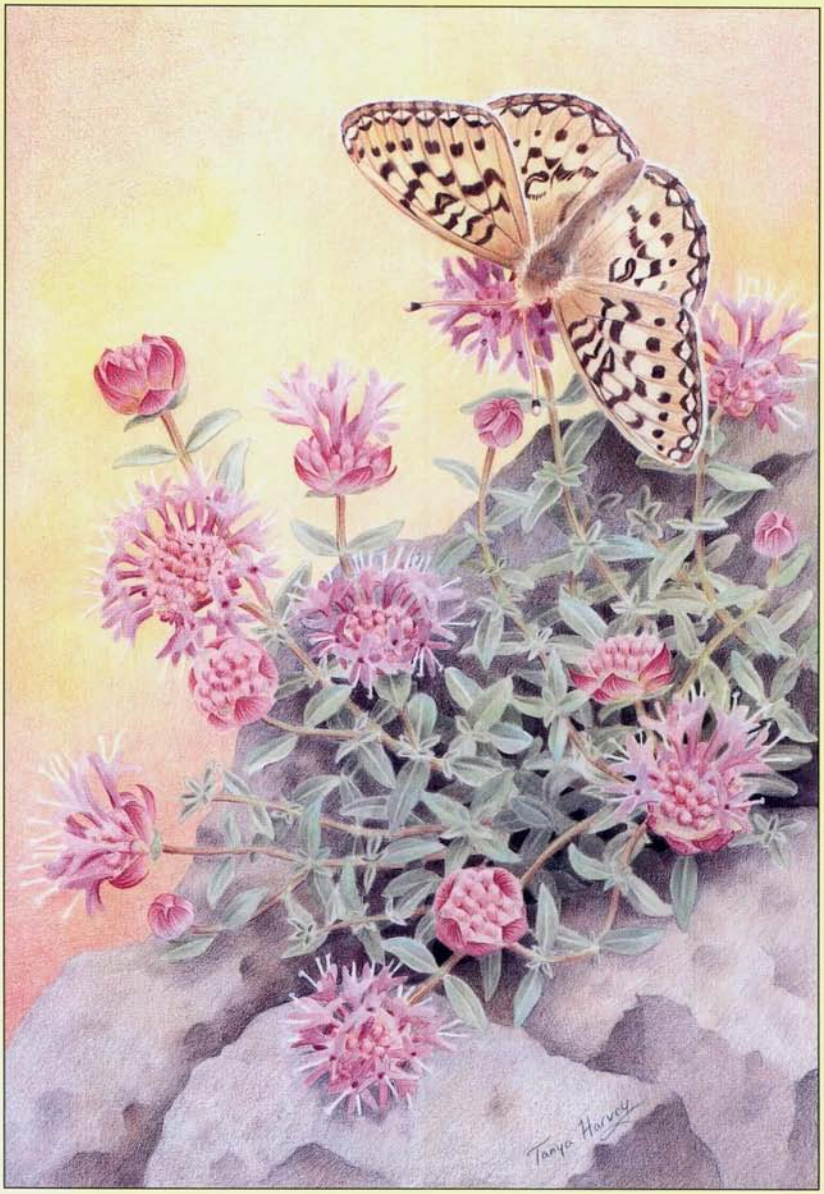
ROCK GARDEN *Quarterly*



Volume 60 Number 3 Summer 2002

COVER: *Monardella odoratissima* and Fritillary, painting by Tanya Harvey, Lowell, Oregon

Printed by AgPress, 1531 Yuma Street, Manhattan, KS 66502

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BULLETIN OF THE NORTH AMERICAN ROCK GARDEN SOCIETY

Volume 60 Number 3 Summer 2002

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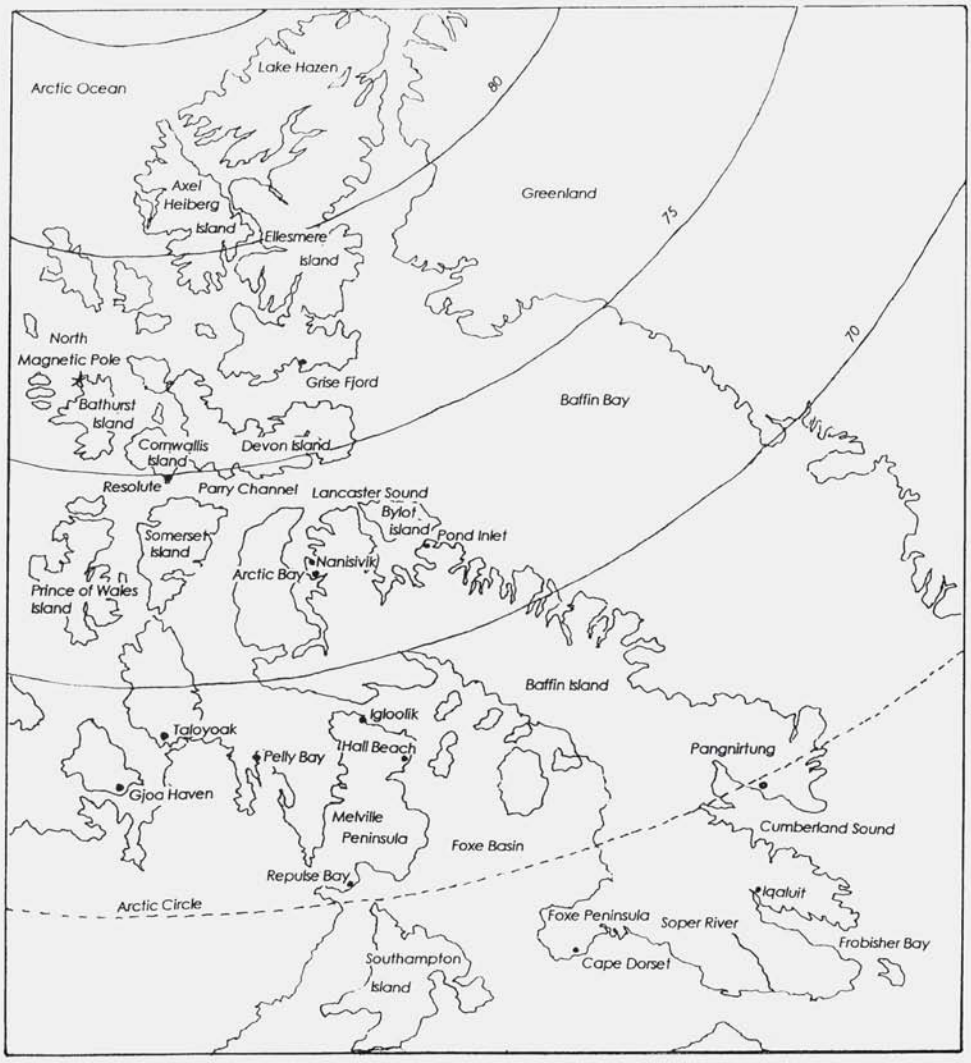


The High Arctic of eastern Canada. (Map by Louise Parsons)

The World's Biggest Rock Garden: The High Arctic

Joe B. Parks

Mention of the Arctic conjures images of vast expanses of ice and snow and nights that last for months—and that is a realistic picture for a good part of the year. But for a brief time there is also spring and summer, a time when the snow melts, the streams burble, the fish bite, the sun never sets, and plants burst forth. Though this region is best known for its animals and birds, it is the plants that make *all* Arctic life possible. Without plants, there would be no lemming, hares, muskoxen, caribou, or ptarmigan, and thus no snowy owls, ravens, foxes, or wolves, and likely even no polar bears.

I have been privileged to travel extensively in the Canadian High Arctic (75° North latitude and above) for several years. I've spent time at places ranging from Tanquary Fiord (about 82°N), Eureka, and Grise Fiord in the High Arctic to Iqaluit, Pangnirtung, and Cape Dorset in the Low Arctic (see map). I've not only photographed plants but have also taken their temperature, measured the light they receive, checked for ultraviolet fluorescence, and determined the pH of the soil and water. I'd like to share a few of my experiences in this rock gardeners' paradise. The smallest flowering plants I've seen are around the size of a raisin, and even the largest—centuries-old willows—are seldom more than a few inches tall.

Surprisingly, the High Arctic can be defined as a desert, having an annual precipitation (mostly as snow) of less than 15 inches (38 cm), with as little as 4 inches (10 cm) on some northern islands. Very little snow accumulates from year to year, and in the spring much of it melts so rapidly that it causes spring floods.

Although there are ice-capped mountains, much of the Canadian High Arctic consists of rolling, gravelly hills interspersed with exposed rock and canyons, so much like a moonscape that training for outer space exploration is conducted on Devon Island. Limestone dominates most of the areas I've visited. Fossils are common; there are several astounding ancient "forests" of stumps and fallen

timber that can be cut, sawed and shaped like any wood and lived when the Arctic was warm (see Jane E. Frances, "Arctic Eden," *Natural History*, January 1991, pp. 57–62); that on Axel Heiberg Island is particularly impressive. Ancient beaches lie as much as 180 feet (60 meters) above the current sea level, with old whale skeletons on even the highest. Ellesmere Island has several large ice caps with glaciers, as do Devon, Bylot, and Baffin. Some fiords are 100 miles (160 km) or more long, with glaciers in business at the top end.

Yet as harsh as this sounds, much of the land in the Canadian Arctic—probably at least 80 percent—is free of snow and ice in summer. As the climate continues to warm (as it has in the millennia since the last ice age), the land and water are becoming increasing open. These changes are now occurring at an increasingly rapid rate—and they are destroying the Arctic as we have known it.

Even where there is no ice or snow on the surface, there is plenty of ice underneath. From northernmost Ellesmere Island to Hudson Bay in the south, the ground is frozen year round a short distance below the surface. In much of the High Arctic, this permafrost is within 2 feet (60 cm) or less of the surface and extends down 900 feet (275 m) or more. I have seen ATVs (all-terrain vehicles, which have a clearance of only about 12 inches/33 cm) stuck in the mud, spinning their wheels on the permafrost. It is the presence of this permafrost that, in large measure, enables the Arctic desert to bloom.

In the areas where I've been, both soil and water are uniformly calcareous—usually around pH 7.2 to 7.5, and occasionally higher, to be expected where the dominant rock is limestone. Topsoil as we understand it is almost nonexistent. Soil nutrients, particularly nitrogen, are extremely low. Now that thunderstorms are occurring in the Far North, perhaps nitrogen levels will rise somewhat. In summer 2001, the first thunderstorm in living memory occurred at Resolute Bay.

The paucity of soil and nutrients is typical in a cold, dry climate where decomposition is glacially slow. Live biomass beneath the surface of this cold, dry ground is much lower than in temperate climates. The detritus we take for granted (dead plants, leaves, twigs, and other biological materials) isn't to be seen. The comparatively luxuriant plant growth seen around bird perches and animal dens shows just how infertile the Arctic soil is elsewhere.

The most prolific plant growth is usually at the foot of cliffs, where birds provide a plentiful nutrient supply. Plant bonanzas can also be found around permafrost seeps on south-facing slopes, in the glacial till below active glaciers, and on sandbars along streams. The densest vegetation of all is in the many bogs and swamps, which are dominated by grasses, sedges, and rushes.

Natural accumulation of organic material on the surface is further reduced by the wind-driven snow, which at Arctic winter temperatures has a texture a lot like grains of tungsten carbide. The snow particles ablate much of the detritus and carry it away as dust before it can decompose. Thus, very little on-site decomposition (the normal source of soil and nutrients for plants in temperate and tropical environments) occurs.

I once melted some old ice from the Parry Channel (the "Northwest Passage") and filtered out the entrapped microscopic material. (Old ice is easy to spot

because it is gray with trapped dust.) I expected to see fine grains of sand and bits of dust under the microscope, but I was surprised also to find considerable organic content. However, not all ablated material is trapped in sea ice and lost in the ocean. Clumping plants such as *Dryas integrifolia* and arctic willows have evolved a successful survival strategy to collect this blowing dust, or loess. The comparatively warm environment provided by these clumps and mounds of vegetation promotes some decomposition and doubtless maximizes nutrition in an environment otherwise desperately short of nutrients.

