors under lights at about 65° F (18° C), where germination resumed for about 3 months. After about 1.5 years from sowing, over 80% of the seeds had germinated. Finally, I sowed untreated seeds in two large trays filled with a soil mix of equal parts potting soil, perlite, and grit and covered with a layer of limestone pebbles, dropping the seeds into the rock. These trays, left outdoors totally unprotected for 3 years, produced seedlings each year. Thus, there is no particular need to treat the seeds with GA3; untreated, they germinate at a high percentage, albeit over a longer period of time, a few at a time. This prolonged germination likely is a survival mechanism useful in places where drought, early snowfall, and late snowmelt may kill some seedlings.

I have not experimented with the influence of light on germination, and I do not know of any controlled experiment demonstrating its effects on *A. jonesii*. From my own observations, seeds germinate quite well when left uncovered.

Many growers have commented on the difficulty of getting *A. jonesii* to bloom, noting that the flowers are few and infrequent and, furthermore, that the plants tend to die after blooming. As noted earlier, this species is also temperamental in the wild, but I have not seen any wild plants dying off. In the fall, plants with follicles appear healthy. The following spring, some living plants still bear the remains of the previous year's flower stems and follicles. I have not experienced die-off after going to seed in cultivated *A. jonesii*, but I have occasionally had large, healthy-looking plants of *A. canadensis* and *A. flabellata* var. *nana* suddenly go limp and die after producing seeds, the result of root rot. No doubt this sudden death resulted from bacterial infection during hot, humid weather. Actually, *A. jonesii* appears to have few problems in cultivation here in the upper Midwest; our principal problem with it is attacks by caterpillars which can defoliate and kill a plant in less than a day.

I hope that these notes on the habitat of *A. jonesii* and on translating habitat characteristics to cultural practices will be useful. Though I have not addressed temperamental flower production, I believe that one needs first to develop strong, healthy plants and fertilize regularly with a high-phosphorus product.

Finally, I wish to thank NARGS for the small grant provided that allowed me to model the geographic distribution of Jones's columbine and to delineate new populations of the species in the Bighorn Mountains. It was most fruitful work.

Note: A version of this report with more extensive references and statistical tables is available from the NARGS Archives.

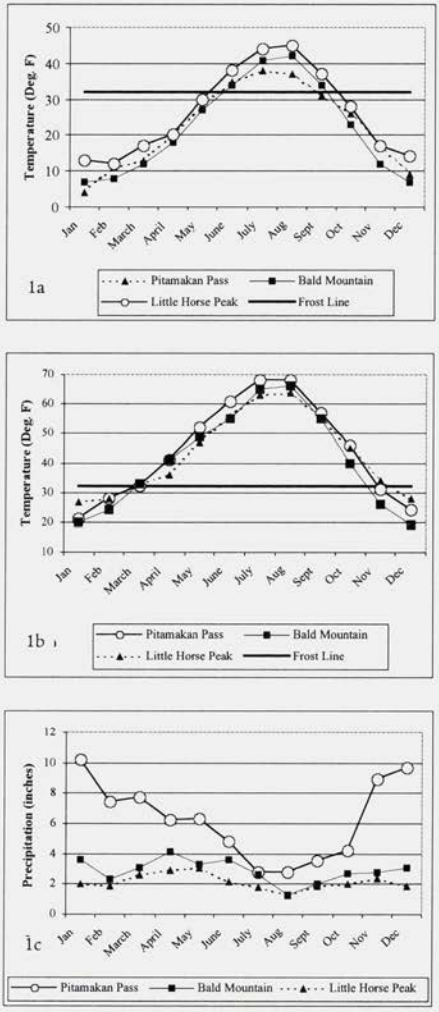

Figure 1a. Monthly mean minimum temperature. 1b. Monthly mean maximum temperature. 1c. Monthly mean rainfall. Locations: Pitamakan Pass (Glacier National Park, Montana), Bald Mountain (northern Bighorn Mountains, Wyoming), Little Horse Peak (southern Wind River Range, Wyoming).

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Marcel Jouseau, professionally employed in water resources management, dedicates much of his spare time to modeling the distribution of rare plants. He raises plants in Minnesota.

Clematis of the American West

Graham Nicholls

The genus *Clematis* is widespread in the temperate parts of both Northern and Southern Hemispheres, comprising more than 200 species. A few of these are native to western North America and are appropriate garden companions to other plants of the region—the smaller ones as rock garden subjects, and the larger perhaps twining among ornamental dryland shrubs nearby.

Clematis columbiana (including var. *tenuiloba*), commonly called rock clematis, Columbian virgin's bower, or bell rue, ranges from British Columbia to northeastern Oregon and east to Montana and Wyoming. It grows in foothills and montane woodlands, often on steep, wooded slopes, flowering in spring to early summer. A woody climber, it scrambles and twines along the ground, into low bushes, and up tree trunks, often in deep forest shade. The leaves are opposite, three-parted, toothed or deeply lobed, to 6.3 cm (2.5 inches) long. The flowers, very much like those of European *C. montana*, are 3.1–6.3 cm (1.25–2.5 inches) long, pendent, and bell-shaped, with four purple to violet-blue or lavender-pink sepals; they are solitary on short leafless stems growing from the leaf axils. The species was first collected by Nathaniel Wyeth along the Flathead River in Western Montana in 1833 and was given the specific epithet *columbiana* in 1834 by Thomas Nuttall, who did not know then that the Columbia River was far to the west. (Photo, p. 180.)

I first saw this species on Dead Indian Hill Summit, Wyoming, in 1993, where it was scrambling around the base of a tree, looking much like the *C. montana* in my garden. Obtaining the plant was a problem at that time; although seed was offered in exchanges and commercial lists, it rarely germinated. Nor were plants then available from nurseries in the UK where I live. After many years of sowing commercial seed, eventually in 2000 I had a successful germination, resulting in three plants flowering the following year.

Clematis columbiana 'Ylva' is a lovely selection with deep purple flowers, raised by Henrik Zetterlund at Gothenburg Botanical Garden and named for one of his daughters. This cultivar is exhibited regularly at Alpine Garden Society shows in the UK.

Clematis fremontii—Fremont's leather flower, Fremont's crowfoot, or Fremont clematis—is endemic in the Great Plains, found only in north central Kan-

sas, south central Nebraska, and a disjunct area in southeastern Missouri. There is some argument among botanists over the geographic variations: some consider that the plant occurring in Missouri is a distinct variety, while others consider them all the same. Its habitat throughout the range is rocky limestone prairie hillsides and sandstone outcrops. (Photo, p. 181.)

This is a non-climbing species with stiff, branched, erect stems 15–40 cm (6–16 inches) tall and broad, opposite, sessile, ovate, deep green leathery leaves to 10 cm (4 inches) long and 7.5 cm (3 inches) wide, with prominent veins. The pale blue-lavender, urn-shaped flowers, made up of 4 or 5 thick sepals, are solitary, pendent, and to 2.5 cm (1 inch) long, with lobes that curl back at the tips showing a creamy reverse. They are terminal on the main stem and short branches. The flowers are followed by clusters of large, short-plumed seeds. After flowering and seed set, the leaves gradually turn brown, and the dry plant rattles when stirred by the wind. By autumn the stems have also died back. It was named in honor of General John Fremont who made expeditions across the West and discovered many new plant species.

Clematis fremontii has caused a lot of interest here among members of the Clematis Society; I believe that up to a couple of years ago, only two of us in the UK grew it. I have had numerous requests for the plant and have managed to distribute it to a few growers. It was once described as "being more of botanical interest than of garden beauty." I can only imagine that the accuser was looking at a very poor specimen; to my mind it is beautiful, and every time I show the slide the audience "wow" their appreciation.

My interest in *Clematis fremontii* was first aroused when I saw a photo in the summer 1990 ARGS *Bulletin*, precursor to this magazine. It was such a striking plant that I just had to grow it. After a few enquiries I received seed from Dyck Arboretum (Kansas) that had been collected in Cloud County, Kansas, on 22 September 1990. It came with instructions to give the seed 3 months cold/moist stratification (in the refrigerator) and then sow it. Sown on 26 May 1992, it germinated in September of that year, eventually flowering in 1996. Cuttings have been taken only from old growth as I want to use my plant for exhibition, and none yet has rooted. When I have enough plants I will try cuttings from new growth.

Clematis hirsutissima (including var. *scottii*), known as sugarbowls, vase flower, or hairy clematis, ranges from the eastern foothills of the Black Hills to Nebraska, and from eastern Washington south to Utah, Colorado, and New Mexico, growing on limestone buttes, open prairies, foothills, open pine woods, and montane and subalpine meadows, where it blooms from spring to early summer. It makes large clumps of slim, erect stems to 60 cm (24 inches) bearing clusters of small, thin, pinnately divided leaflets. The pendent, deep purple, vase-shaped flowers are to 4 cm (1.5 inch) long with reflexed lobes, and are solitary and terminal. They have a silvery sheen produced by a myriad of very fine hairs, which has been described as "like that of a plum, a flower which would fit easily into a Victorian design." As the flower dies, it gives way to a feathery swirl of seeds. (Photo, p. 181.)

Before the NARGS conference at Breckenridge, Colorado in 2003, my experience of *C. hirsutissima* was, as with many other American alpines, that of growing it in a pot in the alpine house or a trough in the garden. Imagine my surprise and delight when, on a trip along the flora-rich Land's End Road on Grand Mesa, I saw it in the wild for the first time. We stopped at a meadow absolutely covered with *Phlox multiflora* var. *depressa*. I had never seen so many, and in heaven I wandered around looking at and photographing the phlox low to the ground. My eyes had focused nowhere else, and it was only as I walked back to the car that I noticed something equally as exciting. I had been walking through dozens of clumps of *C. hirsutissima* in flower and in seed. In my blind enthusiasm I just hadn't seen them.

Propagation and Cultivation

As with all the members of the Ranunculaceae (buttercup family), seed of clematis should be sown as soon as it is ripe or else it loses some viability. It is ripe when it comes away from the head with a gentle tug. If you can only get old seed, however, I suggest you treat it to the cold stratification method I used with *C. fremontii,* then sow it; it usually germinates the following year. I sow my seed on the surface of the compost and cover it with a layer of coarse grit. The pot is then put outside and left to all extremes of the weather until germination, when it is taken into the alpine house. After germination I let the seedlings grow on for a year, potting them on in the second year once growth has commenced. By that time all the seedlings have relatively large root systems.

Cuttings of *C. columbiana* can be taken from fresh growth in spring, and it can also be propagated from rooted side shoots. What I love about this species is that it makes an excellent container plant, whether for the alpine house or in the garden, and if kept trimmed and not allowed to run it forms a nice mound.

In the fall, cut back the dead stems of *C. fremontii* to about 7.5 cm (3 inches), and in early spring remove them altogether at the base by giving them a twist. In late February (in the UK), thick shoots appear from the rootstock, which is just below the surface; they grow on through spring until it flowers in May. This species makes a fantastic pot plant.

The dead stems of *C. hirsutissima* can be treated exactly the same as *C. fremontii.* Although I grow it in the alpine house, where it reaches only 30 cm (12 inches), it will also make a good specimen if grown in the herbaceous border.

Graham Nicholls is the proprietor of one of England's top alpine nurseries and has received many awards for his plants at AGS shows. He is the author of *Alpine Plants of North America* (Timber Press, 2002) and was sponsored by NARGS on a 2005 lecture tour.

Growing Hepaticas from Seed

Joachim Langfeld

Many northern woodlands in spring are graced by the delicate flowers of *Hepatica* species, members of the Ranunculaceae (buttercup family). The varied colors of the flowers—pink, blue, or white—and the attractive lobed leaves, which are often beautifully marked, make these plants appealing to gardeners. Their small size allows them to fit into the shaded rock garden even when this feature is quite small. They are also good subjects for pot cultivation, and many specialists grow their most unusual forms in this way.

Once you have a hepatica or two, you will certainly want more. These are expensive plants to buy, though, so growing them from seed is a good option. Like many other genera in the Ranunculaceae, hepaticas need special care. Here are some techniques I have developed to raise them.

Seed production

Let's start with the good news: hepatica seed is usually produced very freely. The plants are self-fertile, so open pollination (by wind or "bees") is no problem. A closer look at the flowers shows why: the anthers are bound to shed pollen—when ripe—on the stigma. A single flower can produce 20 or more seeds, though the average is probably about one dozen. *Hepatica transsilvanica* seems to be a bit more reluctant to set seed, whereas *H. nobilis* and its varieties usually are more reliable in producing plenty of seed.

This tells a helpful story—and here is the first bad news—about controlled crossings. To be really sure of the pollen parent, it is necessary to cut off all unripe anthers from the selected seed parent before they release their pollen and to protect the stigma until the intended cross can be made. (Cutting off ripe anthers will almost inevitably lead to undesired pollen shedding.) Cutting off unripe anthers is no easy task. Nail clippers may help; at any rate, stamp collectors, dentists, or micro-surgeons have a comparative advantage here!

For the pollination process proper, a brush is often recommended to transfer the ripe pollen from one plant (the "father") to the other (the "mother"). I have

always found this inconvenient. Instead, I use tweezers with a locking device to take anthers with ripe pollen and to put a bit of pollen on the receptive stigma. Seed development starts immediately after pollination and is clearly visible in two weeks. Flowers and developing seed heads can be seen simultaneously on the same plant.

Clearly, controlled crossings of these low-growing species require potted plants—or a gardener who is very physically fit. Additional protection with a suitable covering (for the plants, not the gardener) is also quite helpful. This also helps prevent frost damage, since frozen stigmas turn brown and become unable to produce seed.

For a cross the best plants at hand can be used—the best pinks or those with the finest marbled leaves, for example. But there is a wide range of possibilities for interspecific crosses as well. The most famous cross certainly is *H. nobilis* × *H. transsilvanica*, giving *H.* × *media*, a sterile but vigorous plant with beautiful flowers. To duplicate this cross, it is important to use *H. nobilis* as the mother, as this makes it easy to distinguish seedlings from unwanted pure *H. nobilis* seedlings which will almost inevitably show up. The *H.* × *media* seedlings can be easily detected in their second year because their true leaves are very similar to those of *H. transsilvanica,* clearly different from pure *H. nobilis* leaves.