Regardless of the calendar, the Arctic summer can't start for most plants until the snow melts and the surface thaws, and in the High Arctic this doesn't usually happen until after the summer solstice. Summer is pretty well finished by the time the midnight sun drops low to the northern horizon. Thus, "summer" consists of six or seven weeks beginning in early July and ending by mid-August. Even this short period is broken by cold snaps, since freezing temperatures on summer "nights" are not uncommon. I remember photographing plants in a sleet storm in the last week of July 1999. In 2001, the hills around Resolute Bay were whitened on August 13, the day before I left. Even though it was mostly gone by noon, the snowfall must have effectively stopped plants' physiological processes.

Over all, you would think the High Arctic was an impossible environment for plants: a tough place to grow in, and a poor environment for pollinating insects. Moreover, arctic plants are cheated on both the amount and quality of the sunlight they receive. Whether in Kansas, the Sahara Desert, or the North Pole, everywhere on earth receives exactly the same number of hours of sunshine each year, but the *quality* of the light received in the polar regions is less, for three reasons. First, the low sun angle spreads the amount of light (photons) received per surface unit over a larger area in the Arctic; that is, there is less light per unit area. (The sun gives off the same amount of light in all directions, but the amount of light received at a given location depends on the sun's angle to the earth's surface at that point; the greater the angle, the larger the area over which the light is spread.) Second, the low Arctic sun angle causes sunlight to traverse much more of earth's polluted atmosphere, so it is degraded before reaching the surface. Third, although it has been suggested that the 24 hours of sunshine offsets this low light level (i.e. that 50 percent of 24 hours is the same as 100 percent of 12 hours), the midnight sun, at a much lower angle than the noonday sun, offers little to plants. I suggest that the electrochemical processes of photosynthesis are inhibited from late "evening" to "midmorning" (from about 9 p.m. to 9 a.m.). Once or twice, I've seen "night" temperatures in the 60s F (±17°C), but in clear summer weather, air temperatures at "night" typically range 10° or 15°F (5° to 8°C) below "day" temperatures. The result is "night" temperatures of about 38°–42°F (3° to 5°C)—a bit cold for a plant's complex biological processes.

I measured the amount of the sunlight received at Cunningham Inlet on Somerset Island (74.38°N) on a number of occasions. I found that the sunlight received per unit of level Arctic ground was only a little more than half (50.31 to 51.25 percent) of what it would have been were the sun vertically overhead; and

the perpendicular measurement taken for comparison was of light already degraded by the atmosphere. About two weeks later, I made the same measurements in Dover, New Hampshire (44.30°N) and found the difference here (though a week later in the season) was a bit over 85 percent.

The upper end of the northernmost islands (c. 85°N) has an average summer temperature below 40°F (4°C). At Resolute Bay, approximately 75°N, the average is about 51°F (10°C). This is colder than it sounds, with the low sun angle and the usual 10–20 mph (16–32 kph) wind, you're talking about a chill factor below the freezing mark. I usually have to wear a windproof jacket with three or four layers underneath, plus, when I'm out on an ATV, a down jacket and lined gloves.

Yet though air temperatures are low, the temperature regime at ground level is different, and this is why plants can survive and grow. On south-facing slopes and in sunny declivities out of the wind, I have recorded temperatures as high as 86°F (30°C). Overhanging, south-facing rock outcrops are even warmer. If the slightest bit of moisture is present, there is always a plant community.

Though it surely doesn't sound like much of a place to look for plants, the Arctic is a rock gardener's paradise. For example, I know of no airport, anywhere, that is as lovely as Iqaluit International when every square inch that is not a runway is covered with the luminous rose flowers of *Epilobium latifolium*. The arctic willows (*Salix* spp.)—43 species of them—with their gold or ruby catkins are an eye-stopper in flower and would grace any rock garden.

How do plants survive and manage to reproduce here? The answer is a true marvel. It is true that as you go farther north, the number of plant species decreases correspondingly, from perhaps 400 species at the tree line in mid-Canada to about 50 species in the northernmost parts of Ellesmere and Axel Heiberg islands. There is both a northern tree limit above which no trees grow, and a shrub limit above which *no* woody plants grow. Neither line is exact; they depend on local climatic conditions. Where there is permafrost, trees are unable to put down roots far enough, and above the shrub line, the growth of any woody material is simply too expensive. However, even in the extreme north, such as around Lake Hazen, there are "oases" of greater biodiversity.

The basic circumstance that enables the Arctic desert to support plant populations is the availability of water. Applying the word "desert" to the High Arctic is awkward; we need a better term for a desert climate that has sufficient ground moisture for plant growth. The High Arctic is not a "dry desert" insofar as plants are concerned.

First, there is the snowmelt. Wind-driven snow collects in depressions. Spring is slow in coming, but suddenly, for a few days, there are roaring torrents. The permafrost prevents the snowmelt water from soaking in, so it can only run off. In some places, rivulets flow for several weeks. There is always a tracery of plants along these little streamlets, though they look perfectly dry. In the driest, many plants have become dormant by the end of July.

Second, there are many bogs and marshes, from a few feet across to many square miles. Most marshes I've seen are on slight slopes or almost level areas.

They form through a complex interaction of permafrost and the surface freeze-thaw cycle. Complex dams, ridges, and hummocks are built over centuries and trap meltwater, which can't soak into the ground because of the permafrost, so eventually it creates a summer marsh. Marshes tend to be filled with dense grasses, rushes, or sedges—some with cottongrass (*Eriophorum* spp.), a beautiful sight. This heavy growth tends to suppress other low-growing plants—those we're most interested in. The ridges, hummocks, and dams themselves support a distinct plant community, but I've seldom seen many "rock-garden" plants on them.

Third, there are floodplains at the foot of most glaciers, and in summer, the glacial till below these is well watered. The stirred-up nutrients and fairly uniform water supply support a wide variety of plants and mosses.

Finally, there are many hillside seeps supplied by melting snowdrifts or permafrost, and many places, mostly along streams, where high, frozen banks and cliffs (clay, sand, and gravel) are collapsing as the permafrost melts. This instability is something relatively new. The presence of old arctic willows (some perhaps a thousand years old) along the top edges clearly indicates that these cliffs have been stable for millennia. A few plants take advantage of the damp edges of a collapse, but the best plant communities are found either on south-facing slopes where the seeping meltwater keeps the ground damp, or along the ice-cold streams in washes and valleys.

Surviving and Thriving in a Harsh Environment

The ways that plants survive, thrive, and reproduce in the Arctic is a wonderful lesson in adaptive behavior. They must adapt to a brief growing season often interrupted by freezing periods. Then the winters are an extreme test: not only must plants survive severe cold and total darkness, but also herbivorous animals. Finally, there is a paucity of pollinators. So how do they do it?

To start with, perennials are the norm; monocarpic plants are an anomaly in the Arctic. In any given summer, weather conditions may prevent a plant from producing flowers or new growth. Thus, a plant must have the internal resources to survive during periods—sometimes longer than a single growing season—that conflict with its needs. It is almost forced to be perennial. The rare arctic monocarpic plants survive by adopting a biennial strategy, growing the first year and flowering the second.

To survive, all plants either keep a low profile or grow in protected sites. By hugging the surface, they take maximal advantage of the sun's heat and avoid much of the wind. In the summer, in the usual breeze, the absolute temperature only 6–7 inches (15–18 cm) above the surface can easily be 40°F (25°C) lower than that at the surface. Some plants, such as the little wallflower *Erysimum pallasii*, make the most of both worlds by hugging the warm ground until seeds have formed, then growing a long stem so the wind will carry the ripe seeds away.

In winter, intensely cold and dark, there is no advantage (except for seed distribution) for any plant parts to extend above the snow. Gale-force winds are

common and the blowing snow is severely abrasive. Thus, any part of a plant that extends above the shallow snow cover is likely to be in trouble. Mat-forming plants like dryas are most successful in this environment. They can be found growing in nearly all Arctic environments, from the dry, wide-open desert to moist, sheltered nooks, and from the south to the northernmost shores. Growing as a mat gives a plant a substantial advantage in the battle with Arctic forces. It avoids the worst of the wind, traps and conserves the sun's heat, and traps wind-blown nutrients. It retains its own dead leaves for nourishment, and it makes its own mulch to conserve whatever moisture comes its way.

Since for plants, the name of the game is summer, the ability to trap and retain heat is probably the most important of a mat's advantages. I found temperatures within arctic dryas mats to be considerably above air temperatures, and often 6°–8°F (3°–5°C) above that of the surrounding surface. They achieve this with a dense, vertically oriented leaf canopy (if a 2-inch/5-cm high leaf cover can be called a "canopy"). The vertical leaves first trap the heat, then radiate it *within* the plant rather than back into the atmosphere. In addition, the dense texture of the mat slows the wind down to a whisper, further reducing heat loss.

Other plant forms trap heat, too. For example, I measured the leaf temperature of arctic poppies (*Papaver*) under varying conditions. Even in a stiff breeze, the surface temperature of a leaf was typically higher than that of the surrounding air (though not as high as that of the soil surface). However, no poppies and similar plants could match mat-forming plants in this respect.

Mats also can trap and retain the rare summer showers of rain, snow, or sleet. Not so obvious is their ability to trap and retain nutrients. They achieve this just as a snow fence traps snow—by slowing the passing wind. When the wind slows down, it drops some of whatever load it is carrying. Inevitably, a small amount of this material will be nutrients for the plant.

Investing heavily in roots is another way plants improve their chance of survival in the High Arctic. Frost heaving is a major problem for plants wherever the ground freezes, so many arctic plants have evolved long anchoring taproots.

The biggest problem for arctic plants, however, is climatic variability. Summers can be so short or so erratic that a plant may have difficulty in storing up the reserves needed for survival. Some willows exhibit series of very narrow growth rings, indicating that "poor" summers often occur in succession. Therefore, many plants have developed large, fleshy rootstocks to carry them through lean years.

Another survival technique, and a surprising one to me, is green winter leaves. At first, producing green leaves that will spend most of their life in total darkness seems to be a terrible waste of resources. But a plant that has green leaves "ready to go" the moment there is sufficient warmth and light (and this can even occur in melt cavities under the snow) enjoys a much longer growing season than do those that must produce new leaves in spring before they can photosynthesize.

Still another survival technique is the production of flower buds in fall. By the end of summer, for example, the arctic poppy has formed all its buds for the following summer. The moment the ground warms up, it's ready to reproduce.

Seed production in an arctic climate is not a sure thing, with the short growing season, erratic weather, and few pollinators. Not always able to produce seed during a given summer (or even successive summers), most arctic plants have evolved secondary means of continuing their species. They reproduce both sexually and asexually. Since asexual babies are clones, this forgoes the seedling adaptability that is very important in a harsh environment, but surely it's better to have produced a live clone than to die with no progeny at all. The viviparous knotweed (*Polygonum viviparum*) is a good example: it produces flowers (and hopefully seeds) at the top of the stem, and bulbils lower down, ready to take root and produce an identical plant as soon as they fall to the ground. These tiny bulbils, not much larger than a glass pinhead, were a food staple of the Inuit.

The same problems that stress plant life also stress insects. Although in the lower Arctic there are zillions of insects such as mosquitoes and midges, all of which can act as pollinators, I have seldom seen more than one insect at a time in the High Arctic. There is so little standing water here, and what exists is so cold, that mosquitoes have difficulty reproducing. The literature says that bumblebees are a major pollinator, but I have not seen even one. There are butterflies and moths, but in all my visits, I have seen only a few dozen individuals. In my observation, flies are the major pollinator, at least in mid to late summer. I've seen small, dark-colored flies going from flower to flower, but so seldom that it's worth remarking on.

Thus, it might seem that the biggest area of competition among arctic plants would be attracting insects. Arctic poppy and dryas flowers (like our sunflowers) turn with the sun. It is often assumed that this is to attract pollinators, since flowers continually facing the sun would be warm for more hours of the day and thus induce more insects to visit. I have been unable to substantiate that assumption. The interior of *all* Arctic flowers I have checked—not just the poppies and dryas—is warmer than the surrounding air if the sun is shining, so on this point I am not sure that sun-facing plants have an advantage.

In fact, most arctic plants have evolved some means of maximizing the amount of heat and light obtained from the sun. Vase-shaped flowers such as the nodding saxifrage (*Saxifraga cernua*) would not have to move to collect extra heat. With its convex interior, the flower would automatically reflect the sun's rays down toward the nectary and the ovary for as long sunlight reaches the inside of the flower. Other plants, such as *Oxytropis*, have flowers arranged around the stem so that some are always facing the sun. Still others bear their flowers in a corymb, with some always facing the sun. Some choose sheltered spots facing the sun so that they are exceptionally warm, even when it's cloudy.

Perhaps these arrangements for collecting heat are not specifically designed for attracting insects at all. At Tanquary Fiord and again on Somerset Island, I watched flies working on flowers seemingly without regard as to whether a particular flower was in sun or shade. Every flower on a plant was visited before the fly moved on to another plant, nectar obviously being the prime attractant. Thus it may be that the primary purpose of collecting sunlight in a cold climate is to

improve the chances of completing the complex process of seed production. A plant has no control over when scarce insects visit, so pollination is as likely to occur late in the season as early. Without extra heat, seed production in the arctic summer would be difficult even if a plant were pollinated on the first warm day, but many plants do not flower until midsummer. If pollination does occur, a plant absolutely must be able to take advantage of it, regardless of the weather. A warm stigma to speed the pollen on its way, a warm ovary to speed up meiosis and cell growth, and a balmy temperature to assure rapid seed maturation are necessities for survival of the species. Remember, too, that the entire plant, not just the flowers, participates in heat collection.

Can you grow them?

Inevitably, my gardening friends ask, "How many plants did you bring back?" The answer is "None." There is no way that High Arctic plants are likely to survive in this more southerly latitude. Sure, our climate is warmer, and sure, we can provide proper moisture and perfect drainage—but that's not where the difficulty lies.

The fly in the ointment is the difference in the latitude. High Arctic plants are exquisitely attuned, genetically, to the growth cues provided at their native latitudes. The angle of the sun, the length of the day, and the length of the seasons are all unique, and this is what they have genetically adjusted to over the millennia—those that didn't, disappeared. These plants burst out of dormancy, produce flowers, mature their seed, and return to dormancy within an incredibly short period, and then remain dormant for a long time.

Growth cues received by transplants to our more southerly latitudes would be genetically confusing; our summer days are too short, the nights too warm, the light too intense, the growing season too long, and the dormancy period too short. They would be unable to respond effectively. Even though they would have a surfeit of warmth, sunlight, and nutrients, their genetic programming would not permit them to take advantage of it.

This is a problem that we too often ignore when selecting plants for our rock gardens. Clearly, survival is not just a question of temperatures and moisture. Survival depends primarily on how well a plant's genetic capabilities can adapt to the seasonal growth cues that it receives at a particular location.

Nevertheless, it is always worth trying a new plant. Raising a large population of seedlings maximizes the chance that you will obtain a few that are more adaptable to your climate. Moreover, some rock gardeners who live at high altitudes can take advantage of the well-known equation "altitude=latitude," which is an oversimplification but sometimes works. Arctic plants are likely to need shade, though, if grown at high altitudes in lower latitudes where the sunlight is more intense. The rock gardeners who enjoy the greatest success with these plants seem to be those who live in northern maritime regions, such as the coasts of eastern Canada and Scandinavia. Extremely good drainage must be provided,

though, since these regions experience much more precipitation than the High Arctic.

Some Plants of the High Arctic

Wherever you go in the world, a few species make up the bulk of the vegetation. In the High Arctic, it is willows that are ubiquitous, from the sorriest of habitats high up on dry hillsides to those where any Arctic plant could grow. My lack of knowledge about *Salix* is almost as vast as the genus itself, but I am told that only two of the 43 species of boreal willows inhabit the High Arctic. The one that I have seen most often is ***Salix arctica*** (photo, p. 194).

Arctic Willows are without any doubt the oldest living things in the High Arctic. To study their growth, I have collected many dead specimens (collecting a live specimen would seem like destroying an ancient redwood). Despite considerable variation in growth-ring width, these specimens typically have from 7 to 12 growth rings per millimeter; thus, they have required somewhere between 190 and 310 years to grow a single inch (25.7 mm) of wood. In comparison, a red oak in my garden averages 2 inches (5 cm) of radius growth in five years, a rate 60 to 100 times faster. Some arctic willows may be as old as the famed bristlecone pines of the southwestern United States. I have seen live willows with trunks as much as five inches (12.7 cm) across near the base, and a determined search would probably turn up larger ones. A plant with a trunk 5 inches across—even at the fastest growth rate I've measured—could easily be a thousand years old. (I use the word "across" instead of "diameter" because willows usually grow one-sided, probably because of snow blasting. Older willows often seem to have more dead wood than live, and after cross-sectioning a number of dead trunks, I've not seen a large one that has a center point with rings arranged around it.)

The arctic willow is a toughie. Though it is absent at the top of Ellesmere and Axel Heiberg islands (probably because the season is too short for wood production), I've seen it at Eureka (about 80°N). It is a creeper, but the branches often rise 6–8 inches (15–20 cm) above the ground. The fuzzy white catkins stand straight up above the plant and, like other Arctic flowers, collect solar heat.

The net-veined willow, ***Salix reticulata***, is not a true denizen of the High Arctic but is so choice I must mention it. A creeper seldom more than a few inches high, it has almost round, dark green, net-veined leaves. Its beauty lies in its erect red catkins; when they glow in the sunshine, the plant is a knockout. There is some variance in color: on some individuals, the catkins are a gorgeous ruby red. This willow should grow well in rock gardens, at least in Canada and the northern U.S.; I have seen it growing wild as far south as Newfoundland.

The arctic dryad, ***Dryas octopetala***, sometimes called "arctic avens" or "mountain avens," is, after the willows, the most common plant I've seen in the High Arctic. On dry flats and open hillsides, it and willows often are the only plants. Its mats often reach 2 feet (75 cm) or more wide but are usually no more than 2–3

inches (5–7.5 cm) high. The larger mats must be a hundred years old or more, but I've had no opportunity to measure their growth rate. The trapping and retention of heat and nutrients by the mats is discussed above.

Arctic dryas is possibly the most adaptable plant species I've ever seen. It grows from Mt. Washington in New Hampshire at 45°N to the High Arctic at almost 84°N, an almost incredible range of season length, temperatures, light quality, soils, and moisture. It grows in the acid, granitic, relatively wet soil of Mt. Washington, the limestone barrens of Newfoundland, and the arid limestone gravels of Arctic. Yet in spite of this adaptability, I have been unable to keep it growing for long here in Dover. Perhaps it is simply not genetically adapted to our long summers and short, erratic winters; possibly, too, the warm, humid summer nights of the low-elevation Northeast are not suitable.

Dryas flowers early in the season and is lovely in bloom, with pale, creamy flowers covering the low mats. The petals are translucent, so that the mats, seem to glow with an inner light, apparent at a considerable distance. After flowering, the seed heads with their puffs of twisted tails extend above the mats so the wind will carry them away.

The arctic poppy, ***Papaver radicatum*** (syn. *P. lapponicum*) is almost as common as dryas but is less frequent in the open "desert." Arctic poppies grow from well below the Arctic Circle to the High Arctic islands. I have seen it at Eureka (80°N), and it is listed as growing at Lake Hazen (82°N). Its flowers are usually a lovely pale yellow, though paler cream and even white ones are common. A colony of white poppies in a breeze is a particular delight. Occasionally I have found plants with bright green or green-striped flowers; supposedly, this occurs if the buds are damaged before opening. A single plant often has eight or ten stems, each 5–6 inches (12.5–15 cm) long, with a solitary flower at the tip. Other arctic flowers turn with the sun, but only the arctic poppy follows it for 24 hours every day. The seeds, held in a typical poppy capsule, depend for dispersal on the wind shaking the capsule. The capsules are deep and the openings around the top quite small, so a strong wind is necessary to shake the seeds loose—a neat way to ensure wide distribution.

The river beauty, ***Epilobium latifolium***, often called "dwarf fireweed," gets my vote as the most beautiful Arctic plant (photo, p. 195). I met it at Iqaluit International Airport on my first trip to the Arctic. As the plane emerged from the low-lying clouds, ahead lay a glowing rose-colored mass. As we touched down and sped along the runway, it looked as if we were landing in the middle of a beautiful tapestry. Since the airfield was not accessible, I searched for the plant during my short layover and finally found some growing near the school. The next time I saw it was over a thousand miles north at Tanquary Fiord, where masses of plants were sheltering coveys of young ptarmigan.

River beauty is a close cousin to common fireweed or willow-herb (*Epilobium angustifolium*). Its purplish-rose flowers are among the largest on any arctic plant, and certainly the brightest—a standout in the landscape even on a cloudy, foggy day. The plants are 8–10 inches (20–25 cm) high, and so floriferous that it doesn't take many to make a beautiful carpet. This species grows at high eleva-

tions in many parts of the American West and does well in rock gardens, though seedlings are tricky to establish initially.

Red moss (***Bryum cryophyllum***) is a real eye-catcher with its large, brilliant ruby-red cushions (photo, p. 194). In the sunshine, a clump of this moss has almost neon-like luminosity. It is most often seen mixed with a contrasting bright green moss, making it look all the more brilliant. When I first saw it, near the rough landing strip at Otto Fiord, I thought it was a glittering red candy wrapper discarded by some slob (yes, there is plenty of trash in the supposedly pristine Arctic). Walking over to pick it up, I discovered instead a clump of red moss catching the sunlight just right.

Contrary to popular belief, I have found mosses rather scarce in the High Arctic. The problem is water: with no shade except from rocks and cliffs, virtually no rain during the growing season, and constant drying wind, mosses have a difficult life. They often grow in damp spots in association with other plants, but here they are mostly rather insignificant. Where there is a slow-moving, continuous water supply, however, they form enormous, thick beds that may be centuries old.

Mastodon flower (***Senecio congestus***), a groundsel, is the most unusual flower I've seen anywhere in the Arctic. I saw it only once, and then accidentally. We landed for lunch at Igloolik, at the northwest corner of the Foxe Basin and just below the Strait of Hecla and Fury—not exactly High Arctic. As usual, I rushed through lunch and went exploring. The entire airport is built of gravel raised a few feet above the beach, as flat as my kitchen floor and probably more barren. I searched, but the bulldozers had done their job well. Vegetation recovery in the Arctic can take a hundred times as long as it does in a temperate zone. Giving up, I walked down the access road for exercise, and in an undisturbed grassy swale were tall yellow flowers that looked like some misbegotten cross between a dandelion and a thistle, each wrapped in great wads of shaggy wool. Mastodon flowers are very tall for an Arctic plant, about 2 feet (65 cm) high. The foliage is a low fuzzy rosette; the purpose of the fuzz is to trap and retain the sun's heat. Being tall is a way to ensure that seeds are well distributed by the wind, but it is doubtful that such tall plants would succeed in open, exposed situations on the Arctic desert; perhaps that is why I never saw it again.

The nodding bladder campion, ***Melandrium apetalum*** (syn. *Silene apetala*) is a real curiosity (photo, p. 193). Infrequent and not given to forming large colonies, it still catches the eye with its bright purple-and-white striped "bladders" (the inflated calyces) fluttering in the breeze. They look much as if someone had hung out a bunch of diminutive Japanese lanterns for an elfin party. The petals are minuscule, so, to most observers, the calyx is the "flower." I speculated that this enlarged calyx had evolved to collect solar heat, but I found the interior of the calyx to be the same temperature as that of the surrounding air.

The saxifrages get the prize for the dicotyledonous genus with the most arctic members. There are least a dozen, of which I've seen seven in the High Arctic. Flower colors range from white to yellow to brilliant purple, with shapes from vase-like to buttercup-like. Some species grow as tight buns, others as large

cushions, and still others as solitary rosettes. Some have evolved specialized means of distributing their seed, and others have alternative strategies to ensure posterity.