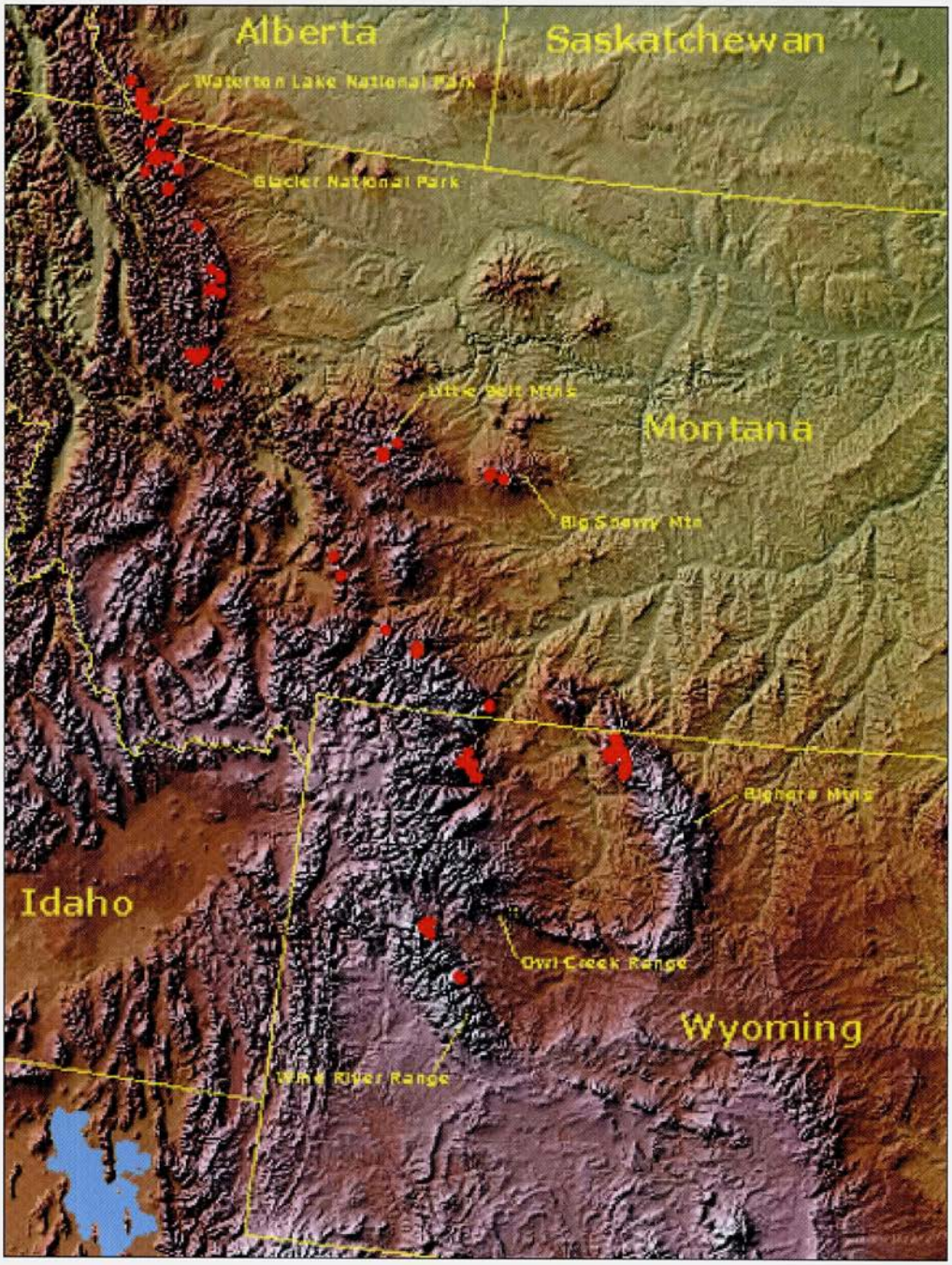
Interesting crosses with *H. transsilvanica* can also be made with all the *H. nobilis* complex (var. *japonica*, var. *pyrenaica*). Since there exist hybrids involving even the most exotic hepatica, *H. maxima*, there is a vast field for further experiments.

Those who have the much-sought-after double hepaticas may want to try breeding more of them. True doubles have neither anthers nor stigmas and are consequently sterile both ways. Most such plants in cultivation originated as mutations found in the wild, particularly in Japan. I have been told, however, that if semidoubles are crossed, a certain percentage of the seedlings may be true doubles, and that this line of breeding is carried on by Japanese specialists. Even semidoubles are expensive to buy, however. Apart from two well-known double *H. transsilvanica* forms—'Elison Spence' and 'Konny Greenfield'—and a vigorous pink *H. nobilis* double, I have had bad experiences with growing doubles, most of which have proved weak and unreliable.

There is probably some good news at last: hepaticas (perhaps all of them) seem to be protogynous. That is, the female parts of the flower are receptive before the pollen of the same flower (though not the other flowers of the same plant) gets ripe. It should therefore be possible to pollinate a single flower with anthers still unripe without danger of self-pollination—but only for a short time, surely not longer than a week.

Seed harvest

Bad news again! Hepatica seeds are mostly greenish, so you can easily overlook them. Furthermore, the flower stalk elongates considerably during seed ripening and tends to lie down, so potted plants have to be spaced a certain distance from



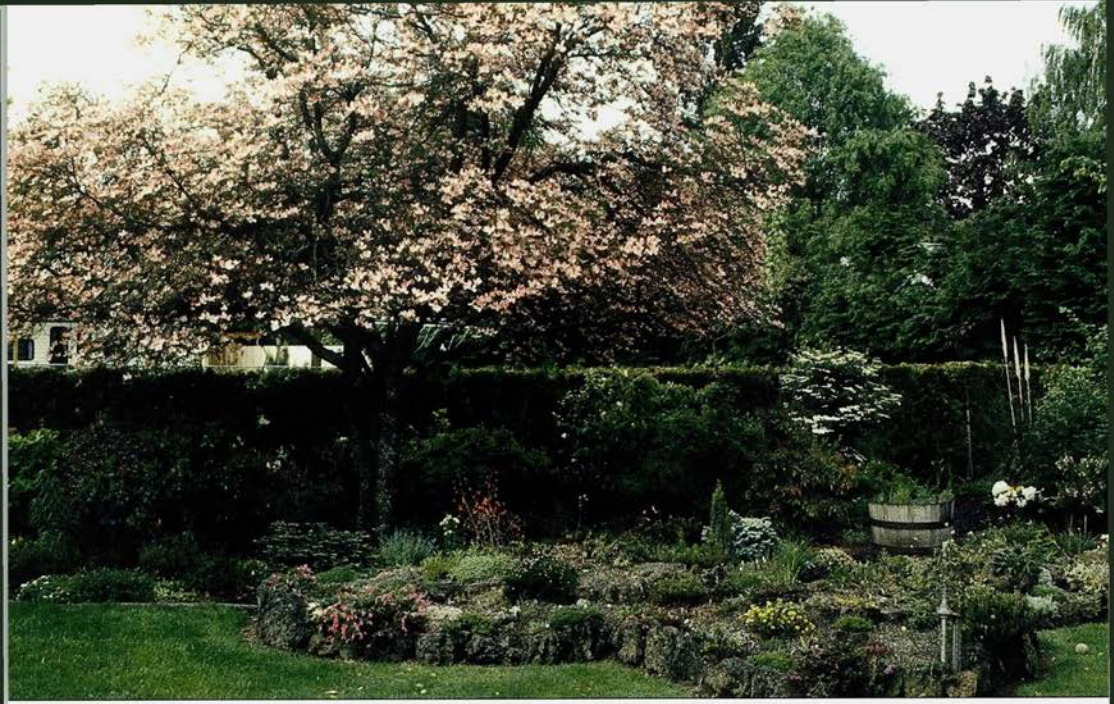
Geographic distribution of *Aquilegia jonesii* (p. 163). Red dots show known populations; yellow dot on Owl Creek Range shows Phlox Mountain, the original collection site in 1874 by Parry.

Aquilegia jonesii in flower and in fruit (p. 163; photos by Ev Whittemore and Marcel Jouseau, respectively).

Above, hepatica seedlings. Below, a method of collecting ripening hepatica seeds in a film canister (p. 175; photos, Joachim Langfeld).

Clematis species of western North America: above, *C. columbiana*; below, *C. columbiana* var. *tenuiloba* (p. 172; photos, Graham Nicholls)

More western *Clematis*: above, *C. fremontii*; below, *C. hirsutissima* on Grand Mesa, Colorado. (Photos, G. Nicholls)



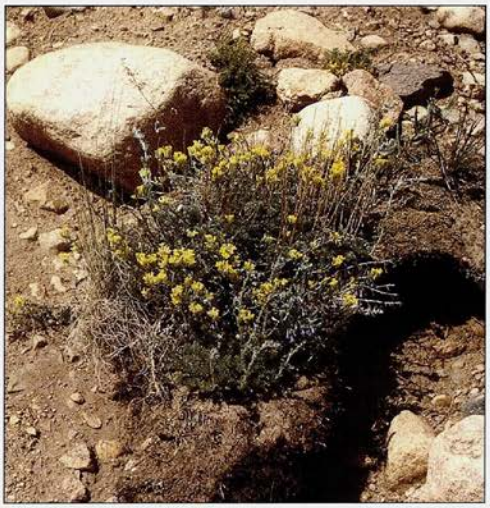
Raised beds in the Portland garden of David and Donna Hale (p. 197). The beds above, photographed in 1993, had been rebuilt by 2000 (below) to include more variation in shape, relief, and microhabitats, with an alpine house added.

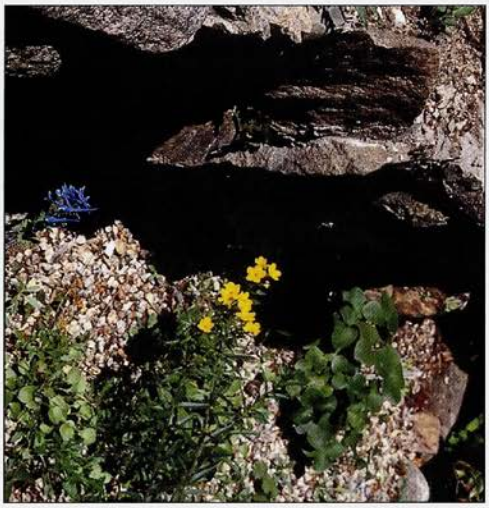
The Hale garden near Cannon Beach began with "plum pudding" beds in 1982 (above), and was later rebuilt to include crevices and other microhabitat features (below).

The Hale garden at the beach in 2003.

Lomatium minus (p. 222) in flower in the bulb frame; below, its habitat in a rock-filled ditch surrounding a "biscuit" formation in north central Oregon. (Photos, J. McGary)

Aquilegia bertolonii (p. 218) in the garden; this photo by David Sellars received honorable mention in the 2004 photo contest. Below left, *Lithospermum multiflorum* flowering with *Penstemon procerus* near Shawnee, Colorado; below right, *Lithospermum caroliniense* in the garden (p. 221; photos, James Jones).





Representatives of two genera in the Ranunculaceae that we'd like to feature in coming issues. Above, *Pulsatilla vulgaris* Papageno Strain, photographed by Stefania Wajgert, took 4th place in Class 3 of the 2004 photo contest. Below, *Ranunculus adoneus* photographed by Jane McGary during the 2003 NARGS annual meeting in Colorado.

Award photos from class 1 of the 2004 contest. Above, *Epilobium siskiyouense* in Oregon, by Tanya Harvey, 2nd prize; below, *Physaria alpina* in Colorado, by Yoko Arakawa, 3rd prize.

More award photos from class 1, portrait of a plant in the wild. Above, *Gentiana divisa* in New Zealand, by Doris Taggart, 4th prize; below, *Eritrichium nanum* in Wyoming, by Jay Lunn, honorable mention.

Above, *Primula sikkimensis*, photographed in Bhutan by Yoko Arakawa, honorable mention, class 2; below, *Lewisia pygmaea*, by Jay Lunn, honorable mention, class 1.

Above, view of Boreas Pass, Colorado, by Tanya Harvey, 2nd prize in class 2, plants in a natural scene. Below, rock garden and waterfall at Kew Gardens, by Jack Muzatko, 2nd prize, class 4, rock garden scene.

Summer color in the Betty Ford Alpine Garden, Vail, Colorado, photographed by Dianne Huling; honorable mention, class 4.

neighboring pots. Finally, ripe seeds remain fixed in the seed head (which then looks like a medieval cudgel) for only a few days.

When the seeds are ripe, they usually become yellowish and easily come off when touched ever so lightly. They will, of course, also fall down untouched. Precious seed released from plants in the open ground will consequently send us crawling around collecting seeds one by one with the help of tweezers—for most of our neighbors, surely a somewhat irritating late spring ritual to watch! You can collect seed from potted plants safely by placing single pots in trays big enough for all the seed heads outside the pot rim to drop their seeds onto the tray. If trays are inconvenient (as in the open ground) or if there is not enough space available, film canisters or similar containers are very helpful. The seed heads, shortly before becoming ripe, are put into the canisters, a perfect fit with hepaticas—you can even fit several heads into each canister. Tipping the container slightly should prevent rain or irrigation water from getting into the film canister (photo, p. 179). If there is danger of seed predators, the canisters could be closed with lids notched for the stalks, or blocked with cork or thin slices of plastic foam. Around my garden seed predators are no problem on hepaticas, though they are on snowdrops.

It is also possible to cut off the seed heads when they are not yet fully ripe. This works well for hellebores, also in the Ranunculaceae. However, it might be advisable to restrict this beheading to the very last days of seed ripening. The whole seed harvest takes only a few weeks. Here in Berlin, we do more than 90% of it within two to three weeks in May. Of course, plants under glass will behave differently.

Seed storage

This is by far the most crucial and the unhappiest part of the story. Hepatica seed is definitely ephemeral. Dry seed obtained via a seed exchange in spring is almost surely DOD—dead on delivery. I speak from more than 20 years of experience. Even self-harvested or other freshly harvested seed is no guarantee of viability if not stored properly, without drying.