The purple saxifrage, ***Saxifraga oppositifolia***, is the most common saxifrage in the High Arctic and certainly the most striking with its masses of near-fluorescent royal purple flowers. Growing as a cushion, it is especially efficient at collecting and holding the sun's heat, so, like dryas, it gets a jump-start from the sun very early in the season while moisture levels are still high. Thus, it is one of the first flowers to bloom in the Arctic, in early July. I have heard that in some places it forms such great swards that the land looks purple in the distance. It also flowers sporadically throughout the summer, so it is not uncommon to see cushions with both open flowers and dry seed pods at any time.

The spider plant, ***Saxifraga flagellaris***, flings out long red "runners," each with a baby plantlet at the end, giving the impression of a large, rather awkward red-legged spider. Its yellow flowers, like those of *S. cernua*, are solitary on the stem. Obviously, neither one depends heavily on seeds for propagation. I saw this plant in the mud of a permafrost seep on Somerset Island. It looks quite fragile—though no High Arctic plant could really be. From outward appearance, it may actually be shorter-lived than some of its cousins, so clones, though they reduce adaptability, may be its best means of ensuring the future of the species.

The nodding saxifrage, ***Saxifraga cernua***, is another member of the genus that uses multiple means of perpetuation (photo, p. 196). It produces a 5–6-inch (12–15-cm) stem with a single white flower perched at the top. Along the stem at every leaf node is a tiny bulbil, ready to drop off and grow. I've usually seen these as solitary plants growing in moist, protected locations. The only place I've seen an extensive colony was a small sloping ledge under a bird cliff; it was white with flowers, and one little black fly was feasting on the nectar. Sites like this, with plenty of fertilizer, continuous irrigation, and perfect drainage, are always plant-filled, but here the nodding saxifrage had crowded out just about everything but the moss.

The bog saxifrage, ***Saxifraga hirculus***, has clusters of glistening yellow cups that show up from quite a distance. The first time I saw it, on Devon Island, I was certain I had found my first High Arctic buttercup. Though its typical soggy habitat helps us identify the bog saxifrage, sometimes buttercups (*Ranunculus* spp.) grow in the same habitat, so to be certain, we have to examine the stem and flower interior. Tempting though this beauty is, and willing to germinate rapidly, few gardeners have ever made it happy.

Much more amenable to cultivation is the prickly saxifrage, ***Saxifraga tricuspidata***. It produces its yellow-dotted cream flowers fairly early in the season; later, the cluster of twin-beaked seedpods arising from its cushion of three-toothed leaves provides unmistakable identification. This saxifrage has a very neat way to distribute its tiny seeds over a period of time rather than all at once. Each "beak" has a very small opening, so that no matter how boisterously the seedpod is shaken by the wind, only a few of the seeds are released at one time. At least some should then fall to earth when growing conditions are the most propitious.

Other saxifrages I have seen in the High Arctic include the spotted saxifrage (***Saxifraga bronchialis***), which has white flowers, and the brook saxifrage (***S. rivularis***), which grows in tight buns and has lovely pink (and reputedly, making identification difficult, sometimes white) flowers.

Sulfur buttercups (***Ranunculus sulphureus***) are among the more dazzling High Arctic flowers (photo, p. 197). The large, shiny yellow cups are impossible to miss even on the dullest of days. The short-stemmed flower (about 3 inches/7.5 cm high) with its brown hairy calyx seems much more handsome than our familiar weedy buttercups. No doubt the shiny concave petals focus sunlight on the stigma and calyx, and the hairy cover helps to retain whatever heat is gained. The finest buttercups I saw were on Cornwallis Island, growing in the disturbed soil around a restored 5,000-year-old Thule Culture hut. There appeared to be no other buttercups in the vicinity, so I wondered if the disturbance turned up very old but viable seeds, or if the disturbed soil was more hospitable to newly arrived seeds.

The yellow anemone, ***Anemone richardsonii***, could be easily mistaken for a buttercup, particularly since it is the only yellow anemone in the High Arctic. However, where I have seen it, it has been associated with other plants (mostly grasses) in damp locations, whereas *Ranunculus sulphureus* has usually been out in the open with little competition. The anatomical distinguishing feature is that the anemone has petaloid sepals as opposed to the true petals of the buttercup.

The arctic daisy, ***Chrysanthemum arcticum*** (photo, p. 193), is unmistakable: a daisy is a daisy is a daisy (with apologies to Gertrude Stein). Though low-growing (about 2.5 inches/6 cm) and fuzzy-stemed, they look much like our familiar field daisies. I wonder if one could attempt to obtain a more compact garden plant by crossing the two?

Dandelions (***Taraxacum*** spp.) shouldn't have been a surprise, but still it was somewhat startling to see that our front-yard scourge is perfectly at home in the High Arctic. The only difference I observed in the arctic plants was their wine-red leaves, possibly a response to low temperatures. Actually, dandelions are extremely well adapted to arctic life. The fuzzy, compound flowers maximize heat retention; the fluffy seeds are adapted to distribution by arctic winds; the low-growing rosettes stay warm and are protected from the wind; and the fleshy root is a prime vehicle for carrying the plant through poor years.

Mountain sorrel (***Oxyria digyna***) grows throughout the Arctic. It has been reported at the extreme northern reaches of land, where it often has to survive summers during which the snow doesn't melt at all. The plants I've seen are only about 2 inches (5 cm) high, with rounded heart-shaped leaves, but in some parts of its cosmopolitan range they are much larger—up to a foot (30 cm). The flower stem is a showy russet red, with the flowers arranged around it like most docks. The leaves taste just like the "sheep shower" (sheep sorrel) leaves we used to pick and eat in our childhood rambles, and was, at one time, an important food for native people.

Viviparous knotweed (***Polygonum viviparum***) is described above in connection with its specialized reproductive strategy. This plant is often mistakenly

called "alpine bistort," properly the name of *Polygonum bistorta*, a plant of the western American Arctic and the Old World that is not found in North America east of the Mackenzie River Delta.

The arctic harebell, ***Campanula uniflora***, is the only member of this family that grows in the High Arctic. I saw it only once, in a meadow on Devon Island near the old Mounted Police station, but since it is low-growing and nestles among much taller grasses, it may simply be hard to see rather than scarce. Its lovely blue flowers grow one per stem, nodding slightly and more closed than those of most garden campanulas.

Thrift (***Armeria maritima***) is another plant that surprised me in the High Arctic. I was following a sulphur butterfly (probably *Colias hecla*) across a barren, steep gravel slope on Axel Heiberg Island. It led me on a merry chase to this small clump of pink flowers. Only after some study did I accept that it was thrift, absolutely identical to the plant that grows in our gardens—and on seashores all around the world.

Louseworts (***Pedicularis*** spp.), with their relatively tall flower spikes, are among the loveliest flowers in the Arctic. The flowers—which come in pink, lavender, yellow, red-purple, and even bicolored—look somewhat like dragons with wide-open mouths. Though I found only two species in the High Arctic—on Devon Island and nearby—louseworts become much more common as you move south toward the lower end of Baffin Island. Flame lousewort (***P. flammea***) has brilliant yellow flowers. Its 3–4-inch (7.5–10-cm) high whorls of dark red compound leaves would make it a desirable addition to any rock garden even if it never bloomed. I found it growing among grasses on dry, gravelly hillsides near Maxwell Bay and also on Beechy Island. The relatively large ***Pedicularis capitata*** (photo, p. 196) has a spike of 1.5-inch (4-cm) cream-colored flowers atop a whorl of compound green leaves. The "fangs" on the upper petal make the flowers look ready to grab any insect that comes near. I've usually seen it in moist situations. ***Pedicularis sudetica*** (photo, p. 196) is far the loveliest of the genus, but the only place I've seen it growing is below the Arctic Circle on Cape Dorset. Its bicolored flowers grow spirally around a 6–8-inch (15–20-cm) spike. The upper portion of each flower is red and the lower part pink. This lousewort seems to prefer grassy meadows, where its stature makes it a stand out.

Moving to the mustards (Brassicaceae), we meet ***Parrya arctica***, a very showy plant (photo, p. 195). The 2–3-inch (5–7.5-cm) clumps of dark green leaves covered with lavender flowers would grace any rock garden. The long leaves are mostly vertical, an excellent method of trapping and holding heat. This *Parrya* always seems to grow high up on sheltered, south-facing damp slopes, out of the wind and warmed by the sun.

Draba species are supposedly quite common here, but I found them only twice. The first time was on Devon during a foray to the old Mounted Police station (abandoned after two successive "Mounties" committed suicide, supposedly because of the extreme winter isolation). The second time was on Somerset Island, where drabas appeared several times in the gravel beds along a deep gully. All were miniature plants, only an inch or so (3 cm) in diameter. The

drabas feature low rosettes, fleshy roots, and hairy leaves, all arctic trademarks. I'm surprised I didn't see more, but they are so diminutive, I may just have missed them.

Pallas's wallflower (***Erysimium pallasii***) is another plant that fooled me when I first saw it. Walking across a barren, desert hillside on Axel Heiberg Island (the same hillside where I found the armeria), I spied what appeared to be a cactus! I rushed over to inspect this incredible find ("Amateur discovers new Arctic plant . . ."), only to realize that I had spotted some long, almost pencil-sized brownish seed capsules growing haphazardly on a well-branched stem some 18 inches (50 cm) above the barren hillside. There were no flowers, and only a miserable basal rosette of leaves. Stumped, I photographed it and moved on.

Later at Eureka, where a robust plant was growing by the weather station entrance, I finally determined what it was. I have not seen this species in bloom, but it is described as starting out as a low rosette of almost stringy leaves, with buds and flowers tucked tightly into the center. Soon after fertilization, the scape starts growing, and by the time the seeds are ripe in late July, it can reach as much as 2 feet (66 cm) tall, covered with the curved, pencil-like seedpods. When the pods are torn to pieces by the high winds, the seeds are picked up and carried long distances.

The pink family (Caryophyllaceae) is represented in the High Arctic by the lovely campions as well as those scourges of our gardens, the chickweeds (*Cerastium* and *Stellaria*). Of the two campions I have seen in the High Arctic, the *Melandrium apetalum* is by far the more striking, but the little moss campion is much the lovelier. Moss campion (***Silene acaulis***), a cosmopolitan species that has produced some forms easily grown in rock gardens, has tight buns of grass-like dark green leaves, usually only 3 or 4 inches (7.5–10 cm) across, but I have seen them much larger. The buns probably would attract little attention, except that there always seems to be a few flowers open. I first saw this delightful plant in a wet meadow near Grise Fiord, so soggy that, even with boots on, I had to jump from rock to rock to get over to it. My other sightings have always been in moist locations, though this species inhabits drier sites in other parts of its range. The flowers, a lavender-pink that really stands out, completely cover a plant in full bloom.

The familiar chickweeds (*Cerastium* sp.) and starworts (*Stellaria* sp.), such a nuisance in gardens, are delightful in the High Arctic setting. Those I've seen are heavy bloomers and do not appear to be aggressive, perhaps because life at the margin is such a struggle. Anyway, they could sure teach those growing in my yard a thing or two. The long-stalked chickweed (***Stellaria longipes***) is truly elegant (photo, p. 196). With good reason, most Arctic plants seem to hunker down as if to ward off a blow, but not this plant! Its stiff 4–5 inch (10–12.5 cm) stems with blue-green, opposite leaves, and a single flower on top, stand at attention. The vigorous, showy clumps I've seen always grow in sheltered, south-facing locations, well out of the wind.

Arctic purslane, ***Honckenya peploides***, is another member of the pink family found in the High Arctic, where it was formerly an important indigenous food

plant. Well suited to arid conditions with its fleshy leaves, it amazingly survives the cold. The similarly fleshy southern purslanes (weedy members of the Portulacaceae) melt to the ground with the lightest of frosts, so these Arctic "succulents" have achieved quite a feat of genetic engineering. *Honckenya*, perhaps more interesting in fruit than in flower, is reputedly confined to sandy seashores, but I have also found it along stream banks and hillside seeps some distance from the sea. As opposed to the seashore mats, these inland plants are truly minute, with a big one being perhaps smaller than a quarter (about 22 mm). The fleshy whitish flowers contrast nicely with the apple-green leaves. Though little, the plants actually stand out in the drab landscape among the rocks because of their light-reflecting quality. One plant I photographed had flowers strung together in hose-in-hose fashion like a string of beads.