What is to be done? Of course, it is possible (and safe) to sow harvested seed at once, but this will not leave you enough time to select your seeds, and it doesn't solve the problem of proper seed distribution among hepaticaphiles. Now the film canisters used earlier emerge as real multipurpose tools. All seed gathered from a specific cross or plant is put into a single film canister (with a label!) and stored in the refrigerator. A small plastic freezer container easily holds a group of canisters. In my conditions, they are left open, and the natural humidity in the refrigerator prevents the seeds from drying out. However, if you feel there is danger of dehydration (for instance, in a frost-free refrigerator, which removes humidity constantly), you should put a lid on the container. The seeds can then be sown when time and climate permit, say from June to September. Other equally good methods of storing hepatica seeds effectively all are directed at

keeping them cool and moist but avoiding excess moisture. If you prefer to keep them in small plastic bags, silica gel or a small amount of dry vermiculite can be used to control excess moisture.

If you have a lot of seed from a specific cross or plants, I can recommend a method of storage used by a very experienced gardener and nurseryman who has grown thousands of hepaticas this way. A small clay pot is filled one-third full with clean coarse sand. A second part of sand is mixed with the several hundred seeds and poured into the pot. The remaining space in the pot is filled with sand. Finally, the pot is buried in the garden in a shady place where it will not dry out.

Seed sowing

At this point I am referring only to really interesting seed; consequently, simply sowing in the open is out of the question. Use a fairly big container; a small one increases the danger of drying out dramatically. If square plastic containers are used, 16-cm or 18-cm cubes are most suitable. I like to put a square piece of a thick, fibrous material used for irrigation purposes in greenhouses (a "capillary mat") in the bottom of the container to protect against beetles crawling into the pots or roots infiltrating them. The styrofoam boxes used to ship grapes or fresh fish are a good alternative to plastic containers. At any rate, they should be fairly deep.

Fill the container with a porous soil mixture. A well-aerated seed compost is absolutely necessary! You can ensure this by incorporating crushed scoria or pumice, perlite, or something similar. A little slow-release organic fertilizer as well as some lime (advisable for most hepaticas) should be added. Note that this "seed compost" is not a single-purpose seed medium, however, since the seedlings have to stay in their "seedling containers" for at least a year and a half. Compress the soil slightly and leave a space of approximately 3–4 cm below the rim. Next, put a layer of 1–2 cm of clean coarse sand or similar material on top of the soil. The sand (or its substitute) should be watered lightly.

The reason for this procedure becomes clear with the sowing process proper. *Every single seed* is placed with tweezers on the surface of the sand in a regular array—and moist sand makes this placement easy. Space the seeds about 2 cm (¾ inch) apart. Finally, put another 1–2 cm of sand (or substitute) over the seeds. The seeds are now embedded in the middle of a layer of fairly sterile medium intended to give some protection against fungi and other pathogens. If you have a lot of a certain kind of seed or have stored seeds mixed with sand, you can sow the seed or the seed/sand mixture into a large box "sandwiched" between two layers of clean coarse sand.

From now on, the seed containers must *never* dry out completely. They may be sunk in the garden where shade in summer will protect them and enough rain or other irrigation will reach them. If you've been lucky enough to get a lot of seed and have a couple of containers, you might do as I do. I dig a rectangular hole about 20 cm deep. Four planks screwed together are inserted in the hole to

make a frame. Since the containers should be placed in the shade of trees or a hedge, you need to cover the bottom of the frame with a root-proof plastic sheet. Then set all the containers into the frame, more or less level with the surrounding soil surface. If there are cats or other animals around, you will find it useful to cover the frame with wire mesh. Winter protection is also advisable. If there is no reliable snow cover, some pine boughs or other material can cover the containers. It seems important to avoid too many cycles of freezing and thawing.

Seedling care

Germination usually takes place underground during the winter but is noticeable only in the spring after sowing. Two cotyledons, each about 1 cm long, appear (they are usually oval, but may be slightly lobed in *H. nobilis*; see the photo on p. 195). If not, you should wait another year, or even two if you are patient and optimistic. Delayed germination is frequent—hepaticas are sometimes simply unreliable and temperamental.

Germination success is never complete; there are always failures. A failure rate of 20–50% must be regarded as normal. My experience suggests that seed from European *H. nobilis* variants germinates reliably, while *H. transsilvanica* and Japanese species are more reluctant.

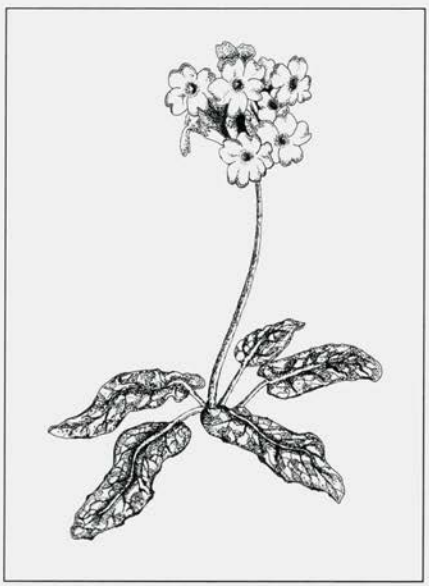
Once you have seedlings, *do not touch them* in their first year, or you will risk losing them all! Transplanting seedlings, whether into pots or the open ground, should be done a year later in spring (May here), after first true leaves—usually two—have developed. A little extra care, such as foliar fertilizer spraying, would be beneficial. Mature hepaticas are fairly robust, but newly transplanted seedlings are not. If germination is partly delayed, only the older seedlings with true leaves should be pricked out. It is now that careful spacing during sowing really pays.

If you are lucky, you will see some single flowers among your seedlings one year after transplanting. Complete or nearly complete flowering will occur a year later. Really mature plants with a lot of bloom need two more years—five and a half years from sowing. And then you will have a lot of seed, too!

Lessons for hepaticaphobes

If you are not willing or able to grow hepaticas from seed, you can still profit from the recommendations above if you grow any plants with ephemeral seeds. Our own NARGS seed list offers an impressive array of some 40 genera, from *Aconitum* to *Uvularia*. To mention just two popular examples, with hellebores everything works much as with hepaticas, the only modification being the inclusion in the seed compost of dolomite (lime containing magnesium), whereas with trilliums no lime is necessary. I hope, though, that you will experiment with hepaticas, and ornament your shady rock garden, large or small, with these delicate beauties of spring.

Joachim Langfeld has gardened in Berlin for more than 30 years and is especially interested in raising plants from seed. Apart from hepaticas, his favorites include *Hemerocallis, Helleborus, and Trillium*. He is glad to answer further questions about the topic of this article; contact him at <Joachim.Langfeld@freenet.de>.



Primula forrestii, drawing by Mark Akimoff

Raised Beds: Principles and Reflections

David Hale

In the larger context of the garden, raised-bed rock gardens are useful as ornamental features and also provide many microclimates for the alpine gardener. They also lift the plants so that they are more easily observed, appreciated, and cared for. (Photos of the author's gardens, pp. 182-184.)

Because a raised bed is (or should be) a work of art and landscape architecture, I think that some gardeners shy away from them, preferring to garden in scree-type beds in the sloping parts of their gardens, or using the front of a border to grow small perennials. The raised bed in its various styles is frequently criticized—most people have read about the early rock garden expert Reginald Farrer's nasty names for it, such as "almond pudding" and "dog's grave"—but I hope to convince you that these criticisms are usually unwarranted.

When we are presented with a piece of flat land, we have a couple of options. Floyd McMullen, one of the recipients of the NARGS Le Piniec Award, recommended making some excavations to change the contours of the garden by creating depressions and elevations, though not extreme ones. I believe the Rock Alpine Garden at the Denver Botanic Gardens was begun in this way. If, however, you want to work on flat land without excavating, you will have to use the elevations of the rock garden alone to provide contour.

You may do your planning one bed at a time, or all at once within an overall landscape plan. Most of us have no clear idea of the scope that our gardens will eventually have, so we do it piecemeal, trying to blend the new features into the old. In addition, as we progress as rock gardeners, growing different arrays of plants and using different styles of construction, we will always be looking for a location for our "last" rock garden bed.

The scale of what you build is dictated by the size of your garden and the strength of your arms. The "mini-mountain" style which imitates real alpine scenery is much criticized, and usually justifiably, but in a large garden it can be successful. Certainly the rock garden at Edinburgh, Scotland, is a wonderful example of a large, beautiful garden in which trails actually go through and over the garden.

Placement of the beds is crucial. Assuming that we all want to grow the widest possible variety of plants, it's a good idea to consider all the climatic condi-

tions that exist in your garden. You might start with a rock garden in full sun for the sun-lovers, and another in a shadier part of your garden. This would provide for the majority of the rock plants that you will grow.

Depending on your means of irrigation, varied amounts of water will reach different parts of the garden, and this will allow you to extend your range of plants even more. For example, if there is a particularly dry spot, you can place a bed for drought-tolerant plants there.

Beware of tree roots! They can suck up a huge amount of water, even invading the rock garden and seeming to replace the soil. The overhang of a tree can stop a considerable amount of rain, too.

In any case, plan for irrigation before you start building the raised beds. Install the pipes and stanchions for overhead watering, if you want to use it on the less moisture-sensitive plants. For those that react badly to sprinklers, you can install subterranean water delivery systems. One technique I've used to control the water supply is to bury a "leaky hose" (a porous type of hose, obtainable from garden centers) in the rock garden bed and completely eliminate overhead watering, which can cause rotting in the crowns of many alpines. It's best to do this during the original construction of the bed. The hose can be manually controlled or put on a timer. Before you bury it, it's a good idea to put a length of hose into a large bucket and run water through it to measure how much water it delivers per minute. This will help you determine how much hose to bury to produce the amount of irrigation you want. Water oozes through the entire hose, and the material is durable enough that a trowel is unlikely to puncture it.

It's important to plan your rock garden beds so that you can be absent even during the most severe weather. If this requires irrigation with automatic timers, install them. Then you won't have to rely on friends and neighbors who may not understand your plants, and you'll be able to visit the mountains during the alpine bloom season. Timers can be overridden with "rain switches" that will turn off the sprinklers during unexpected rainstorms.

Raised beds provide beneficial environmental conditions in many other ways. "Drainage" is a word that is frequently heard in rock gardening circles, and just as frequently it has multiple definitions. Perhaps the commonest advice given about our plants is "It needs excellent drainage." Pooling of water around the crowns and roots for any length of time is fatal for most alpine plants. The good drainage of an elevated site prevents this through both lateral runoff and vertical drainage. Digging a hole beneath a plant on the flat and filling it with drainage material such as grit does no good if the water has nowhere to go; the water will fill up the hole and eventually drown the plant, a situation known as the "teacup effect."

The higher the rainfall, the sharper the drainage must be. If the sides of the bed are steep, lateral runoff will be good, but most of us also incorporate drainage material in the fill of the bed, using almost any sort of rock, grit, or coarse sandy material. This incorporated grit leaves air spaces that allow the necessary oxygen to reach the plants' roots. We're not just trying to get rid of water; we're also trying to aerate the soil.

It's very helpful to begin by learning some characteristics of your garden soil, particularly the pH (acidity/alkalinity) and nitrogen content. Try to get soil amendments that have a pH in the range of 5 to 7. Almost all plants do well in this range. In fact, most plants that grow naturally in alkaline soils will probably do just as well in an acidic soil. Acid-lovers, on the other hand, won't grow well in alkaline soils. As for nitrogen, a lack of it probably won't kill rock garden plants, but too much tends to make them lanky and "fat." You may need to add a little nitrogen from time to time, or avoid it because your soil is already very rich. "Lean" soil amendments such as most rock products will help lower the nitrogen content.

There are as many formulas for rock garden soils as there are rock gardeners. I think each of my beds has a slightly different mix, depending on what I had available at the time of construction. One of my favorites is a mixture of three parts ¼"-minus washed crushed rock and one part loam. Quarter-inch-minus crushed rock, or grit, is widely available in North America. In wetter areas, I would increase the amount of rock, and would decrease it in dry spots. This is a good basic filler for a raised bed, although you may wish to customize the soil right around certain demanding plants.

The actual construction of the rock garden bed is the controversial phase, but it shouldn't be. There are many artists among us with their own set ideas. The literature of the past offers many more with particular takes on both the design and the content of rock gardens. You need only read the works of William Robinson or Farrer to see how opinionated gardeners can be! There is a strong feeling throughout rock garden writing that only a limited number of forms should be allowed, and that these must be *natural* forms. Well, take a stroll outdoors, and you will soon notice some chaos in what Mother Nature has done. She's downright careless at times, piling things helter-skelter and then knocking them down, and perhaps pouring lava over the whole mess. I've visited places in the Pyrenees, for example, where half a dozen different types of rock in different colors are mixed together, or where I saw piles of broken rock that might have been left there by a giant dump truck. This isn't my idea of a tidy rock garden. I think we just ought to try to compose a pleasing (at least to us) feature that fits into our landscape, with room to grow the plants we want.

There's an insulting term for every style of raised rock garden. The simplest to build is the berm, or mound. With rocks placed in it at random, it gets called a "plum pudding." It the rocks are upended, you get an "almond pudding," probably a worse design. But on the whole, the plum pudding is very functional. To introduce some design, place the rocks to form terraces in concentric circles. This is probably one of the most efficient construction types because it leaves a maximum of planting area. The terraces may be of any width. (This reminds us that the principal purpose of rocks in the rock garden, besides beauty, is to hold the soil. If rocks are not used, or are too widely spaced so they don't form a barrier, the soil will eventually wash down.) The terrace now presents us with a line of rocks, and if they are somewhat uniformly rectangular, it gets called a "jack-o'-lantern." Once again, you have to ignore the insult: this is the most functional

type of rock garden, and the lines will soon be softened by the plants. The famous rock gardens at England's Kew and Wisley were built this way on a very large scale.

To avoid your concentric terraces looking too naïve—too much like they belong in a front yard along with garden gnomes and a miniature wishing well—use two techniques. First, the bed should have a "footprint" that is longer than wide and slightly irregular. Second, "scallop" the terraces with rock so that one level doesn't run completely around the bed. That will also give you some small "coves" and pieces of vertical wall for special plants.

The shapes of the rock garden are endless, and visiting private and public gardens will give you plenty of ideas. I'd like to mention a couple of others. The first is a rock lover's rock garden. Jack Poff, the longtime head gardener at Portland's Berry Botanic Garden, is of this school, and I tried to copy his style in one of my beds. He constructs his rock gardens with terraces, using rocks that are quite flat on top, and places them with the lower course of rock nearly abutting the next course above. This "staircase" style is beautiful, displaying choice stone well, but the disadvantage is that it leaves little planting room. It's only easy to plant this type of bed during the actual construction.

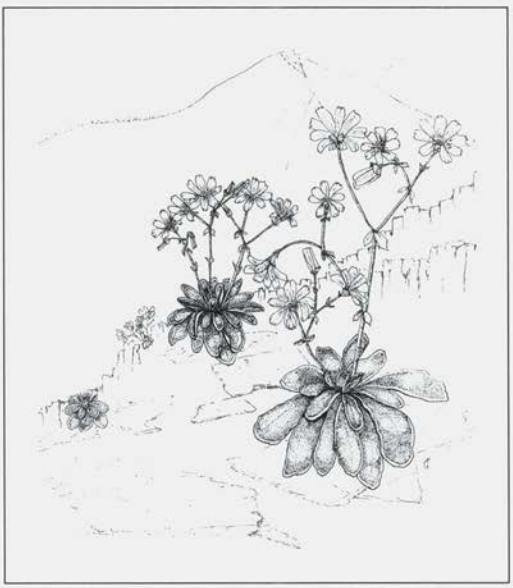
Another type is the crevice garden, which has become almost a religion recently. I believe a mini-crevice garden installed on top of a raised bed can create a very pleasing effect. The crevices provide many microclimates, moderating the temperature because rock is a poor conductor of heat, directing water away from or toward plants, and providing a natural barrier to their spread. The crevices can be directed vertically or at an angle; if they are horizontal, they are not very functional and are quite difficult to plant. Crevices 4 to 5 inches (10–12 cm) wide are quite functional and easy to plant. I prefer to fill them with builder's sand, a type of washed sand with many different particle sizes and even some pebbles. Many plants grow spectacularly in this medium. In addition to aeration, sand with some fines in it provides capillary action, drawing moisture from below in times of drought, something grit does poorly. Plants in this type of sand withstand high rainfall and irrigation without crown damage.

Planting the raised bed can be done at almost any time, depending on local conditions of cold, heat, or drought. I prefer spring, when the weather is usually forgiving and the plants can become established before the summer's heat. Plants that need some kind of protection are given places behind or nearly underneath rocks to shield them from sun, wind, and rain. In the past, I've lost plants in my rush to get them into the garden before they were mature enough. You learn by trial and error that small plants without an adequate root system should be held over until fall, or if possible the next spring.

The varied contour of the raised bed and the small niches in it will allow you to place small covers to protect sensitive plants during winter, whether it's cold or wet or both that threaten their survival. You can even cover an entire raised bed with a temporary roof or low "hoop house." If you plan for the latter, you can design the bed in a suitable shape and perhaps install pipes in the ground at its edges to hold the PVC hoops.

Much more detailed information on soils and certain types of construction is to be found in the NARGS book *Rock Garden Design and Construction* (Timber Press, 2003). Another fine source is *The Rock Garden and Its Plants* by Graham Stuart Thomas. The latter discusses the history of rock gardening at length, but it also offers many photos and drawings with major emphasis on the naturalistic crevice garden. Not being an artist, I suppose I'm an imitator; I enjoy seeing gardens of many types and imitating parts of them, and this book gives the reader that opportunity.

David Hale, a retired physician, gardens with his wife, Donna, in Portland, Oregon, and near Cannon Beach on the Oregon coast. They travel widely, and David has introduced a number of plants to cultivation through his seed collections. He also contributes an occasional feature, "The Botanical Traveler," to the *Rock Garden Quarterly*.

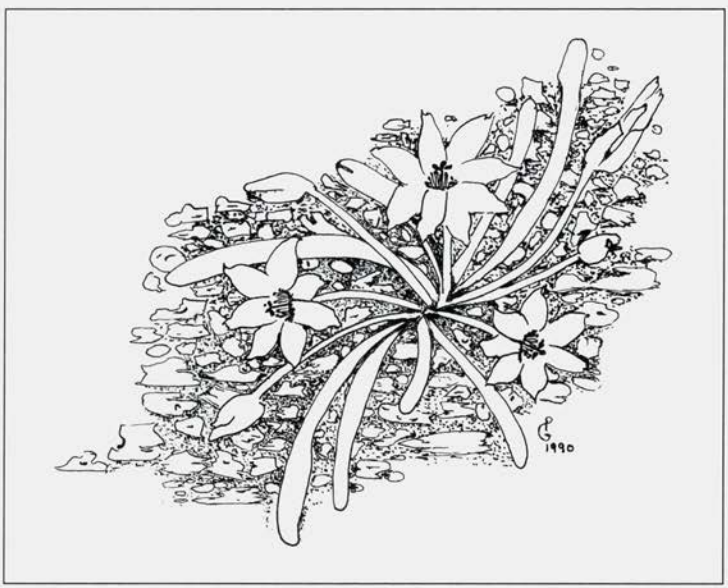


Lewisia cotyledon, drawing by Phyllis Gustafson

About the Artist

The covers of the 2005 volume of the *Rock Garden Quarterly* feature paintings of Rocky Mountain alpine plants by Cindy Nelson-Nold of Lakewood, Colorado. Working in her home studio, she has also produced botanical illustrations for two books written by her husband, Bob Nold: *Penstemons* and *Columbines*, both published by Timber Press. A longtime member of the Guild of Natural Science Illustrators, Cindy has had paintings exhibited at the Missouri Botanical Garden, the Denver Botanic Gardens, and Longwood Gardens in Pennsylvania, as well as the Hunt Institute for Botanical Documentation in Pittsburgh and the Smithsonian Institution in Washington, D.C.

Cindy undertakes private commissions "from anyone determined enough to endure the rigors of negotiation and the inevitable and protracted delays in completion" involved in acquiring her work. Contact her at 3665 S. Moore Street, Lakewood, CO 80235-1145, or by e-mail at <sphinxmoth@earthlink.net>.



Lewisia pygmaea, drawing by Phyllis Gustafson

Letter from a Heretical Dinosaur

Geoffrey Charlesworth

When I was a youthful 51, 33 years ago, even being 80 seemed such a remote possibility that it was easy to accept it as the end of the line—certainly the end of time as far as gardening was concerned, and therefore not worth thinking seriously about. This age-parochial point of view is a helpful way to face mortality but fails miserably when you actually reach 80 and find yourself still tied to a garden. I want to write down a few thoughts that are trying to jell in my mind (not solidify yet—there is still time to change), but I must emphasize that this is about me, and no unwanted advice for others is intended. Gardeners are especially egocentric (in a good sense) and will do whatever they please with their time and property. This is as it should be, so there is no danger of my brainwashing unsuspecting innocents. We can look at someone else's garden, or an edited version of one on a slide, with genuine admiration, all the time thinking (but never saying out loud), "I wouldn't do that; this might work better."

Aging in gardeners is gradual but inevitable. If your garden is such a treasure that you can bequeath it to a rich conservation society along with a large endowment, or if one of your young near relatives is currently helping you to maintain it and promises reverently to continue after you have left him house, garden, and a tidy amount of cash, then there is no need to worry about bad design; you can splurge as gracefully and extravagantly as imagination and funds allow. But at 80, if you are stuck with your own garden and can't let go, and refuse to retreat to a peaceful nursing home because you want "one more spring" or have some other sentimental reason, then sooner or later you have to make some concessions to age. This includes garden design.

If you don't know it already, you will learn by experience that time takes its toll on a gardener's body. At 50, macho behavior is a given. Moving rocks, digging sod, and wielding a chainsaw are fun in themselves, besides proving to anybody watching that gardening is as manly as running a marathon. But inevitably and universally, knee cartilage wears thin, calcium deposits accumulate in hands and spine, muscles diminish, eyesight dims, stamina and speed plummet, and cancer threatens sunburnt skin. Not to worry, though: all this is gradual, and the body heals itself most of the time. The bad news is that it happens.

So I shall attack rocks, the very foundation of our society. The more monumental your rock structure is, the less amenable to change it will be 20 years after you build it. This should not deter anybody from importing massive boulders into their landscape and constructing vast piles of rock with authentic-looking geological features. Most people are in love with rocks. Some even feel that plants spoil their beauty. So here is my heresy: although at fiftyish I used to believe that the need to fight and conquer rock was natural (it is probably what God was doing on the eighth day), now that I am past 80 I am asking, "Why am I doing this?"

My body is saying "Stop." I can no longer push rocks around, let alone lift or carry them. And then a subversive thought arises: "What use are they?" And then another: "What beauty do they have?"

You will have your own answers, but I shall offer mine. Rocks form a good environment for growing alpine plants. This is certainly true for easy plants such as *Saponaria pumilio, Phlox subulata,* or *Aubrieta deltoidea*, which will sprawl gracefully over a rock face and waterfall agreeably over a miniature cliff. But these plants don't need such expensive surroundings to grow well. Their expansive charm would grace a thousand humbler locations.

My own garden is surrounded by rough pasture filled with the wild plants of western Massachusetts. Seeds of goldenrod and aster blow in throughout October and into November, landing on my rock formations; throughout the year, each in its season, chickweed, oxalis, dock, purslane, and spurge arrive as seed, their stems and roots forming sheets of vegetation. They are hard to get rid of, especially when small, and often take root deep in the cracks between the rocks. Sometimes only moving the rocks will evict them. This is a normal part of gardening, but though I like weeding I do not like moving large rocks to do it. It would be more rewarding if really good plants were abundant and easy to establish in my crevice garden. I have kept *Douglasia montana* for eight years, *Phyteuma comosum* for four, *Eritrichium nanum* for two; but these small successes don't seems worth the architecture. Forms of *Draba rigida* have been more successful (those known as *D. caucasica* and *D. bryoides*), and *Arabis bryoides* and *Eriogonum ovalifolium* are relatively permanent. *Penstemon teucrioides* made a spectacular carpet for about ten years but died, leaving a large wasteland of woody stumps in the cracks.

The answer to this mildly negative view of rock is obvious. Every garden has to be renewed and replanted every seven or eight years. Just take the rock garden apart and rebuild it. This is sensible advice for a large botanic garden—you could even get a new director to make it happen—and also for a vigorous 60-year-old with perhaps one other person to help, but not such good advice for anyone beyond a certain point in life (not defined by age alone).

By now I have essentially two ways of making new beds. One of them allows Nature to do most of the work. It takes time and some exertion (or help) and is far from perfect. Start with the location where you want the bed. Make a compost pile there, preferably containing lots of sod and discarded seed compost as well as the usual herbaceous garden rubbish, with as little woody material as

possible. Turn it at least once a year, pulling out live roots and leaving them exposed to the sun to die. Also pull out any visibly growing plants whenever you pass the heap and put them on top of the pile. After about three years, remove the top layer of undecomposed material, push it to one side to form the beginning of the next compost heap, level the top of the heap if you want, surround the heap with rocks or logs to support the sides for a couple of years, rake it, and prettify it with stepping-stones, crevice rocks, or anything else that will detract from the pile-of-dirt look. Plant it. For the next two years at least, you will have to weed it frequently until the goldenrod has given up trying (oxalis will continue beyond your lifetime). By this time, many of the original plants will be established; the ultimate design will be clearer in your mind, and you will have a new bed with almost no work and cost.

The second type of bed possible for old people is also simple and also requires a cleared space to begin; the sod you dig up can be used for the previously described compost heap bed. Make a rectangular outline with cinder blocks (ugh!). It should be either three or three and a half blocks wide; four blocks makes reaching the center tiresome, and anything less than three looks stingy. The length can be anything convenient—perhaps six blocks would be good for a first experiment. Fill it with coarse sand. Rake it. Plant it with your best seedlings. Now you have somewhere to sit as you plant out, and the reason for limiting the width becomes clear: something to do with elbows and hips. A danger is the urge to fill all the holes of the cinderblocks with sand too and plant them. This looks great—much better than vacant holes that will attract seedlings of violas, aubrietas, or scutellarias—but then you have nowhere to sit as you plant and weed, so you have to kneel (there go your knees), and the bed is suddenly slightly too wide.

Admittedly, these beds have their imperfections. They lack the dramatic quality of a load of imported rock or tufa. They lack the intimate quality of containers. But a compost heap covered with mats of *Silene acaulis, Gentiana paradoxa*, silver saxifrages, *Draba olympica,* and *Dianthus microlepis* looks very much like a heap of rock covered with the same plants. It wouldn't be a home for your best plants, though: the soil is too rich and more suitable for species peonies, dracocephalums, romping campanulas, and choice genistas.

The cinderblock bed is neat but not pretty. Even with *Aubrieta canescens* billowing over the sides and *Androsace villosa* in the holes, you are still aware of industrial gray cement and intractable straight lines. My solution is to segregate these rectangles away from the free-form rock beds and the raised beds and call them "experimental" beds. Here I can grow plants with a one- or two-year life expectancy. But also here I have grown large mats of *Daphne arbuscula, Arnebia echioides, Douglasia laevigata*, small forms of *Eriogonum umbellatum* and *E. ovalifolium, Draba rosularis* and *D. polytricha*, and many other attractive species for varying lengths of time.

Planting *Viola delphinantha* in a regular rock garden or a compost-inspired raised bed would mean its instant death, but in a cinderblock cavity I have had one flourishing for at least six years. Once a plant is established in a hole, it is

impossible to get it out without root mayhem, so telling myself that it is "experimental" and on trial for hardiness is a white lie. But plants themselves don't care about such deceptions; *Phyteuma comosum, Dianthus alpinus, Androsace* 'Millstream', and scores of others have enjoyed the frugal hospitality of a cinderblock hole. You cannot expect to get divisions or do any kind of propagation except seed or rootless cuttings once a plant has agreed to live there.

Modifications of the rectangle are possible too. Starting with a suitably located rectangle, which can be on mowed sod, fill it with shredded leaves in October. On top of these you can store another dozen open bags of shredded leaves over winter. At the end of winter, everything should be compressed enough so that you can make a "sandwich" bed of leaves, compost and sand (a technique described by Jim McClements in *Rock Garden Quarterly* 57:2, spring 1999). If you are impatient, this can be planted almost right away, or you can wait until late August. I have found this method is excellent for special primulas (doubles and julianas), double trilliums, cypripediums, fancy heucheras, dodecatheons, double *Leucojum vernum*, and soldanellas (which never bloom).