Conclusion

This article has offered but a glimpse of the many lovely plants in this beautiful, lonely land. I hope it intrigues you enough that you will go to see it for yourself before it disappears forever—for it *is* disappearing, and rapidly. What climatic change doesn't alter or annihilate, man may destroy.

The High Arctic is at the very cutting edge of climatic change. Even minute changes in such a hostile climate can radically affect plants that are genetically attuned to an existence that is marginal at best. I believe that much of the plant life seen today in the High Arctic will be significantly changed (or even made extinct) in the next century—and probably sooner rather than later.

Joe Parks lives in Dover, New Hampshire, where he has a tree farm and a garden that includes two rock gardens, a thousand or so rhododendrons (mostly his own hybrids), many perennials, and a large collection of wildflowers and ferns. He has hybridized many New Hampshire hardy rhododendrons, including the disease- and insect-resistant Cherokee series of deciduous azaleas. He also collects books on Arctic exploration before 1900.

Sources

Gardeners who want to attempt these challenging plants will find seed offered occasionally in the NARGS, Alpine Garden Society, and Scottish Rock Garden Club seed exchanges. For more sources, see the Winter 2002 issue of the *Rock Garden Quarterly* on Alaska.

The Cultivation of Some Himalayan Lilies

Chris Chadwell

In the summer 2001 issue of the *Rock Garden Quarterly*, I described five Himalayan species of *Lilium* that are suitable for rock gardens, as they occur in the wild. In this article, I examine the same species in cultivation, drawing on the experience of growers during the past two decades and on some obscure reference material. I hope to present a fresh perspective through the eyes of a modern-day plant hunter.

Lilium polyphyllum: The West Himalayan Lily

The handsome pendent, greenish-white flowers of this lily seldom grace our gardens, and it rarely finds it way into specialist society seed exchanges. Indeed, the 1982 edition of Bernard Harkness's *Seedlist Handbook* omitted it, as does the Royal Horticultural Society's *Plant Finder 2001–2001*, which lists nurseries offering unusual plants in the United Kingdom. This lily is covered in *The Bulb Book* by Martyn Rix and Roger Phillips (Pan/Random House, 1981), which boasts a fine photo taken in Kashmir by Oleg Polunin. Rix describes this plant as "not easy"; perhaps his including it had more to do with the availability of a fine photo than with its frequency of occurrence in gardens.

What explains its scarcity in cultivation, given that it has been introduced repeatedly over more than a century? Its abundance on the forested slopes around Shimla, the summer capital of the British Raj in India, led to numerous occasions when seedpods or bulbs ended up in the luggage of Victorian or Edwardian travelers returning from the foothills of the northwestern Himalaya. After all, *Clematis montana* was first introduced into cultivation by Lady Amherst from the same location as long ago as 1831, and it had become widely grown in England and America by the beginning of the twentieth century. The climatic conditions prevailing in its native habitat suggests that the West Himalayan lily might be expected to be the most amenable in our gardens of all Himalayan lilies. Plants that hail from the cooler, drier Western Himalaya are generally better suited climatically to much of North America (and most of England) than are

those originating in the humid, high-rainfall "monsoonal" Eastern Himalayan districts of Nepal and Sikkim.

One obvious reason may lie in the "delayed hypogeal" germination of *Lilium polyphyllum*'s seeds, as opposed to the "immediate epigeal" type that characterizes the other four Himalayan lilies discussed in this article. In epigeal germination, the cotyledon rises above the surface of the soil, often with the seed case still attached to its tip. At this stage, there is virtually no actual bulb. The first true leaf does not appear above the surface until the bulb has formed and the root system enlarged. In immediate epigeal germination, the cotyledon emerges in a short time, sometimes just a matter of days after sowing.

In the hypogeal type exemplified by *L. polyphyllum*, however, the cotyledon stays below ground, forming a tiny bulb with a root at its end. The bulb, without the aid of photosynthesis, survives the following winter before growth resumes. In this case, the first leaf that can be seen above ground is a true leaf. Understandably, most novice growers fare better with seed that exhibits rapid germination—especially when it's visible above ground! Maintaining pots of seed in optimal condition for more than a year is not always easy, and this may be why an inexperienced or inattentive grower (a description that applies to most gardeners from time to time) may fall at the first hurdle. Nevertheless, the complex germination process does not explain why specialist lily growers have not enjoyed greater success with the West Himalayan lily, since they exhibit the skill and determination to cope with what seed authority Norman Deno has called "two-step" germination.

Is the West Himalayan lily just more demanding than other lilies? According to Prem Nath Kohli, former proprietor of the seed company P. Kohli & Co. (est. 1928): "*Lilium polyphyllum*, of the Martagon section, is a rare and charming woodland lily . . . growing at an altitude of 1800–3600 meters. It is no beginner's lily, but is recommended to be cultivated by specialists. The 1.2-meter long stem bears an umbel of fragrant, nodding flowers in June, which are bell-shaped, and not nearly so much reflexed as most other Martagons. The flowers are dull yellow or greenish outside, and creamy white, beautifully spotted and streaked lilac inside and with red anthers. . . . While ordering the bulbs of *L. polyphyllum*, be sure that you receive them with roots and not like daffodils, narcissi or tulips. . . . Plant the bulbs in deeply dug, well-drained rich soil containing lots of rotted leaf-mould to which some ground sphagnum has been added. They should be planted in shade on a northerly aspect, amongst shrubs and ferns and protected from the wind. It is advisable to place large stones under and around bulbs to conserve moisture."

Among more recent experiences are those of the shareholders in my own Himalayan expeditions. We gathered only a modest quantity of this species' seed during the Kashmir Botanical Expedition of 1983 under the collectors' number CHP&W 93 (Chadwell, Howard, Powell and Wright), and during the Plant Hunting Expedition to Kashmir under CC&MR K23 (Chadwell and Ramsay); supplies were rapidly exhausted, leaving none for me to experiment with. It is hardly surprising that no one reported initial germination for *L. polyphyllum*,

which exhibits delayed germination; and shareholders tend to report results after the first season, but not thereafter. One exception was Mrs. Philippa Wills from Avon in the West of England, who wrote several years after receiving seed from Kashmir. She and her husband had raised five plants of *L. polyphyllum* CC&MR K23 and had flowered them in their garden; unfortunately, however, these lilies are no longer with them.

A couple of years ago I got back in touch with Malkolm Warrington, who lives not far from Heathrow Airport. He sowed seed of *L. polyphyllum* in April 1986, but nearly a decade passed before its first flowering; it now blooms regularly for him. The plants were only 7.5 cm (3 inches) high in 1993. His guide to cultivation is simple. When the plant dies down at the end of the season, it is left in its clay pot (10 cm diameter, when he reported) and is overwintered in a cold frame. About March or April, it is repotted in a mixture of fresh John Innes No. 2 compost (a British product based on sterilized leafmold, not available in North America) and gravel and left in an unheated greenhouse to grow on. It attains a height of about 60 cm (2 feet).

During the 1990s, some North American growers may have obtained seed of this species from the list of Jim and Jenny Archibald. Last year I met a member of the Alpine Garden Society who still has a plant raised from my 1980s seed; he told me that for several years he had given seed from his plant to the Archibalds. In *Lilies: A Guide for Growers and Collectors* (Timber Press, 1998), Edward McRae writes that the species has been grown in Albany, New York, and near Portland, Oregon. He, too, notes its difficulty, and recommends a cool, half-shaded exposure, good drainage, and deep planting.

Lilium nepalense: The Nepalese Lily

This has proven to be the most widely grown Himalayan lily, both as a distinct species and in its hybrid descendants. This is only fitting, in light of the magnificent deep garnet hanging bells it produces. Even a sober botanist such as myself cannot fail to be moved when encountering this glorious plant in flower. It is not endemic solely to the Nepalese Himalaya, as Jim Jermyn states in his recent book *The Himalayan Garden*; it is also found on rocky, scrubby hillsides in both Uttar Pradesh and Bhutan, as McRae correctly notes. It is recorded as having occasionally been cultivated in gardens near Darjeeling.

Narsim, a distinguished Indian seedsman, for half a century supplied seed of *L. nepalense* gathered in Kumaon to the firm of P. Kohli & Co., based in Kashmir. I was fortunate enough, in the company of Mrs. Urvahsi Suri, Kohli's daughter, to meet Shri Narsim, a wonderful gentleman, shortly before his recent death in his eighties. Since his late teens, he had made his home in and around the Narayahswamy Ashram, situated at about 2600 meters (8450 feet) elevation along a pilgrimage route to sacred Mount Kailash in Tibet. A few years ago, I received a fascinating letter from Alan Woodriff of Fairyland Lily Gardens in Oregon, expressing interest in Himalayan lilies. His father, Leslie Woodriff, who

had died in 1997, was one of the legends in hybridizing lilies, creating 'Black Beauty', 'White Henryi', and 'Stargazer'. Alan remembered, as a child, seeing *L. nepalense* in bloom—most likely supplied through P. Kohli, and thus thanks to Narsim. He recalled the unique color, but mostly the fragrance, noticeable for 100 meters or more at night but not detectable during the day. He had been told that it is pollinated by night-flying moths and adapted to attract them. (I can't confirm this.) After years of trying, Leslie Woodriff finally crossed *L. nepalense* with *L. speciosum*, producing 'Oriental Charm'. It is said to have an exquisite, almost indescribable fragrance; one flower can perfume a whole room, but the scent is still delicate. The hybrid is male-sterile, with anthers bearing no pollen. Alan Woodriff hopes to obtain sufficient seed of *L. nepalense* to raise several acres of blooming and breeding stock. I hope that seed collection Chadwell (CC) 3669, gathered in shrubby sites between 2700 and 3000 meters (8775–9750 feet) during my 2000 expedition to the Kailash Himalaya, will help him toward his goal.

I first collected seed of this lily during a 1990 expedition to central Nepal. Alistair McKelvie, former editor of the Scottish Rock Garden Club's journal and my collecting partner on that expedition, still has CC&McK 104 growing in his Aberdeenshire garden in northeastern Scotland.

Gary Fisher, who works for Cotswold Garden Flowers in Worcestershire, England, finds that *L. nepalense* seed is a bit "hit-and-miss" in terms of germination. When he has sown it on a damp surface at room temperature, no or only a few seedlings appear; success or failure is apparent within a few days. He has only grown this lily in pots, which must be deep because of its stoloniferous habit. He keeps the bulbs dryish during winter—a requirement also noted by Edward McRae in Oregon—and repots them in April. At repotting, they have to be turned around, or else the new shoots emerge from the bottom of the pots. (This underground wandering habit is an adaptation found in many lilies and probably "moves" the plant to new, more nutrient-rich soil.) The plants are kept well-watered while in growth.

One reason for the comparative success of the Nepalese lily in cultivation is probably the ease of vegetative propagation, an important consideration for commercial growers. Its stoloniform underground stem enables increase by stem bulblets. You only need well-nourished, healthy specimens, ideally well mulched with humus-rich compost, to succeed with it. Because the mulch needs to be kept moist, even in sunny summer weather, the addition of coarse sand may be advantageous. Some growers supply additional nutrients, in the past usually in the form of bone meal but now usually as commercial fertilizers. Do not disturb the young bulblets until the main stem has withered in late autumn. The main bulb can be left intact, and the fresh bulblets replanted as soon as possible.

The Department of Plant Research and Conservation in Nepal has been promoting plant propagation by tissue culture. *L. nepalense* has been raised to flowering by this method, resulting in specimens that were awarded a gold medal at the International Garden & Greenery Exposition held in 1990 at Osaka, Japan.

Lilium nanum: The Dwarf Himalayan Lily

References to *Lilium nanum* in the horticultural literature are few and far between, but the species is available commercially. Paul Christian, a specialist nurseryman in Wrexham, England, offers bulbs of three forms. The first he considers to be the typical form, apparently long cultivated in England; however, its polished deep chocolate-maroon flowers are hardly a typical variant, so I must express considerable doubt about this. The second is *L. nanum* forma *flavidum*, hailing from Sikkim, with soft yellow flowers; according to the *Flora of Bhutan*, vol. 2, part I, the flowers of this form in the wild are creamy white streamed with yellow or green. The third is a recent introduction from seed gathered in Bhutan that displays a smaller bell, more inclined to purple; *L. nanum* in Bhutan typically varies from deep reddish purple to lilac.

Although I have not yet seen *L. nanum* in flower in the wild, seed of it has been distributed from a number of my expeditions in the Eastern Himalaya. The first such collection was CC&McK 549, gathered by Alistair McKelvie at Gosainkund Lakes in Nepal in 1991. This seems likely to be the genuine article, since Alistair noted that the bulb had no tunic (thus ruling out confusion with *Lloydia*) but did have narrow scales, agreeing with the description of *L. nanum*. Another plant that grows in the same area and that can be confused with *L. nanum* in seed is *Fritillaria cirrhosa*, and I wonder which of these two the collections from my more recent expeditions are going to turn out to be. Some were named without benefit of the capsules to aid in identification. It should be realized that a majority of expedition seed has to be identified solely from material at the fruiting stage—the idea that plant hunters are able meticulously to "mark" individual plants in flower and return to gather their seed months later is largely a myth!

Many shareholders germinated CC&McK 549. Betty Jorgensen in New Mexico reported germination after 3–4 weeks at 21°C (70°F), with bulbs forming by late October of that year. A Mr. McWilliam from Northumberland, England, commented that despite their small size going into winter, most of his seedling bulbs had survived. Alistair McKelvie also germinated seed but regrettably could not keep the plants long enough to flower them. Jane McGary, editor of this journal, has flowered *L. nanum* (grown from garden seed) for several years in northwestern Oregon, growing it in a raised bed of sand, loam, and leafmold with an eastern exposure, where it survived temperatures of 5°F (–15°C).

Lilium oxypetalum: The Central Himalayan Lily

According to most accounts, Frank Smythe, a mountaineer and keen plantsman, was responsible for the first introduction of this lily from the Bhyundar Valley (christened the "Valley of Flowers"), though his seed may have been mixed with that of *Lilium nanum*. Bob Mitchell, writing in *The New Plantsman* (vol. 4, no. 3), states that Dorothy and John Renton flowered Smythe's collection at Branklyn, Perth (now a National Trust for Scotland property) about 3 or 4 years

after sowing in 1938. Six plants had yellow flowers; the remainder were purplish pink and spotted. Sealy subsequently named the purplish form as variety *insigne* from bulbs sent to Kew from Branklyn. According to Mitchell, that variety "is well established as a good, reliable plant for the peat garden, particularly in the north of Britain." (Mitchell's article contains several errors. The Bhyundar [not "Blyundar"] Valley is not in central Nepal but in Garwhal, in the Indian state of Uttar Pradesh. Furthermore, the range of *Lilium oxypetalum* extends eastward only as far as western, not central Nepal, as claimed in the article.)

Just what is *L.oxypetalum* var. *insigne*? I will take up this problem in a moment. First, we can note that although Smythe may deserve the credit for the first introduction of this variant, he was not the first European to return from the Himalaya with the typical yellow form. As far as I have been able to discover, that honor should go to another mountaineer, Marco Pallis, who brought back bulbs after his 1933 Ganges & Satlej Expedition. Pallis described the plant—found at Gangotri, close to the source of the Ganges—as a cream yellow dwarf lily. It proved new to cultivation and quite hardy. In his *Peaks and Lamas*, published in 1939, Pallis wrote that *L. oxypetalum* had flowered in the nursery of the well-known alpine grower Walter Irvine in Bromborough, Cheshire, England.

McRae, following Carl Feldmaier, states that *L. oxypetalum* var. *insigne* was introduced by George Sherriff from Simla in 1939. However, even though this introduction was assigned a Sherriff number, he was not in that region at that time. The person who deserves at least some of the credit is Tsongpen Lepcha, one of Sherriff's most skilled local collectors, who undertook the 1939 expedition alone, with minimal guidance. (His main goal was *Primula obtusifolia*.) Tsongpen gathered specimens of *L. oxypetalum* from rocky, open mountainsides in the Baspa Valley, in Kinnaur District on the Tibetan borderlands, about 150 kilometers (90 miles) northwest of Smythe's Valley of Flowers and about the same distance northeast of Shimla (the present spelling). Elevation and habitat around Shimla, though ideal for *L. polyphyllum*, are unsuitable for *L. oxypetalum*. The material sent back to England may or may not have included variety *insigne*.

It does seem that the plant known in cultivation as *L. oxypetalum* var. *insigne* originates in localities where both *L. oxypetalum* (the yellow form) and *L. nanum* are also found. More study, based on observation of the plants in the wild and of cultivated material raised from fresh seed collections, is required to resolve the remaining confusion. The most recently published field observations are by Henry Taylor in *The Rock Garden* (journal of the Scottish Rock Garden Club) for January 2002. His article, titled "Kinnaur: Rare Plants and a Puzzle," includes a photo, taken in the Baspa Valley, of what Taylor understands to be *L. oxypetalum* var. *insigne*—the first color illustration of this variety that I have seen. One does not have to be a botanical taxonomist or lily expert to see that it bears little resemblance to the typical *L. oxypetalum*, but could easily be a large form of *L. nanum*. I wonder, then, if variety *insigne* has much to do with *L. oxypetalum* at all? If it warrants being a botanical variety of anything, then *L. nanum* seems the prime candidate, as Taylor asserts. Sealy, who named it in 1952 based on a single cultivated bulb, broke a "golden rule" of taxonomy: not to come up with a

new forma, variety, species, or genus based on a single example. Given the capacity of lily breeders to produce hybrids in cultivation, might not *insigne* just be a hybrid between *L. nanum* and *L. oxypetalum*, perhaps a back-cross that resembles one parent closely? Taylor's photo does not suggest a simple first-generation hybrid with obvious intermediate characteristics.

As for cultivation, Gary Fisher reports no success with *L. oxypetalum* and assumes that his local climate in the southern half of England is too hot and dry for it. McKelvie does not know of many people currently growing it in Scotland, except for Henry and Margaret Taylor near Dundee. Paul Christian offers variety *insigne*, which he describes as opening pink and darkening as the flower ages (*L. nanum* darkens too.) He finds this the "easiest" of the dwarf Himalayan *Nomocharis*-like lilies, good in moist, half-shaded sites in the peat garden or under small trees, but not where the soil will dry out too much.

Should any NARGS members be privileged to attempt growing the Central Himalayan lily, the following field observations by Smythe (from *The Valley of Flowers*; London: Hodder and Stoughton, 1938, reprinted 1947) are worth taking into account: "Obviously it revels in the sun on well-warmed, well-drained [well-aerated is what actually matters] meadows and slopes, where there is plenty of fibrous material and rocks to feed its roots with moisture. . . . I set the men to work to collect bulbs and presently they had dug up two or three dozen with their ice-axes. It was not easy work, for the *nomocharis* [as it was considered to be then] bulb grows a full six inches [15 cm] deep and its favourite habitat is a dense matting of bracken roots and sometimes juniper roots between boulders. . . . Dr Cowan very kindly had a sample of soil surrounding the roots of *Nomocharis oxypetala* analysed. . . . It is slightly acid (pH=6.26) and moderately fertile as far as amounts of available plant food are concerned. It has a large amount of organic matter, the loss on ignition being 33.8%."

Lilium sherriffiae: Sherriff's Lily

This lily is now a rarity in cultivation. A restricted distribution, confined to monsoon-deluged slopes in the Eastern Himalaya, suggests that it is likely to flourish only in damper environs. I have no first-hand experience with it, and none of the Scottish growers I contacted are growing it. Bearing in mind the unique characteristics of Sherriff's lily and its reported ease of germination when it was first introduced, I am somewhat surprised. If the species still sets viable seed in cultivation, why is it not seen more often in gardens, especially under the favorable conditions in Scotland? McRae comments on its "swift demise in England" (which he speculates was due to virus infection) after it was raised from Sherriff's seed; has it met the same fate in Scotland?

A Note for the Future

I hope to submit more articles on Himalayan plants to this journal. Betty Jorgensen, from New Mexico, has suggested a feature on *Iris*, covering the species *I. clarkei, decora, goniocarpa, hookeriana, kemaonensis, lactea, milesii,* and *spuria* var. *notha*. Readers keen on hearing more from me about Himalayan representatives of a favored genus can contact the editor. Any input about your experiences growing Himalayan species of known provenience, no matter how informal or brief, would be invaluable.

Feedback from growers does more than assist other gardeners. For example, I am advising on the cultivation of species utilized in Tibetan medicine in various parts of the Himalayan and Tibetan borderlands. There is considerable enthusiasm these days for cultivating, in the interests of conserving wild populations, the plants used in traditional herbal medicines, which remain a primary form of health care in many of these regions. The local doctors are not accustomed to growing the higher-elevation species. Over the past century, Western plant hunters have explored the mountains for species of ornamental merit, a majority of which are also used by herbalists. With the aid of the Sino-Himalayan Plant Association, I am accumulating records and gradually "putting something back" into the countries where these rock-garden subjects originate.

Chris Chadwell has been a plant hunter in the Himalayan regions for more than two decades and has operate Chadwell Seeds (see below) since 1984. He has served as a botanical and horticultural advisor to government organizations in several Himalayan countries.

Sources

SEED:

Chadwell Seeds, 81 Parlaunt Road, Slough, Berks. SL3 8BE, UK.

Jim and Jenny Archibald, 'Bryn Collen', Ffostrasol, Llandysul, Dyfed SA 44 5 SB, Wales, UK

Scottish Rock Garden Club, SRGC Membership Secretary, 43 Rubislaw Park Crescent, Aberdeen, AB15 8BT, Scotland, UK (overseas membership, US $25 annually)

BULBS:

Paul Christian Rare Plants, PO Box 468, Wrexham LL13 9XR, UK <www.rareplants.co.uk>

Domaine Joly–de Lotbinière: A new home for alpines in Quebec

Dave Demers

Surrounded by the greater Quebec City, the provincial capital, and the *Centre du Québec*, Lotbinière County offers many different sights. To the north, its landscape is shaped by scenic views over the St. Lawrence River, with the old Laurentian hills in the distance. As one goes south through flat and forested farmlands, the Appalachians begin to rise. Agriculture is the dominant economic activity. No peaks capped with eternal snow, no dramatic waterfalls, and no megalopolis: Lotbinière is peaceful, little changed over the past two centuries. The subject of this article lies in the extreme northwest of this county, near the St. Lawrence River and between the villages of Sainte-Croix and Lotbinière.

In 1828, a young Frenchman of Swiss origin, Pierre-Gustave Joly de Marval, a successful champagne merchant, married Julie Christine Chartier de Lotbinière, heiress of the Seigneurie (estate) de Lotbinière in "New France," or French Canada. After almost 20 years of negotiations with colonial farmers, they acquired a piece of land adjacent to their estate. Named "Pointe-Platon" by Samuel de Champlain himself, founder of Quebec City, this site was worth waiting for. Three major plateaus supported by 100-foot cliffs form the very tip of an imposing peninsula shaped by glaciers and their residual deposits. This peninsula is blessed with a remarkable maritime microclimate, with rich, deep clay soil, and with abundant water, as well as its amazing 270° panorama of the river. A summer house and its outbuildings were built in a picturesque style, then modified often from 1851 until the 1950s.