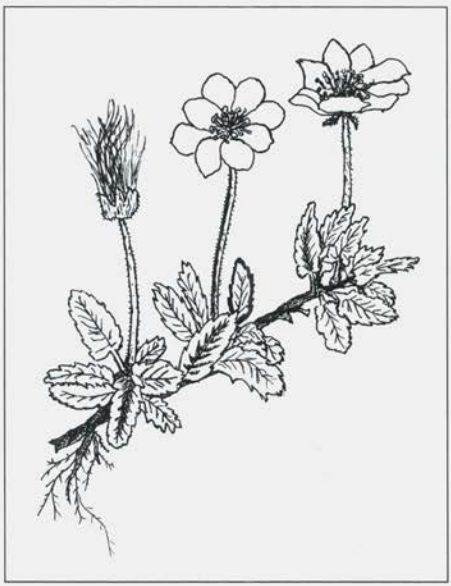
To break the stolid rectangular shape, you can introduce a bay one or two blocks wide in the long side of a rectangle, or construct wilder variations with the obvious linear restrictions. Anything you can do with dominoes, you can do with cinderblocks. Another way of relieving boring geometry is to increase the height of one side to two blocks, thus making two levels or one sloping surface in one bed. An astonishing amount of filler is needed, so order sand by the 10-ton load.

I remember Linc Foster showing slides of the Long Island garden of Rupert Barneby and Dwight Ripley, which was constructed mainly from wide-diameter drainage pipes. These were painted white, giving the same strong effect as the whitewashed houses on Santorini. I can't do that sort of thing; I have too many beds and the wrong surroundings. The bucolic Berkshires are unlike overpopulated Long Island. A truer reason is that I have a great aversion to anything permanent in the garden. Not only would I not paint cinderblocks, I never cement them in place. This means I have to push them back into position at the end of the winter, but it also means I could easily extend the beds if I wanted to, or even change the design. A more profound reason for this horticultural character flaw is that I am constantly haunted by one overpowering thought: How will the next gardener here get rid of all this stuff?

Why do I need all these beds—three new this year? Why not settle into an old age of gently maintaining a modest collection of time-tested, well-loved favorites? Well, that is partly to do with plants themselves. They are very competitive. Even a few plants of *Phlox subulata, Penstemon hirsutus, Anthemis cretica*, and sundry thymes and delphiniums would soon fill your bed with their offspring and obliterate your favorites. If you don't want to say of every plant in your garden "I've seen that before," and if you want a little variety, then you have to introduce new things. That means more space. New plants take very badly to old, crowded gardens. I have a dozen "old" beds where everything newly planted sulks or dies right away, even when I think I have prepared its new home properly. The same thing might happen in an "experimental" bed, but there you sort of expect it.

And for new beds you need lots of seed. I have had to cut down a bit on the amount of seed I sow in a year but still find the seed collectors' lists the most exciting event of the "solstice season." I can still carry a tray of 25 seed pots to its winter quarters and can just manage to load a cinderblock onto a cart when I need to. Being old is terrible but not impossible.

Geoffrey Charlesworth of Sandisfield, Massachusetts, is the author of the Timber Press book *The Opinionated Gardener* and of many contributions to this journal. The garden he and the late Norman Singer created is frequently enjoyed by NARGS members, and hundreds grow plants he has propagated and donated to Society sales.



Dryas octopetala, drawing by Mark Akim

Then and Now

Irma M. Gourley

Eleven years ago, at age 82, I moved to my present domicile in a mobile home park for senior citizens in Windsor, California, near Santa Rosa just north of San Francisco Bay. There are hills between this area and the Pacific, but the ocean still influences the climate. Fog drifts up the Russian River and cools the mid-summer mornings.

I couldn't give up my gardening hobby entirely, and there is a roomy back yard here that receives both sun and reflected heat. Here my sons built some raised beds for me, about 22 inches wide and between 5 and 6 feet long, which they filled with a mixture of gravel, soil, and compost. Then I proceeded with the planting. Could an old woman such as I succeed in growing rock garden plants in coastal California based on many years of experience with them in very different climates?

Now, at age 93, I'll report on the difficulties I met and the successes I achieved. I'll also compare the effects of different climates on what I've been able to grow.

Fifty years ago I became a devotee of rock gardening. For the first four or five years, while we lived on a three-quarter-acre plot on the bank of the South Umpqua River near Roseburg, Oregon (just north of the Siskiyou Mountains), my rock garden plants were allotted space primarily on the lawn's edge, and odd spots not already occupied by grass, perennials, annuals, vegetables, and berries. Then we moved to a large ranch north of Oakland, Oregon, where our home stood on a hillside. This slope, with rocks added, was an excellent site for a spacious rock garden.

Several red-berried elder bushes (*Sambucus racemosa*) dominated this hillside garden. They aren't really classified as alpines, but I found these high in the Cascade Mountains and transplanted them. (Collecting native plants was applauded in those days, as you can tell from reading early issues of the *ARGS Bulletin*.) Elderberries need some water, but once established they got by with occasional good soakings during the dry summers. They attained the size of small trees before we left the ranch.

Tree lupines (*Lupinus arboreus*, native to California), grown from seed, filled the intermediate size range between the elderberries and smaller plants. Their

yellow flowers appeared in late spring. and the leaves, smaller than those of the Russell Hybrid lupines of borders, clothed them densely.

Not much water from our spring could be spared for flowers, and this dictated the choice of plants. *Helianthemum* grown from seed and a few of the hardier *Cistus* species lent a Mediterranean character to the garden, especially on the south slope, which was the driest. Their spring display was very colorful.

Twenty years later I moved to Hermiston, Oregon, in the Columbia Basin east of the Cascade Mountains. There I began transforming a large mound of sand into a suitable home for rock plants by creating wide terraces. Stones provided the risers for some sections, but more often I used cement blocks. This area has sandy, alkaline soil rich in volcanic ash, with plenty of potassium, which induces superior form and growth in a great variety of plants. The winters can get very cold with no snow cover, or they may remain mild all season. The summers are hot, and frequent strong winds blow the sand about. Slugs and snails were absent, but grasshoppers arrived in hordes. Leaf-cutter bees also disfigured some satin-petaled flowers. Sudden sharp drops in temperature after the sap rose in woody plants presented the greatest hazard.

Evergreen shrubby penstemons had flourished in my hillside garden west of the Cascades, but I didn't succeed with them on my sandy terraces east of the mountains; no matter, though, since some gorgeous blue-flowered penstemons were at home there. They grew larger and bloomed regularly year after year, even self-sowing. One, *Penstemon acuminatus*, grew wild in the sand dunes nearby. At my garden today in Windsor, neither of these types thrives for long, but I can grow the more tender hybrids for the border. They, too, are very showy and bloom for a long season through the summer heat.

Did any of the plants that thrived in both western and eastern Oregon also succeed in my northern California garden? A few did. *Geranium sanguineum* var. *lancastriense* ranks among the best and easiest. In California it comes into bloom early, along with *Iberis*, or opens its light pink flowers to mingle with the bright blue ones of *Veronica* 'Georgia Blue' or the paler blue of *Veronica* 'Nestor'. Later it shares the stage with *Campanula* 'Blue Gown' and *C. portenschlagiana*.

Dianthus species and hybrids have formed an integral part of all my gardens. True, on my hillside garden cottage pinks and not alpines sprawled beside one of the paths that traversed the slope, letting me view all the plants at close range and care for them. By the time I got to Hermiston, I had raised my sights and chose more alpine forms, so I planted *Dianthus* 'La Bourboule' and several varieties of *D. gratianopolitanus*. I prized 'La Bourboule' so highly that I brought a division along to California, and I still have it 11 years later, plus several plants I've propagated from it. Now, however, the chief place has been usurped by other varieties that bloom much longer. There is one named 'Blue Hills', outstanding for its neat mound of blue-green foliage. 'Pike's Pink' is a light pink with short stems, and 'Rachel' is similar. The last two are selections or hybrids from *D. gratianopolitanus*, displaying large, double, fragrant flowers.

Gypsophila repens, another member of the pink family, also has adapted well. The form 'Rosea' which I grew at first seemed to fade badly under hot sun, so I

now grow the white form. I like it best as an edging plant, mediating harmoniously among its gaudier neighbors. Furthermore, the onset of summer heat doesn't stop its performance. Although not entirely evergreen in winter, it is very hardy and long-lived.

I had *Iberis sempervirens* in my sandy garden in Hermiston, where it barely survived the frost damage it suffered every winter. Campanulas did wonderfully well there, spreading and self-sowing, but here in California I've found them impermanent and difficult. The plants just dwindle away over a year or two. Nor are all veronicas as foolproof as is generally claimed. *Veronica* 'Trehane' has displayed no flowers here, even though it had many stems. Also failing to bloom were 'Blue Reflection', *V. allionii*, 'Minuet', 'Heidekind', and *V. armena*. Even the usually reliable *V. prostrata* 'Heavenly Blue' produced abundant foliage but no flowers. Those I've found dependable here are 'Georgia Blue', 'Waterperry' and 'Nestor'; sometimes 'Giles von Hess' manages a few stems of pink flowers.

Iberis performs so well in California that no garden need be without it. Early blossoms appear in February to take part in the winter parade of primroses, daffodils, and pansies, as well as the taller, brilliantly colored ranunculus and Iceland poppies. For several months *Iberis* covers itself with snowy clusters, then remains a small green shrub for the rest of the year. A bit large, perhaps, for raised beds, but it shares space politely with miniature plants.

Past experience might pave the way, but the garden begins where the pavement ends. When I moved from an area with cold, dry winters to one where frost is rare but rain plentiful in winter, I had to become familiar with a very different assemblage of plants to fill the hot, gravelly beds around my mobile home. I wanted old favorites, but also more variety—particularly plants that would bloom in summer and fall. The search itself fills me with enthusiasm, and failure doesn't dampen it.

Sisyrinchium bellum, a blue "grass flower," blooms throughout spring and early summer. Its leaves, only a few inches high, resemble miniature iris fans. The flowers, though not the pure blue of gentian or lobelia, appear very blue next to the lavender-pink of *Scabiosa lucida*. I also grow *Sisyrinchium macounii* 'Album', whose flowers continue the white motif begun by *Iberis* and *Achillea*. Its foliage is as low and broad as that of *S. bellum*, but its flowers are slightly larger and rounder. Both combine well with *Armeria, Geranium, Potentilla, Dianthus*, and other vigorous growers, and can be divided easily. They can also be removed easily where unwanted, for their roots don't go deep.

In summer, *Scutellaria suffrutescens* decks itself with small red blossoms. Its numerous stems are upright to about 6 inches (15 cm), thickly clothed with small leaves in exact proportion to the flowers—a jewel for the raised beds. However, it does look rather bedraggled in late winter before the new growth starts; dead branches mingled with green ones somewhat spoil its effect. But as the days lengthen and the sun shines brighter, it puts up new stems and fresh foliage. I've divided my first plants and now have it in almost every bed. It tolerates both summer water and drought. A plant like this deserves good neighbors, but plants that bloom here in summer, especially in August, aren't plentiful.

I purchased *Scutellaria suffrutescens* from High Country Gardens (see Sources), and I found *Zephyranthes candida* there too. Known as "white rain lily," it grows from a bulb which multiplies rapidly, so that now I have several moderate clumps. The white flowers appear in waves beginning in August and continue until late fall, held singly on stems not much above the leaves—less than a foot (30 cm) high in my lean gravel mix. I like it with the *Scutellaria* even though they are different in every way. They impart freshness to the summer scene, when many plants look worn out and weary.

My most inhospitable beds, demanding the toughest plants, are next to the south wall of my mobile home where they get reflected heat. Here I've established ruschias (a genus of South African succulents) and, surprisingly, a yellow rose. A gift from my grandson Brandon, it outgrew its tiny basket, so I planted it out, and it became a small floribunda with healthy evergreen foliage. I've now divided it into two plants, which are seldom without flowers. How can such a delicate plant endure the heat? It must actually be a very tough plant.

In an oval bed nearby grows *Geranium sanguineum* 'Jubilee Pink'. Its flowers are large and of a lively magenta hue, appearing without ceasing through much of the year. *Origanum* 'Kent Beauty' dangles its large rosy bracts over the geranium in an attractive mixture of colors. *Veronica* 'Georgia Blue' is a lovely contrast in spring.

Small *Eriogonum* species are favorites of mine, but those from dry habitats found the Santa Rosa climate intolerable. Yet I've already found several choice ones that seem to be adapting successfully. *Eriogonum jamesii* did very well in my Hermiston garden and was the first one I planted here. It has coarse foliage and plentiful flowers, but its stems are too long, and the flowers age not to a bright hue but to dingy brown. The most successful have been selections of *E. umbellatum*, and I have four kinds now. A "compact variety" from Siskiyou Rare Plant Nursery flourished in Hermiston and retains the same form here, with small leaves and compact growth, though its flower stems are much longer in California. The flower balls mature to a lively rust-red. *E. umbellatum* var. *polyanthum* seems very like Siskiyou's "compact variety." The leaves of var. *humistratum* are quite different, though, and its habit is less congested, but it hasn't bloomed yet. *E. umbellatum* 'Warner Mountain' has very dark leaves which turn chocolate brown, almost black, in winter; one might think it was dying, but a closer look reveals tiny gray new leaves developing. It began blooming at an earlier age than any other variety; the flowers were supposed to be yellow but were greenish yellow with red spots. In just a few days they turned a beautiful red, the best color yet exhibited by my eriogonums—mahogany rather than scarlet or crimson.

I've established *Calylophus hartwegii* var. *lavandulifolius* (from High Country Gardens) in areas where many other plants perish in reflected heat. This extraordinary plant, related to *Oenothera* (evening primrose) blooms primrose yellow from large, orange buds almost year-round. It's rather too large for the raised beds, but I find dauntingly hot spots for it. Its delicate framework of many-branched stems bear scattered slender leaves and are not quite upright. *Calylophus serrulatus* is a smaller plant that seems almost an annual here, but is a good size for the raised beds.

Rhodohypoxis, a small bulb with flowers in red, pink, or white, also blooms in summer. Heat seems to please it, but it also appreciates summer water combined with good drainage.

Nurseries now are offering more plants from the South African mountains, including *Delosperma, Osteospermum*, and *Gazania*. I found a treasure in *Hirpicium armerioides*, a *Gazania* relative. The compact mat of foliage is only a few inches high, and the stout flower stems remain short. Showy white flowers with bright yellow centers decorate the mat for many weeks, and the foliage is ornamental all year. It combines well with almost all other plants, including succulents. The flowers don't open early in the morning, but each one lasts several days—a characteristic of some other South African daisies.

Delosperma floribunda 'Starburst' flourishes here. Early in April, the fuchsia-pink flowers with large white centers begin to appear in abundance over the succulent foliage, continuing until late fall. Many flowers open at once on a small plant. The clump doesn't spread. It's perennial but short-lived here, probably because of our warm, wet winters.

Although many veronicas have failed here, one of their relatives from New Zealand seems well satisfied. *Parahebe decora* is small enough to fit among my other miniatures—indeed, it has the tiniest leaves of all. It's a stemmy little shrub with sprays of white flowers. I haven't grown it long enough yet to learn its faults or ultimate size.

Plants from other countries continue to find a home in my garden. I've described a few that I've been growing for several years, but I'm very excited about some new ones which I'm trying out now, and I will tell you about them later, as well as reporting on more that prove to be dependable, obtainable, and ornamental.

Sources

High Country Gardens, 2902 Rufina St., Santa Fe, NM 87507-2929
Siskiyou Rare Plant Nursery: see advertising section in this issue.

Conversations in the Garden:
Correspondence and Miscellany

Compiled by the Editor

Here we resume our newly revived participatory feature. We're glad to have received some comments already, and encourage all our readers to participate. The editor's addresses appear on the last page of this and every issue.

Thanks are due: Our recent request for back issues to complete the editor's archive elicited generous contributions from Pat Bender, Sasha Borkovec, Jim McClements, and Ian Plenderleith. Thank you! We now have a nearly complete set of the *Bulletin of the ARGS* and *Rock Garden Quarterly* for reference here. Complete sets are held by the NARGS Archivist and the Book Service.

Walter Blom of Albany, Oregon, who contributed a Plant Portrait of *Narcissus cantabricus* and *N. romieuxii* to the spring 2004 issue, sends this added comment on "the erratic behavior of *N. cantabricus*": "First, the name *N. cantabricus* subsp. *monophyllus* ['single-leaved'] does not seem correct, at least not for vegetatively propagated bulbs; plants growing in the wild might appear different. Throughout the years I have never found a single-leaved plant out of hundreds of bulbs of various *monophyllus* forms. As with all other daffodils, I grow them out of doors, and harvest and replant each year. Their minimum number of leaves is two, but often many more. Still, with many fewer leaves than *N. cantabricus* subsp. *foliosus* forms, their vegetative increase is comparatively slow. We also experience this phenomenon in hybrid daffodils. Triandrus and Jonquilla hybrids with many leaves increase fast, in contrast to many trumpet daffodils with few leaves and slow increase.

"Second, there is no consistent pattern in the vegetative reproduction profile of *N. cantabricus*. The bulbs in general do not split, but occasionally produce ten or more offshoots. My impression is that, when properly grown, these "splits" become nice flowering-sized bulbs after several years.

"Third, the corona and anthers show a regular pattern, but the number of segments in the corolla is quite variable, from six to nine, a pattern not seen in any other type of daffodil. *N. romieuxii* is more consistent than *N. cantabricus* in this respect.

"Fourth, although I harvest the bulbs yearly in May and store them in a cool place (around 70° F) during summer, over the years their flowering time varies greatly, from October in an early year through to January in other years."

When the relationship between gardening and plant conservation comes up, opinions can heat up quickly. For example, when editing the previous issue's article on growing *Castilleja*, I corresponded with the authors, Beth Lawrence and Thomas Kaye, about their recommendation that gardeners not attempt to grow rare species such as the one they're restoring to part of its former range. A horrible example often brought up by those who condemn the cultivation of rare plants is *Tecophilaea cyanocrocus*, the "blue crocus" of Chile, which has often been said to have fallen victim to overcollecting for the horticultural trade. John Watson, the great Andean botanist, got off one of his best lines in connection with this, writing that *T. cyanocrocus* was more likely exterminated by overgrazing than by "spade-wielding peasants in the pay of villainous Dutchmen." Anyone who has seen its former habitat near Santiago can believe Watson's claim: almost no plants remain except those that even the ubiquitous goats won't eat.

Yet hope was held out for the survival of this species in the wild, and in spring 2001 the Chilean botanists M. Teresa Eyzaguirre and Rosario García de la Huerta discovered a surviving population. They report this in *Gayana* 59(2):73–77, 2002. The following excerpts have been translated from Spanish:

"The Foundation R. A. Philippi for Natural History Studies mounted two expeditions to a mountainous part of the Metropolitan Region, around 40 km south of Santiago, during spring 2001. During these expeditions, we were able to confirm the existence of one population of *Tecophilaea cyanocrocus* in the wild state. Two samples were collected: one deposited in the SGO herbarium and one in the herbarium of the Foundation.

"The site is a level area with rocky outcrops. It has a slope of less than 10 percent and lies at 2040 meters above sea level. In terms of its potential for human use . . . it is without value for farming, cattle grazing, or forestry. In the Köppen system of classification, the climate corresponds to type Csb1, seasonally hot with a prolonged dry season in summer. The median annual temperature is 14.5° C. Median annual precipitation is 750–900 mm, partly in the form of snow.

. . . "The population of *T. cyanocrocus* occupies a clearly delimited site of 20 by 50 meters. The population is dense, between 30 and 50 plants per square meter, in clusters of 5 to 20 corms. The greater part of the plant is below the soil surface, with only about 5 cm of it rising above. The subterranean portion varies in length, influenced by the presence of rocks in the soil. A smaller population, comprised mostly of isolated individuals, was found in a nearby spot, in a cleft through which meltwater runs. The latter is associated with *Calandrinia* cf. *affinis* and *Barneoudia major* [typical snowmelt plants of the region].

"The morphology of this population corresponds to *T. cyanocrocus* Leyb.; however, there are differences in the amount of color on the tepals. The tube is blue,

and the greater part of the tepals white with veins and tips of intense blue, similar to those of the cultivated variety *leichtlinii*. . . . In the smaller population we found three individuals with entirely white flowers."

The authors recommend that the site, which is on unused private land, be recognized as a crucial place for government protection. They have not made its exact location public in view of the extreme vulnerability of the plants.

Jim Jones of Lexington, Massachusetts, a past president of NARGS, writes: "It was with the greatest interest that I read Michael Young's incendiary article, "Smoke in the Water"; I only wish I had seen it earlier. I've embarked on a crusade to acquire every winter-blooming plant that might be suitable in hardiness and size for my cold greenhouse (minimum 0° C), concentrating in the past on the treasure-trove of South African species. This winter my attention turned to Australia, also rich in prospects. I placed an order with Nindethana Seed Service (members.iinet.au/~nindseed/) and received the seed with, I must say, no fuss and bother, only to find that smoke exposure was recommended for some of the species. While bottled smoke seems to be a staple item down under, I little thought it might be available here, in the condiment section!

"What to do? I placed the seed on a handkerchief, handkerchief in a corn-popper, and gingerly smoked it in the fireplace. At least I didn't get popped *Pimelea*. In fact, there was some modest germination, though nothing like that of nonsmokers such as *Pultanaea* and *Bossiaea*. The tally is: *Anizoganthus bicolor*, 0; *Lechenaultia formosa*, 1; *Pimelea brevistyla*, 1; *Bossiaea foliosa* and *Pultanaea microphylla, retusa*, and *villosa*, abundant; plus several other genera. *Bossiaea* and *Pultanaea* are legumes and as such were treated to a boiling water treatment."

Several NARGS chapters produce annual "handbooks" as well as periodical newsletters, and their editors should know that these publications are carefully read here. Especially impressive is the annual of the Ontario Rock Garden Society, which includes a meeting schedule, chapter history, officer roster, library catalog, the pointed and amusing "Garden Visiting Etiquette," an elaborate list of open gardens, retail plant sources, and a directory of members. On the back cover are conversion charts for metric/U.S. measure and Celsius/Fahrenheit temperature, for those Canadians whose minds are still in imperial mode or who have to deal with the recalcitrance of their southern neighbors in this regard.

From time to time the *Rock Garden Quarterly* includes memorial articles about members who have died recently; however, space does not permit publication of all the obituaries submitted to us. To clarify policy on this, the *RGQ* publishes obituaries of longtime NARGS members who have become known to the Society at large through their activities as national officers, national award recipients, authors, or introducers of new plant material. Those whose NARGS activities

have been mostly local are often remembered by short obituaries in the *Bulletin Board*, the organizational business newsletter mailed with this journal. Articles of the latter category should be no more than two paragraphs in length and should be sent to the Executive Secretary, Jacques Mommens (see inside back cover for addresses).

Polling the Editorial Advisory Committee last year elicited a number of suggestions, both for specific future articles and for general changes and improvements. I'd like to open this discussion up to all the members. Please comment or, better by far, contribute!

People who belong to more than one international rock/alpine garden society often compare the various journals. Some ask me why the *RGQ* can't have color throughout like the Alpine Garden Society and Scottish journals do. The answer is "money," pure and simple. It would cost an additional $8000 per issue to print our bulletin this way. We'd have to raise dues again immediately to support such a change—and perhaps exacerbate the decline in membership.

An enjoyable feature of the AGS journal is the many brief notes on plants that have won awards at UK pot shows. For many reasons, such shows aren't common in North America. However, we would welcome similar contributions from growers who do exhibit in places where shows are regularly held, such as British Columbia.

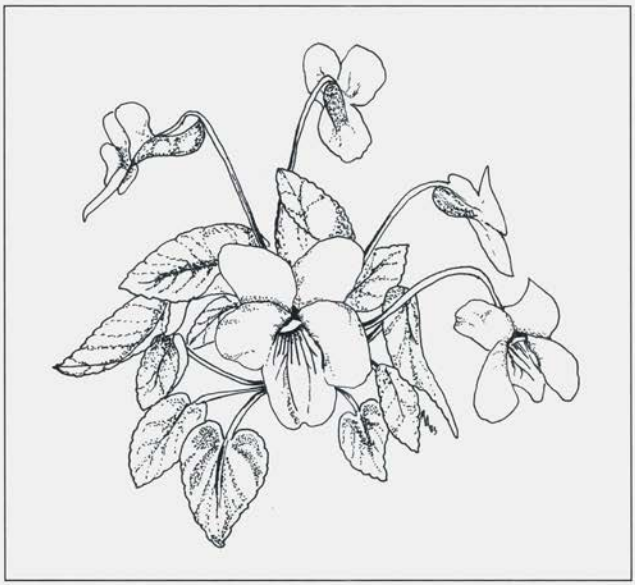
We've made an effort to produce special issues in which a preponderance of articles focus on a single region or plant family. The winter issue each year concentrates on the site of the next Annual General Meeting of NARGS, giving the host chapter an opportunity to whet the appetites of potential attendees and giving readers some in-depth information about a part of North America they may never have visited before. The plant-family articles have drawn favorable comments and, even more important, invited contributions from experts outside the Society. What plant group would you like to see featured?

Some want new articles on trough planting, others think it's "been done to death." Are there any new angles? Another slightly controversial genre is the "travelogue." Some readers find these articles valuable aids in planning their own travels or understanding how to grow plants from the featured areas. Others think they're boring. Our view is that as long as a significant proportion of readers enjoy a certain genre, we'll continue to present it. In every issue, each member should find some things he or she wants to read.

As I write, it's spring again. The flowers are blooming and the slugs are eating them in the dark of night. A correspondent on Alpine-L asked, "I have been told that spreading coffee grounds around plants offers protection against slugs. Can anyone confirm this from personal experience?"

Bob Nold, a noted Denver-area gardener and writer, answered: "Well, I drink coffee and we did see just one slug in the garden in the last two years. That's not

exactly the same thing, I know. Beer is said to be effective too. I forget where I read my favorite beer remedy. What you do is drink a few beers and go out into the garden and hit the slugs with a hammer."



Viola flettii, drawing by Mark Akimoff

PLANT PORTRAITS

Aquilegia bertolonii

DAVID SELLARS, Surrey, British Columbia

Aquilegias were not popular in our garden. Years ago someone gave us some aquilegia hybrids, and they have since infested the rock garden area. They have roots like dandelions and are just as hard to remove from gravelly soil. Our other notable experience with the genus was trying to grow *Aquilegia jonesii.* We tried tufa and rain shelters, but the plants didn't want to cooperate.

The seed exchange is a wonderful vehicle for trying different plants, but there are of course failures in this endeavor too. You end up with lots of seed pots growing lovely mosses and liverworts, and, unless you are as meticulous as a monk, you soon lose track of what you have—or rather, what you don't have.

I noticed something unusual in the seed pots in the spring a few years ago. Emerging from the grit was tightly rolled, dark green, finely cut foliage. Checking the label number, I found I had a single plant of *Aquilegia bertolonii* (photo, p. 186). Knowing nothing about it, I must have added it to my order to fill out the numbers. I was happy to plant it out anyway, since success in seed growing overcomes most other considerations.

Imagine our delight a year later, when we saw large, gorgeous blue flowers emerging over the dainty foliage: very much a miniature columbine. Though it's not as diminutive as *Aquilegia jonesii,* the flowers are just as large, and it's much easier to grow. Discovering we have such a lovely plant is yet another example of serendipity in gardening.

According to *Flora Alpina*, the recently published bible of the mountain flowers of Europe, *Aquilegia bertolonii* is found in the Maritime Alps of southern France and northwestern Italy, the Apennines of central Italy, and from Slovenia south through the Dinaric Alps. The plant in the wild is 10–30 cm (4–12 inches) high, but in our garden it grows at the lower end of this range, and its size is perfect for the rock garden.

Aquilegia bertolonii is a real treasure and a reliable performer for us year after year. It sets lots of seed, so there is ample opportunity to propagate more. It even self-sows in the garden, but it's not invasive, unlike some of its brethren.

Anemone nemorosa, *Anemone ranunculoides*, and related species

HANNELOTTE KINDLUND, Alvsjo, Sweden

In recent years I have become more and more fascinated by *Anemone nemorosa* (wood anemone or windflower) and the many forms of it one can find in woodlands and in nurseries. Every spring I search the woods around Stockholm, the Swedish capital, for new variations. It is hard to find really garden-worthy forms, but by now I grow some of them together with a nice collection of named cultivars. (You can find images of my collection at http://www.abc.se/~m8449/anemone.html#nemorosa.) Since *Anemone ranunculoides* looks a lot like a yellow *A. nemorosa* and has the same cultural needs, I am including it in this discussion.