During those years, the surrounding wilderness was gently divided with long curving paths, framed with plantations of exotic trees, dotted with a garden pavilions, and beautified with a large *potager* (kitchen garden) and flower beds. Five generations of *seigneurs* (estate-owners) left their personal imprints on this landscape. Architectural details reflect their many travels in the Middle East and Europe; century-old trees and experimental plantations confirm their dedication to conservation and the latest advances in forest management; and carpets of lily-of-the-valley, *Bellis perennis,* and periwinkles are living witnesses to vanished gardens.

After more than 25 years of neglect, the Domaine Joly–De Lotbinière now shines again. A private nonprofit organization, the Fondation du Domaine Joly–De Lotbinière, took it over from the provincial government in May 1998, and a major and much-needed restoration program was undertaken. As owner of the original 150-hectare (375-acre) property, the Fondation is proud to share its unique heritage: eleven original buildings, now enhanced with thematic exhibits and historic furniture; a natural preserve encompassing tidelands; an exceptional native forest of red oak, sugar maple, and American beech; almost 4 kilometers (2.4 miles) of trail along the river; the northernmost black walnut plantation; and historical gardens as well as new horticultural developments. A hundred volunteers, almost as many sponsors, and dynamic fund-raising activities make all these projects possible.

Within two hours' drive from Montreal and about 45 minutes from Quebec City, the Domaine is in a position to be a major component of Canada's contemporary horticultural world. An elaborate plan directs energy and attention in this realm. The central core garden surrounding the buildings is quickly being restored to its condition as in the early 1900s, while the *potager* welcomes historically inspired thematic gardens. Farther toward the Gardener's House and down to the river, the garden plan becomes more freely creative. A new specialty retail nursery, named "Quercus, autre chose, autrement" ("Oak, something else, another way," expressing innovation), operates in the century-old greenhouse. A Mediterranean garden centers the Prairie Ronde, an old agricultural field; beyond it is an Ericacetum (a garden of heaths and other ericaceous plants), a newly dug pond, and an extensive shady woodland garden. Some specific plant collections and trials have been initiated, and new service greenhouses envisaged. A specialized horticultural internship will be launched very soon—the first of its kind in Quebec.

Into this lively garden activity, enter NARGS. One of the first of all these exciting projects to be realized is our brand-new alpine trough garden. Blessed with a generous grant from the Norman Singer Endowment Fund in 2000, in 2001 we introduced more than 22,000 visitors to the fascinating world of alpine gardening. Strangely enough, Quebec is considered by many as the last frontier for alpine gardening in North America. Not that our climate, with a temperature range over more than 65°C (105°F) and abundant snowfall, is not suited for alpines, nor that Quebecers aren't avid gardeners. In fact, alpines grow marvelously well in most of the province, and our people are, according to official surveys, among the most garden-loving on earth. Perhaps alpine gardening was considered an "English" hobby until recently. As a proof that this has changed, we now have our own NARGS chapter—the only bilingual one!

Alpine and rock gardens are still a rare enough sight around here. One immediately thinks of the Montreal Botanic Garden and of Les Quatre Vents in Charlevoix County, both with world-famous rock gardens. In addition, a few great private alpine gardens and nurseries can be found, featuring the most exotic gems. But there was still a gap to be filled: a garden open to the public, outside Montreal, with a human-scale approach. This is exactly what our initiative aimed at.

The new trough garden is a focal destination point at the end of a long allée of mature oaks, in front of the greenhouse and two steps from of our busy holding beds (photo, p. 198). The overall site, as any designer would agree, speaks out in terms of right angles: a square house, a typical long rectangular glasshouse, linear ditches flanked with tall vegetation, and a large rectangular lawn cut by six imposing rectangular beds make the straight line the *mot d'ordre* ("password"). This was our starting point.

Our meeting with the team of Oser l'Auge was fundamental. They gave us invaluable assistance by creating and sponsoring a good part of the production of the 16 troughs we requested. All quite formal in outline, these troughs range from 12 to 48 inches (30–120 cm) in length. (We jokingly compare the biggest ones to small bathtubs.) Made of hypertufa with a hint of cement coloring for the desired gray tint, some of these containers have planting holes artistically carved in their sides. Within a square plot of 10 by 3.5 meters/yards, bisected by a blue flagstone path, these troughs were arranged in groups or as isolated specimens. The surrounding ground was shaped to smooth the troughs' bold lines.

The idea behind the placement of these troughs was, basically, to create two different soil environments. On the south side of the path, the largest section, we sought alkalinity; on the north side, a slightly low pH was the target. Coarse river sand, crushed baked clay (Turface™), peat, compost and Mycorise™ (a bacterial product that enhances mineral absorption by plants) were the main ingredients of the soil mix. The troughs on both sides enjoy full sun almost all day long. However, since some of the taller troughs rise up to 30 inches (75 cm), plenty of sheltered pockets, cool and partly shaded, are created. We soon discovered that those microclimates are also protected from the sprinklers, resulting in some problems keeping them irrigated.

Of course, as in any respectable alpine garden, rocks are included. With great excitement and anticipation, we imported tufa rock and used it freely in several trough landscapes as well as on the surrounding ground. It is amazing how strongly visitors react to this rock, touching it and requesting some for themselves. On the low pH side of the trough garden, we placed some local rounded fieldstones, achieving a more subtle impression.

The worst nightmare of the whole enterprise was the top-dressing gravel. For more than a year, we have been searching for the right kind. Easy? No! Local quarries were useless, offering only the crushed rock used for road paving. We had to use this material for the first few months, with no great success. Finally, last November, just before our first light snowstorm, we hurriedly replaced the crushed rock with a fine beige 1/8-inch gravel. A delight!

The plant selection process took a while. It was a challenge to fill such a large and diversified space. We had to bring the whole trough garden up to a high level of interest for the opening, only a month after planting. Budget, availability, and cultural requirements were the main selection criteria. Once again, help flowed in. Donations and purchases from Quebec ARGS sales, from the Montreal Botanic Garden, from a couple of great nurseries, and from enthusiastic individuals totaled more than 300 plants. This wonderful selection contains

deciduous shrubs, dwarf conifer cultivars, some bulbs, and many herbaceous perennials. Of course, there is still plenty of room: plants will grow higher and spread out, while ever choicer specimens will be added.

Thermopsis barbata, a Chinese legume that has challenged even the best Scottish growers, will, we hope, soften the base of a medium trough. *Aquilegia grahamii* will, without much doubt, come back next spring. *Saxifraga cochlearis* 'Minor' will surely tighten into the densest bun. The highest trough will eventually be nicely clothed with *Dryas integrifolia*.

Quite new to us, this way of gardening brought its share of questions and challenges. Among them is plant identification. All over the "conventional" gardens, thin metal stakes hold discreet labels on which a number is engraved. This allows visitors to refer to a master list included in their guided-tour brochure. This method has proved to be gentle on our budget as well as on the overall appearance of the garden. A similar approach with much shorter stakes has been used for this trough garden. Thus, visitors can learn from and enjoy the garden without the strange feeling of looking at a plant cemetery.

As I write these lines, a welcome white blanket has settled down on the garden after a long, comfortable autumn. In a few months, we hope to discover the very first blossoms of the year, days ahead of any taller perennials—a spring we await most eagerly.

Dave Demers is Head of Horticulture at Domaine Joly-de Lotbinière, Sainte-Croix, Quebec.

Building a Hypertufa Rock Wall

Ev Whittemore

[*Editor's note:* Hypertufa, an artificial stone made of cement, peat, sand, and perlite or pumice, is a popular material for trough planters. For more recipes and directions, see the NARGS publication *Troughs*, a special issue of the *Quarterly* available in reprint form, and *Creating and Planting Garden Troughs* by Joyce Fingerut and Rex Murfitt, both available from the NARGS Book Service. In addition, the December 2001 issue of *The Alpine Gardener: Bulletin of the Alpine Garden Society* (vol. 69, no. 4) contains two articles by David Philbey on making hypertufa rocks and experimenting with hypertufa formulas.]

The hypertufa rock wall is a recent addition to the alpine house in our western North Carolina garden. The project began in September 2001, when I made 150 hypertufa rocks of various sizes. My formula was one bag of cement/sand premix combined with slightly less than an equal volume of dry peat with large impurities sifted out, mixed in a wheelbarrow with water to a fairly stiff consistency. This formula produces an almost unbreakable "rock." I formed the "rocks" by dropping large handfuls of the mixture onto a plastic sheet spread on the garage floor.

After the rocks had cured, I colored them with spray paint to make them look more varied and natural. The first coat was flat black, the second a quick "swish" of dark brown, and the third an even quicker application of dark green. I used "flat" or nonreflective paint for all three applications. We had already experimented with painting hypertufa rocks that were set out in the open garden and had found that the color persisted for more than a year, despite rainy weather and overhead sprinkling.

The foundation of the wall is a sheet of preservative-treated exterior plywood set up at the end of the alpine house. It is 4 feet wide and 3 feet high and has small "wings" on each side. The photo shows a temporary brace placed in the center to guide the angle of the wall; this was removed later. At this angle, the planted area is 6 feet from top to bottom.

For the backfill, I mixed my usual rock garden soil: 3 parts cheap topsoil, one part Nature's Helper (finely chopped bark), two shovelfuls of creek sand, and

Construction of the hypertufa rock wall, showing treated plywood backing, irrigation pipe about to be buried, and painted hypertufa rocks. (Ev Whittemore)

two shovelfuls of granite poultry grit. I had to mix many wheelbarrows of this, but with no complaint, because I know this form of exercise is good for the waist.

After I had raised the fill and the closely set rock face about 1 foot (30 cm), I laid a 4-inch-wide bed of cleaned granite grit on the soil medium and placed along it a 1.5-inch diameter black PVC sewer pipe in which I had drilled two staggered rows of 1/8-inch holes approximately one inch apart. I capped one end of this pipe and fitted the other end with an accessible elbow in which I can add water and liquid fertilizer. This will provide subterranean water, much like an alpine moraine, for the roots, while the foliage remains dry. A second, identical pipe is installed about 1 foot higher up the wall. The area above that can be watered from the top of the bed with a hose.

The rocks are very closely laid in "crevice" style. Small plants were tucked in among them as the wall rose. Included are some ferns (*Asplenium ebenoides, Adiantum aleuticum* 'Subpumilum'), *Primula allionii* seedlings, Porophyllum saxifrages, *Gypsophila nana, Draba rigida, Iberis sayana, Haberlea rhodopensis* subsp. *ferdinandi-coburgii, Androsace mucronifolia, Androsace* 'Millstream', *Townsendia jonesii* var. *lutea*, and numerous other little plants that will do best with some protection from overhead moisture and sun.

The Whittemore garden in Penrose, North Carolina, is a treasure house of ideas and projects accomplished by Ev and her husband, Bruce. She has prepared slide programs on the garden for the NARGS Slide Library.