Anemone nemorosa is a common and much-loved spring forest flower in the temperate parts of Europe. It is a plant for the woodland and for the shady or half-shady rock garden. It comes into bloom some weeks later than *Hepatica nobilis*, but occasionally one can see the two species in bloom side by side. In Stockholm, *A. nemorosa* usually blooms in late April or early May. In my garden, 300 km north of Stockholm, the flowers don't emerge before the end of May. They last 3 or 4 weeks, depending on how much moisture and sun they get. In summer the plants go dormant; this resting period arrives earlier in hot, dry climates than in cool, rainy ones.

Anemone nemorosa has a creeping, branched rootstock, and individual plants can spread to a diameter of up to one meter. It appears to me that the flowers are not very attractive to insects, and they don't seem to set much seed. Wood anemones obviously self-sow in nature, but I have never observed a seedling in my garden.

There are many variations in the size, form, and number of the sepals (the colored parts of the flower in this genus), in the height of the plants, and in the form and colour of the leaves. "Monstrosa" flower forms with multiple rows of sepals or sepaloid filaments are not unusual, and often the reverse of the flowers is tinted pink or claret. One can quite often find plants with flowers that change color from white to light or dark pink as they age. The flowers of the best such forms change to pink very early. Blue shades are less common, at least in Swedish forests.

Anemone ranunculoides is not as common in the woods as *A. nemorosa*, and it doesn't vary as much as that species.

The taxonomy of *Anemone nemorosa* and related species is a bit confusing for me. The valid genus name, according to *Flora Europaea*, is *Anemone*. Some sources, among them the Russian *Flora Sibiri* (*Siberian Flora,* 1993), separate these species into the genus *Anemonoides*. The best-known other species (or subspecies) in the group are *A. altaica* (*A. nemorosa* subsp. *altaica*) and *A. pseudo-altaica* (*A. nemorosa* subsp. *pseudo-altaica*). Other species are *A. amurensis* (*A. nemorosa* subsp. *amurensis*), *A. quinquefolia* (an American species), and *A. caerulea*. The only species I could find that is closely related to *A. ranunculoides* is *A. jenisejensis*, which grows in southern Siberia and northward along the Yenisei River.

Most interesting of the less-known species, I think, is *A. caerulea*, which according to *Flora Sibiri* has a well-defined distribution in western Siberia. This species has good blue, or occasionally white, flowers. You can find an image of it at http://www-sbras.nsc.ru/win/elbib/atlas/flora/791.html.

The following links offer maps of distribution in the Northern Hemisphere. *Anemone nemorosa* and related species: http://linnaeus.nrm.se/flora/di/ranuncula/anemo/anemnemv.jpg; and *A ranunculoides*, including *A jenisejensis*, at http://linnaeus.nrm.se/flora/di/ranuncula/anemo/anemranv.jpg.

The wood anemones are easy to grow and in mid-spring add pleasing color to the garden. It's not surprising that their many variations attract gardeners and plant collectors. One can find a great number of named varieties in gardens, but they are often mislabeled. When buying a cultivar, one needs to see the plant in bloom, either in reality or as an image. I now have, for example, four different plants with white, double flowers, all labeled 'Vestal'. The names 'Green Dream' and 'Green Fingers' also have been assigned to a number of different cultivars.

One usually buys these anemones as rhizomes in early fall. The first year after planting, the new cultivars may be disappointing. Colour forms are often pale the first spring. Most cultivars need a couple of years to become established and make a characteristic display. The roots should be planted as early as possible in not-too-dry humus, in shade or half shade, covered by 3 to 4 cm of soil.

Many of the cultivars with blue or pink sepals are similar and one doesn't need to grow them all. I myself grow—among other varieties—the following cultivars, which are offered by nurseries listed at the end of this article. I can recommend all of them! The blue 'Robinsoniana' has larger flowers than most other cultivars. 'Kentish Pink' deepens quickly to dark pink and is one of my favourite spring flowers. 'Viridescens' is a lovely form, the flower filled with small green leaves. 'Green Fingers' has white flowers with a ring of small, green leaves in the middle of the flower. 'Blue Eyes' is a beautiful double white form with blue "eyes" emerging in the center of the aging flower. 'Pink Delight' is a double light pink form which has been offered in Sweden in just the past few years.

Here are some named cultivars that you might find in nurseries (I haven't grown all of them). Blue forms of *A. nemorosa* include 'Robinsoniana', 'Allenii', 'Royal Blue', 'Bowles' Purple', and 'Lismore Blue'; pink forms are 'Kentish Pink', 'Lucia', 'Marie-Rose', and 'Rosea'; green forms, 'Viridescens' and 'Green Fingers'; and doubles, 'Vestal', 'Albaplena', 'Blue Eyes', and 'Pink Delight'. 'Pink Delight' is the first pink double I have heard of. The form of the flower is special and beautiful, but the coloring is very faint. One or two more pink doubles would thus be welcome!

Anemone pseudo-altaica 'Yuki No Sei' is a beautiful white double cultivar from Japan. *Anemone ranunculoides* has a semidouble and a double selection, respectively called 'Semiplena' and 'Floreplena'; it is also a parent of the natural hybrid *A.* ×*lipsiensis* (syn. *A.* ×*seemannii*).

So far I have never heard of a double blue *A. nemorosa*, but there seem to be some Japanese cultivars of *A. pseudo-altaica* with blue, semidouble flowers (e.g., see http://fukus.cside1.jp/00hana/1haru/00023.htm). I wonder also if it wouldn't

be possible to find at least some good semidouble forms among the Russian populations of *A. caerulea*.

Propagation of *Anemone nemorosa* is easy by division of the rootstock in late summer or fall. If seed can be obtained, it should be sown quickly (see this issue's article on growing hepaticas from seed for hints).

Sources

This is only a sampling of nurseries; I am sure that there are many more with excellent collections of wood anemones. Rhizomes are shipped with fall bulbs, so importing them is not problematic as long as they are handled properly so that they do not dry out.

Asiatica (USA), http://asiaticanursery.com
Blomstergarden (Sweden), http://www.blomstergarden.se (offers 'Pink Delight')
Christies (UK), http://www.christiealpines.co.uk
Edelweiss Perennials (USA), http://www.edelweissperennials.com
Munchkin Nursery (USA), http://www.munchkinnursery.com
Paul Christian (UK), http://rareplants.co.uk (many *A. nemorosa*, and *A. pseudo-altaica 'Yuki No Sei'*)
Peters Alpine Raritäten (Germany) has many varieties to offer, but their labels are more confusing than usual. There is, however, a nice gallery of images at http://www.alpine-peters.de/anemone/a_angebot.htm.
Pottertons (UK), http://www.pottertons.co.uk

Lithospermum caroliniense

James Jones, Lexington, Massachusetts

A number of years ago, during a hike in Colorado, I came across a portable rock garden that had calved from the crumbling bank behind it (photo, p. 186). I didn't bring it home with me, for practical if no other reasons, but I did take particular note of one of its components: the very attractive *Lithospermum multiflorum*. Why, I had to ask, wasn't this plant—clearly eager to leap into our gardens—one of the great standards?

I got one likely answer some time later, when I was told by a local botanical authority that the species tends to be cleistogamous; that is, its seeds are produced not from the open flowers but through self-pollination within other flowers that never open fully, a process perhaps best known in the genus *Viola*. Thus, the fertile flowers aren't showy and appealing to gardeners. That has to be far from the whole reason, however, given the willingness of at least the plant I photographed to flower. In any case, it was unavailable.

This changed in 2000, when I saw another species, *Lithospermum caroliniense*, listed by Seeds of the Plains, from a collection made in South Dakota. This is also yellow-flowered and of a similar size—the right size for a rock garden. I sowed it in December and exposed it to cold. It germinated in May, and one plant made it to the garden, where it bloomed in June 2004. It's growing in a typical rock gar-

den soil in an elevated spot, with a 60-cm (2-foot) wall to the south, and to all appearances it's thriving there (photo, p. 186).

The range of *L. caroliniense* is from New York to the Midwest; state-by-state references show it in Texas, Michigan, Arkansas, and other parts of that region. It is said to grow in dry, sandy soils. The only references to it in NARGS bulletins were so ancient as to be beyond my library. [The only entry for it in the index to the first 50 volumes leads us to a brief mention by Edgar Wherry on 17(1):59, "*L. caroliniense* [is] said to have larger and deeper hued flowers [than *L. canescens*], but it seems to be rare and hard to come by." —*Ed.*]

Lomatium minus

JANE MCGARY, Estacada, Oregon

The American West is home to around eighty species in the genus *Lomatium* (Apiaceae, the umbellifer family), commonly known as "desert parsley." Most grow in semiarid to arid habitats, flowering in spring when moisture persists. In summer they become dormant, surviving as a carrotlike taproot. The roots of some species, such as *L. cous*, were important for Native Americans, some of whom carry on the tradition of collection and preparing these foods.

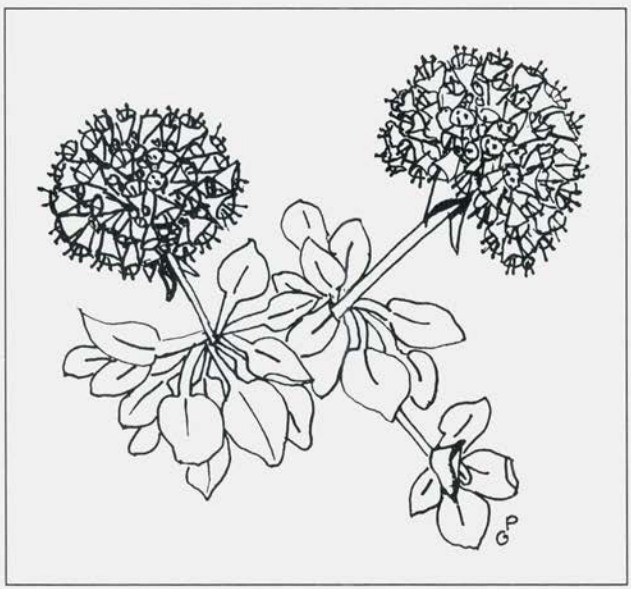
Visitors to the Columbia River Gorge between Oregon and Washington in springtime are always impressed by the large (to 3 feet/1 m) species *Lomatium columbianum* with its feathery, branched foliage mass and big heads of purple flowers. I've seen it grown in at least one rock garden—that of Geoffrey Charlesworth and Norman Singer in Massachusetts. In western Oregon, however, it is almost never seen in gardens; like many other plants of the Columbia Gorge and Columbia Plateau, it seems not to tolerate the wetter winters on the western side of the Cascade Mountains. And it's far too big for the alpine house.

Yet this spectacular plant has a close relative that is virtually a miniature of it. *Lomatium minus* (Rose ex T.J. Howell) Mathias & Constance is a narrow endemic, restricted to a small area in north central Oregon on the Columbia Plateau, and within it to a remarkably specialized habitat (photos, p. 185). Its finely dissected, silvery-glaucous leaves extend only about 6 inches (15 cm) above the surface, and its large heads of many purple florets appear just at the height of the leaves, with the scapes elongating as seeds ripen.

In the wild *L. minus* inhabits an unusual formation called biscuit scabland. Nearly circular mounds, mostly around 10 to 20 feet (3–6 m) in diameter, rise above the surrounding terrain; their origin is mysterious and has been variously attributed to frost action or ancient rodent colonies. Encircling the typical "biscuit" is a "moat," a fairly deep ditch filled with rocks of about fist size and little soil in the top 10 inches (25 cm) or more. In the stone-mulched moats, and almost nowhere else, grows *L. minus*. The sides of the biscuits are often home to the tall, handsome mariposa *Calochortus macrocarpus*.

About ten years ago I collected seed of *L. minus* beside Highway 97 near Shaniko, Oregon. Lomatium seed often fails to germinate, probably because the large seeds are eaten by insect larvae, but I obtained one seedling. After it went dormant, I planted it very carefully in a deep pot half filled with gritty soil and topped up with chunks of volcanic scoria (red "lava rock" used locally as a mulch). I plunged the pot in my bulb frame. The lomatium flowered in its fourth year from sowing and has bloomed every year since. I've repotted it once and it now lives in a plastic mesh pot, which seems to suit it even better than the clay pot; it still has a deep top-dressing of scoria chunks. The bulb frame protects it from excessive winter wet, though it is hand-watered while in growth, and probably gives the dormant plant a little extra heat in summer. It's a beautiful companion to the early spring bulbs around it. So far it hasn't set seed, but I keep hoping.

A good place to view this lovely rarity in the wild is the Nature Conservancy's Lawrence Memorial Grassland Preserve near Shaniko. (No seeds may be taken from this preserve, but populations exist in neighboring areas, such as the one my seeds came from.) The preserve contains biscuit scabland, remnant native grassland, rocky ridges, and rich swales. Its flora includes 165 vascular plants and a number of rare lichens. Those wishing to visit should contact the Conservancy's Oregon field office in Portland (tel. 503-228-9561).



Eriogonum umbellatum, drawing by Phyllis Gustafson

BOOKS

Creating and Planting Alpine Gardens, by Rex Murfitt. Wayne, PA: B. B. Mackay Books.

Reviewed by MELODY CLARKSON, Eugene, Oregon

Where to begin? This question applies both to building a rock garden and to reading Rex Murfitt's all-inclusive book, *Creating and Planting Alpine Gardens.* Just scanning the chapters suggests that the rock garden enthusiast who has not yet decided how to begin need look no further to answer that question: Begin with Murfitt's first chapter. The enthusiast who already has planted a rock garden might begin with his chapters on the nature of soils or on growing alpines under glass. I found I could jump in anywhere and peruse a topic of interest quite satisfactorily.

When I began the construction of my own rock garden a few years ago, I found I needed many pamphlets and books at hand. Discussions of rock placement and soil mixtures always led to further questions that required additional reading material. Rex Murfitt's primer offers a comprehensive discussion of all topics needed for creating an alpine garden, and the uninitiated rock gardener can succeed with no further references. For example, he mentions an ideal location for siting a rock garden, but proceeds to explain how one might also use flat ground, a base of clay, a less than sunny site, and even a site on a solid surface or slab. He describes the perfect rocks and their placement, but he doesn't discourage the gardener from going ahead with whatever material is available, as long as drainage and appearance are kept in mind.

For some, Murfitt may have broken the initial building process down into more basic elements than necessary, detailing instructions for practice with the selected stones and then directing stone-by-stone placement in the actual garden site. The extensive guidance might push a reader to skim ahead and miss a cogent remark; however, you can tell that the author very much wants the initiate's first rock garden effort to be a total success. To support this level of detail, he offers much excellent personal experience. What I find especially enjoyable is his use of personal comments to stimulate the thoughtful advance of the project. For example, he writes, "Imagine our small stones to be these great rocks where only a tiny part of each one is visible" (p. 42). Later in the book, referring to con-

tainer grown plants, he says, "There are two options: either put it in a larger container, or plant it in the rock garden" (p. 78). In his chapter on alpine houses and greenhouses, "Don't forget that everything has to be hauled in and out" (p. 113).

The detail is again intense in the chapter on raised beds, but here the steps advance without repetition. I know I would now have more success if I had thought about a few of Murfitt's concerns in advance: soil depth (too deep has its own problems), weep holes, content of rough fill, settling, and air circulation. Then the chapters on container gardening, greenhouses, and cold frames move the rock gardener into the realm of more demanding plants, but primarily they give a comfort level to simply growing favorite plants well. He offers many options for protection from winter wet or extremes in temperature other than a high-tech greenhouse, always stressing air circulation, with suggestions for accomplishing this in the simplest of structures. However, when it comes to soil mix, there's little room for flexibility. Murfitt does a fine job, clearly and efficiently, reporting on slightly different composts, their history, and their specifics. I will never grow my starts in "seeding soil" nor seed in my "potting soil" again, I promise! And the final words in the chapter on the specifics of soil leave the reader indelibly marked with the understanding that drainage is essential.

Unfortunately, the publisher hasn't risen to the level of the author. The underlining of the book's title on every left-hand page often disrupted my focus; I read it as a continuation of the text from the previous page. I much prefer a chapter title or chapter topic in the header, with more distance from the text and definitely not underlined. Perhaps monetary or time constraints compromised the editing and layout, but style changes in text (especially captions associated with pictures), missing words, and an excess of unnecessary commas compromise the professionalism of the publication.

Real expertise, however, is not lacking in the content. When Murfitt discusses winter hardiness and heat tolerance, snow cover and winter wet, dormancy, acclimatization, and planting time, the complexity of these topics surfaces, reinforcing the value of following the book's recommendations: "It all boils down to what the challenge of growing these plants means to you" (p. 124).

Both beginning and more experienced rock gardeners will regularly consult the final chapters, which specify the growing conditions needed by more than 250 herbaceous and woody plants, dwarf trees and conifers, and small bulbs. Rex Murfitt's enthusiasm effuses through many of the descriptions, differentiating his cultural guidance from the stuffier and more structured offerings found in many garden publications. He always points out which species do well for the less exacting among us, and which might require more diligence.

The amount of thought and the inclusion of every possible aspect of rock gardening that has gone into *Creating and Planting Alpine Gardens* certainly reflect the successes and failures of the author's own alpine gardening. He shares photos in black and white to illustrate text as well some color plates of a few tantalizing plants—none more striking to the alpine gardener than *Sempervivum octopodes*, stretched out in contentment on the cover, directing those wishing to grow alpine plants onto the gravelly path of success.

A Natural History of Ferns, by Robbin C. Moran. Timber Pess, 2004. 301 pp., 26 color plates, 145 b/w drawings, photographs, maps. ISBN 0881926671. Hardcover $29.95.

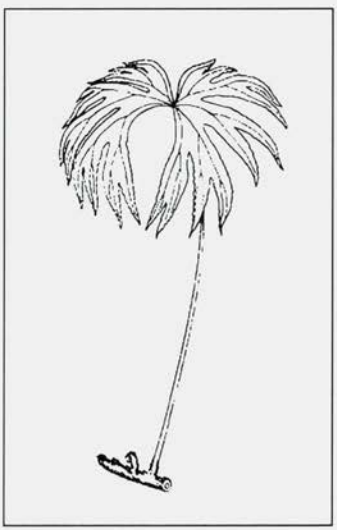
Reviewed by Tom Stuart, Croton Falls, New York

You are in for a treat with this collection of Dr. Moran's tales from ferndom. Why is Robinson Crusoe's island rich in ferns? Why is the hybrid log fern (*Dryopteris celsa*)—to take but one example—fertile, while others fail to procreate? Why do adder's tongues (*Ophioglossum* spp.) survive repeated collection?

What do *Cheilanthes feei, Pellaea atropurpurea,* and *Astrolepis sinuata* have in common? If you have been successful with any of these in your garden, you know they are dryland denizens of rock crevices. Another common feature is apogamy, a means of reproduction that circumvents sex and shortens the time from spore to adult fern, an advantage in arid environments. The chapter on apogamy begins, "Of all sexual aberrations, perhaps the most peculiar is chastity."

Bracken (*Pteridium aquilinum*) shares nasty properties with tobacco (*Nicotiana tabacum*). Both produce carcinogenic compounds, and both are enormously successful. Bracken is recorded in every U.S. state except Nebraska and in nearly every non-desert country of the globe. Its rhizomes delve more deeply than one would imagine—a meter or more—giving it resistance to drought, heat, and cold. It is also resistant to herbicides. Not a garden favorite! Though the fiddleheads are consumed infrequently in Europe and North America (sometimes by inexperienced foragers mistaking them for edible ferns), it is popular in Asia, causing not only cancer but also vitamin B_1 deficiency. Moran's chapter on this weed has many more noxious tidbits.

I grow *Pleopeltis polypodioides*, the resurrection fern, on a mossy rock well north of its natural range. Its capacity for resuscitation is part of its appeal. Here's a puzzle for the scientist in you: Why does the desiccated frond roll inward from the pinnae tips? What purpose does that serve? A neat series of experiments showed that the frond doesn't regenerate through root uptake, but from rain trapped and channeled into the lamina cells by the star-like scales on the lower surface (upfacing, now, owing to rolling). Chronicling the experiments, between the 1920s and the 1980s, by three researchers testifies to Moran's craft.



Potato ferns have to be among the more astonishing acts of creation, and little is written about them. When you Google *Solanopteris*, you get more results including Viagra than useful information devoted to this tuberous member of the Polypodiaceae. No doubt the inaccessi-

bility of these epiphytes in the rain forest canopy has something to do with lack of data, but *Solanopteris* also is symbiotic with the fierce *Azteca* ants. Moran writes: "If you poke the fern, even slightly, ants rush out of the stems and swarm over your fingers and run up your wrists until they find a tender place to clamp onto vengefully. They did that to me."

Several chapters illuminate evolutionary history. I'd heard that the term "fern allies" was no longer acceptable in polite company, monophyletically speaking; now they are "lycophytes." But it wasn't until Moran laid out the fossil and DNA evidence in "The Falsely Framed Fern Allies" that I understood why ferns are further from lycophytes than seed plants.

"Startling" is the right adjective for Moran's frequent focus on oddities like the whisk ferns (no roots or leaves), the "green steel wool" of the Appalachian *Trichomanes intricatum* (misplacing its entire frond generation), and the Mesozoic hanger-on *Dipteris conjugata*, which looks more like the peculiar composite *Syneilesis* than any fern.

Illustration is generous—145 line drawings or black and white photos and 26 color plates. Here is science writing at its best; one simply *must* have this book.

The Magic of Montana Native Plants: A Gardeners Guide to Growing Over 150 Species from Seed, by Sheila Morrison. Privately printed, 2003. 125 pp. Available from the author at Montana Native Plant Press, 3912 Lincoln Rd. Missoula, MT 59802 for $18.95 plus $3.00 shipping. Spiral bound.

Reviewed by WILLIAM H. KING, Salt Lake City, Utah.

This is the latest in a series of books by different authors on growing native plants for specific states or regions. Many of these books were motivated by the assumption that native plants are better adapted to local conditions than non-native ones, especially in drought years. This book differs from many others of its ilk by giving detailed instructions on growing each species from seed to blooming and is very useful in that regard.

The author spends the entire book demystifying the germinating and growing of Montana's "magic" native plants by systematically disclosing all the secrets she has learned about them over a 12-year period of testing them in her garden in Missoula, Montana. She describes her garden's test location as elevation 3200 feet, with 13 inches or less of precipitation per year and temperatures corresponding to USDA Zone 5, but she fails to describe what form of irrigation she uses. From the varied watering instructions for each species that she gives, we can only assume that she hand-waters most as needed. While many drought tolerant species appear in the book, there are also plants that need abundant water. Morrison also draws heavily on the experiences of other authors who have studied the germination and growing of specific species, such as Claude Barr and Norman Deno.

After an eight-page introduction with general instructions on germinating and growing techniques, the heart of the book is comprised of highly formatted sections on each of some 155 species, devoting about one-half page to each. Each species description includes scientific name, common name, life form, range of plant height, flower color or colors, root type, and blooming time. Next, Morrison gives detailed instructions on how to germinate it, both indoors and outdoors, followed by a comment section with some insightful observations about the species.

The species chosen for the book are a very diverse group of plants, mostly perennials from the plains, foothills, and mountains of Montana. Just over 40% of them are 12 inches (30 cm) or less in height and thus are of interest to rock gardeners. Some, in fact, are very choice rock garden plants, such as *Aquilegia jonesii, Douglasia montana*, and *Townsendia montana*. Many more of the species are in the 12–24-inch height range, and a few are as high as 5 feet (1.6 m) but may be of interest as garden backdrops. Individual information is given on fourteen species of *Penstemon* and six species of *Astragalus*.

Regrettably, several very rare species are included, and while growing them from garden seed may be all right, this may stimulate collection in the wild by some gardeners. Also curious is the inclusion of *Cirsium undulatum*, wavy-leaved thistle, usually thought of as an invasive species and listed in the book *Weeds of the West*. Missing from Morrison's book are any species of *Castilleja* (paintbrush), orchids, *Ranunculus*, *Pyrola*, or *Dicentra*, genera we would like to know more about growing. While all of the species listed in the book are native to Montana, many of them are also widespread in the western and plains states.

The book is well indexed by both common name and scientific name, and an appendix lists the 23 easiest-to-grow species. A bibliography is also provided. There are eight pages of color plates with photos of 94 of the 155 species. Though small, the photos are good enough to tell you a lot about the plant.

There is no list of seed sources, as one might expect, but rather an address for a list that will be provided by the Montana Native Plant Society at a minimal price. This seems a rather cumbersome way of providing this needed information.

Although there are some drawbacks to this book, it definitely seems to take native plant books another step forward in providing information useful for growing the plants, and I highly recommend it as a reference book for anyone interested in growing western plants from seed.

Design in the Plant Collector's Garden, by Roger Turner. Portland and Cambridge: Timber Press, 2005. 224 pp., color photos throughout. Hardback, $34.95 (available at a discount from NARGS Book Service).

Reviewed by JANE MCGARY, Estacada, Oregon.

The urge to collect and cultivate as many species as possible in a certain genus, family, or other category may be more prevalent among rock gardeners than in

any other self-identified group of growers. Thus, the reader comes to Roger Turner's new book with high hopes of discovering how to combine this urge with the desire to create a visually pleasing garden. The grower of alpine plants is likely to be disappointed, but the majority of NARGS members whose gardens also feature perennial borders, water features, and woody plants will find much food for thought here.

Disappointing is Turner's dislike of what one might call "domestic" rock gardens. He accepts the principle laid down by Reginald Farrer and other early English alpine specialists that a rock garden should imitate a natural formation in the mountains – presumably the Alps. He disdains the kind of raised bed described in David Hale's article in this issue of the *Quarterly*, though he admires the massive constructions in public gardens: "The rule of thumb is that unless you need a crane to lift them then the rocks are too small." As for the scree garden, "Has a lorry accidentally dropped its load of scalpings on its way to some road-building scheme? One hopes not." He recommends that alpines and other very small perennials be grown in formal raised beds and troughs rather than in the ground.

That advice is good when the garden space is very limited and the surroundings urban or suburban, a situation Turner generally assumes. Even though many of the uniformly excellent photographs were taken in large, often public gardens, he directs his book to the design of the typical English garden, which tends to be smaller than the average North American garden. Thus, readers wishing to place a plant collection on a small lot, perhaps as the result of "downsizing" in retirement, will like this book.

Essentially, Turner advises spreading many similar plants around the garden in various combinations with contrasting plant material, but he also understands the desire to curate a specialist collection (his enthusiasm is for *Euphorbia*). How to do this is illustrated not only by the generous spread of photos but also in information-packed text. Not all the cultivars mentioned are available in North America, however, and some of the material would not be winter-hardy in much of that continent.

We may object to Turner's near-dismissal of our specialty, but even an avid rock gardener like I will agree with much he says. For example, he is sensibly skeptical about the "meadow garden" that less practical garden writers often recommend, writing in the context of his chapter on bulbs: "Unless you live on a savannah, in prairie country, or on the steppes of Mongolia, meadows are a habitat that are made in partnership with man, depending on mowing or on the grazing of animals." Grammatical error notwithstanding, this is something people need to know. I recommend this book, with the caveat that most readers in North America will be tripped up occasionally by British-specific or excessively doctrinaire statements.

NARGS Coming Events

Eastern Winter Study Weekend: New York, NY, January 27–29, 2006. Hosted by the Manhattan Chapter of NARGS. Information: Jacques Mommens, PO Box 67, Millwood, NY 10546 / 914-762-2948 / nargs@advinc.com

Western Winter Study Weekend: Mary Winspear Centre, Sidney (near Victoria), BC, March 3–5, 2006. Hosted by Vancouver Island Rock & Alpine Garden Society. Information: garynwhite@pacificcoast.net; Claire Hughes, 2901 Colquitz Ave., Victoria, BC Canada V9A 2M2, 1-250-388-6594

International Interim Rock Garden Plant Conference and NARGS Annual Meeting: Snowbird Resort, Snowbird (near Salt Lake City), Utah, July 21–26, 2006. Sponsored by NARGS and hosted by the Wasatch Chapter. Information: Joyce Fingerut, 537 Taugwonk Rd., Stonington, CT 06378-1805, tel. 860-535-3067, alpinegarden@comcast.net

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