Chrysanthemum arcticum (p. 175) on Devon Island in the Canadian Arctic. (Joe B. Parks)

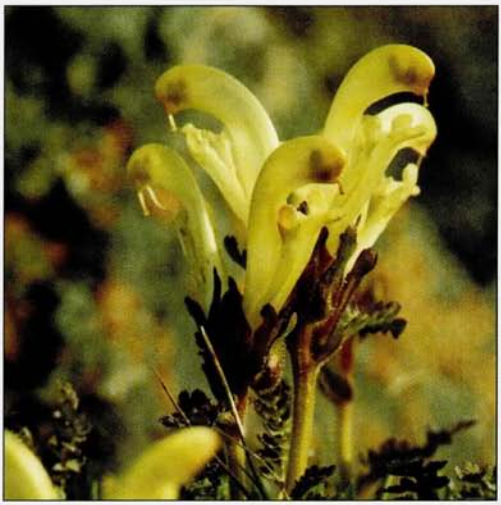
The showiest feature of *Melandrium apetalum* (p. 173; syn. *Silene apetala*) is the expanded, striped calyx. (J. B. Parks)

Contorted specimens of *Salix arctica* (p. 171) on the High Arctic islands may be centuries old. (J. B. Parks)

A colony of arctic mosses features crimson *Bryum cryophyllum* (p. 173). (J. B. Parks)

Parrya arctica (p. 176), a beautiful dwarf wallflower of the High Arctic. (J. B. Parks)

Epilobium latifolium (p. 172), the dwarf fireweed, is the showiest flower in the High Arctic. (J. B. Parks)



Pedicularis sudetica (left) and *P. capitata* (right) are among the many arctic louseworts (p. 176). (J. B. Parks)

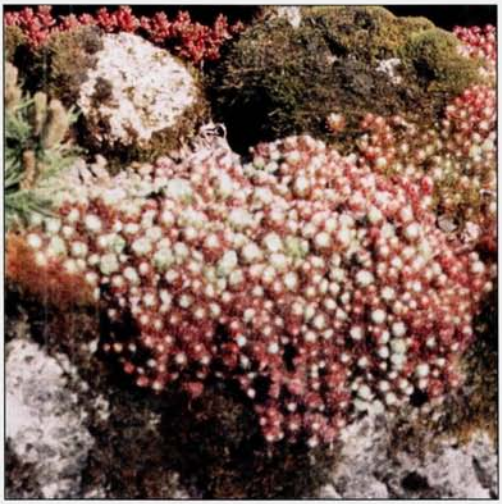
Stellaria longipes (left; p. 177) and other dwarf, large-flowered chickweeds are surprisingly pretty components of the arctic flora. *Saxifraga cernua* (right; p. 174) opens delicate flowers in the brief summer. (J. B. Parks)

Ranunculus sulphureus (p. 175) flowers on Resolution Island in the Canadian Arctic. (J. B. Parks)

Lichens, shown on the Seward Peninsula, Alaska, are a prominent and even colorful element in the High Arctic biota; a review of *Lichens of North America* appears on p. 222. (J. McGary)

Newly planted troughs at Domaine Joly-de Lotbinière (p. 187). (Dave Demers)

Cypella peruviana (left; photo, Tony Avent) and *Alophia drummondii* (right; photo, Rodney Barton) are among the many colorful bulbous irids well suited to the Southeast (p. 206).



A trough garden (above left) at Iseli Nursery in Oregon features *Sempervivum arachnoideum* (p. 208) with conifers. (Jan Noyes) Warm-climate irids feature brilliant colors: *Gelasine azurea* (above right); a large colony and detail of *Cypella herbertii* (below; p. 206). (Tony Avent)

The wild form of *Tigridia pavonia* (p. 206). (Tony Avent)

Oxytropis multiceps (p. 218) growing in a chunk of tufa. (Anne Spiegel)

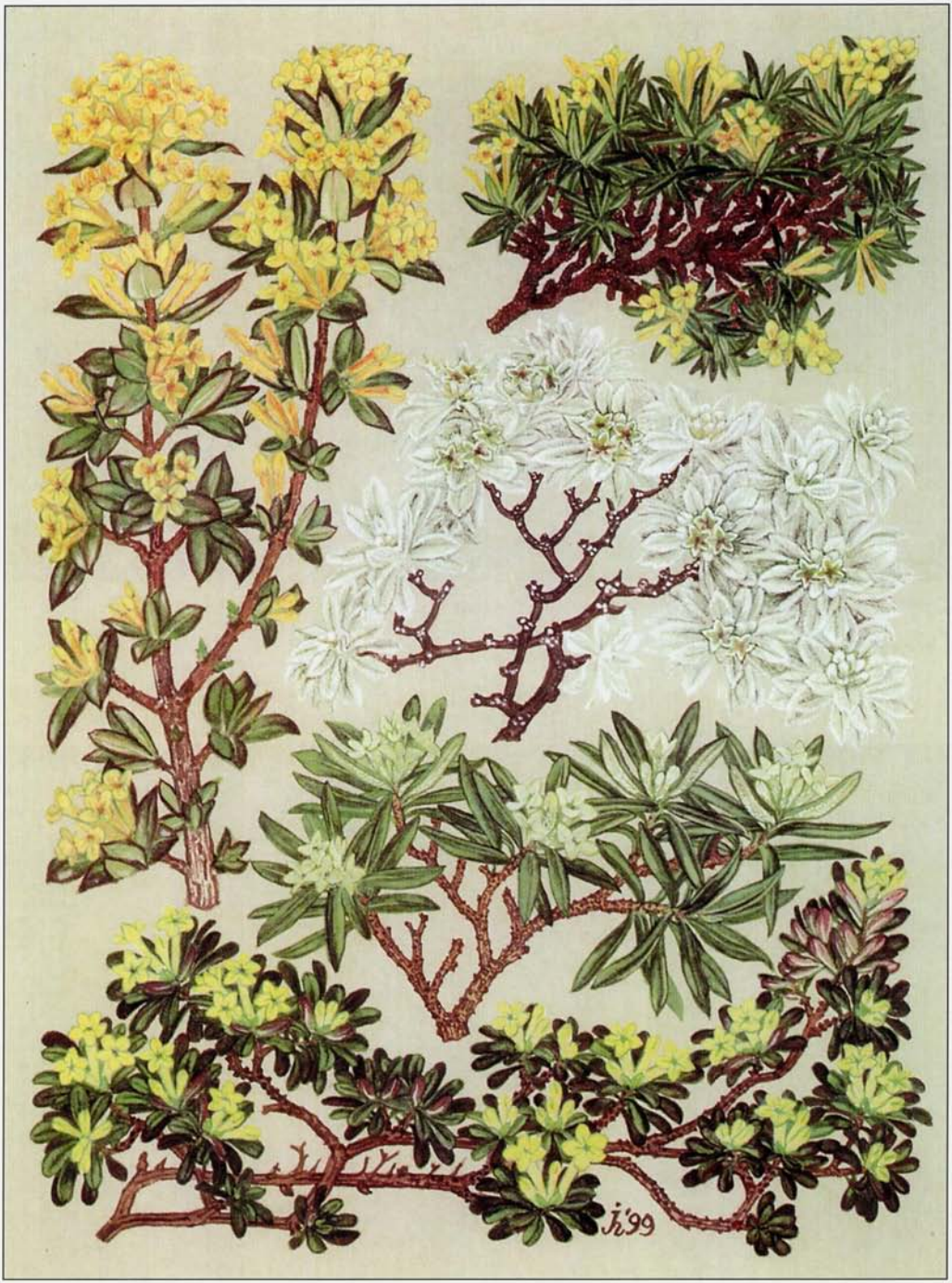
Astragalus barrii (p. 217) in the Spiegel garden. (Jane Grushow)

Erodium reichardii 'Nanum' (p. 220) requires winter protection in most North American climates but has a long summer flowering season. (Pat Tucker)

Erodium chrysanthum (p. 219) is an excellent foliage plant, fully hardy even in Ontario. (Pat Tucker)

Campanula betulifolia (p. 220), a long-lived and floriferous species; foliage in the foreground is *Viola jooi*. (Jane McGary)

Campanula sartorii (p. 221) forms a prostrate mat in a sunny spot; the silver-leafed composite is *Andryala aghardii*. (Jane McGary)



A plate by Jarmila Haldová from *The Genus Daphne* by Josef Halda, reviewed on p. 224. Upper left, *Daphne aurantiaca* var. *aurantiaca*; bottom, *D. rosmarinifolia*; right, top to bottom, *D. aurantiaca* var. *calcicola*, *D. holosericea*, and *D. wangeana*. (Reproduced by permission of the author and publisher)

Bulbous Irids for the Southern Garden

Mike Chelednik

There is a wealth of bulbous plant material suited to the southern United States, still largely untapped even though the South's twentieth-century horticultural sages, Elizabeth Lawrence and William Lanier Hunt, were urging their planting in publications nearly 75 years ago. This article features some of the late spring- and summer-blooming bulbous members of the Iris family (Iridaceae) that have performed admirably in my garden in the coastal plain of North Carolina. These are plants with beautiful, interesting (even exciting) blossoms and amenable garden growth. The species discussed here have been hardy, enduring, and easy to grow in my USDA Zone 8 garden and should be hardy through the eastern portions of the Piedmont in the mid-Atlantic eastern seaboard.

I am excluding the true *Iris* species and such better-known members of the family as *Crocus* and *Gladiolus,* though many species in those genera deserve wider cultivation in the South. I will concentrate on a few of the many exciting genera found from the extreme southern United States through Mexico, Central America, and South America.

Probably the most familiar of the "southern irids" is tigridia (*Tigridia pavonia*), or Mexican shell flower. First cultivated by the Aztecs for both beautiful flowers and edible bulbs, it is one of the wonders of the botanical world. The 3-inch (7.5 cm) upfacing flowers are composed of three broad petals, producing a somewhat triangular shape, and a central "cup," which is generally spotted. The most common color is brilliant orange-red with yellow spots and mottling within the cup, but whitish, lilac, and all-yellow selections exist for the more color-conservative gardener. Each bloom lasts only one day, but the plants bloom for two to three month in midsummer as long as there is adequate moisture. They stand 1.5–2 feet (45–60 cm) tall in flower, with upright, plicate foliage similar to that of juvenile palmettos; thus, the plants are presentable even when not in bloom. Full sun is often recommended, but this applies only to cool-summer climates; I've found that tigridias look much better in part shade, where the foliage contrasts well with other woodland plants. They appreciate a good, moisture-retentive soil in summer but require good drainage in winter. Bulbs are

available from most major bulb purveyors and should be set 2–3 inches (5–7.5 cm) deep. Tigridias are also easy from seed, blooming in the second or third year.

The genus *Tigridia* is a fairly large one, with approximately 30 species ranging from Mexico to Guatemala, and one outlying species (*Tigridia philipiana*) in Chile. I've acquired as many as possible, but because most come from high-elevation plateau regions with mild days and cool nights, I've found few that succeed in North Carolina's persistent summer heat. *Tigridia chrysantha*, from low-elevation pine forest in western Mexico, seems promising, growing vigorously through the heat with wiry, upright foliage. My plants have not bloomed, but the name suggests yellow flowers. The seed was collected and distributed by Sally Walker of Southwestern Native Seeds, a key proponent of the genus. Another species from northern Mexico, *T. ehrenbergii*, is also said to be very heat-tolerant, but I've yet to acquire it.

Another genus to consider for summer bloom is *Cypella*, from Mexico and South America. Similar to *Tigridia* in their narrow, upright, pleated leaves and showy ephemeral flowers, most species I've tried have proven to be worthwhile garden plants. The best species of the genus in terms of vigor (and also, ostensibly, cold-hardiness), is *Cypella herbertii* from South America. The plants grow 2–3 feet (60–90 cm) tall and bloom for much of the summer; the yellow-orange flowers have red-brown markings in the center. The individual flowers, like those of tigridias, are short-lived, but bloom can be expected daily for several weeks. Plants grow equally well in sun or part shade, and they have the added advantage of being drought-tolerant. Cypellas are easily raised from seed, generally blooming in the second year. I've found this one of the toughest irids; my initial plants are now 5 or more years old, with a number of self-sown seedlings growing alongside them.

Another species that has made the rounds in horticultural circles in the past decade is *Cypella plumbea* (sometimes offered as *C. coelestis*). This is a robust species (to 3 feet/90 cm) that grows quickly from seed and produces rather large (to 3 inches wide) flowers of soft, dull blue. It too grows equally well in sun or shade and is not demanding as to soil, provided it's well drained in winter. The plant's major drawback is its tendency to flop over while in bloom; it can be staked if one is into that. *Cypella peruviana*, a shorter (to 1 foot/30 cm), orange-flowered species, has also performed well for me.

The South American genus *Gelasine* provides a few species worthy of consideration for the southern garden. Bearing upright flowers of bright blue, *Gelasine azurea* is vigorous and showy enough to hold its own in a border setting. The flowers are composed of six equal-sized petals, giving them a more regular appearance than those of *Cypella* or *Tigridia*. Plants grow up to 2.5 feet (75 cm), with attractive plicate foliage. The flowers appear over two or three weeks in early summer and are followed by large seedheads, themselves marginally ornamental. My plants have done well in full sun. Propagation is easy by seed, but my initial plants came from the "old" We-Du Nursery in Marion, North Carolina. It was considered hardy there, so I assume it would be adaptable to most areas in North Carolina; it has also survived in the Pacific Northwest down to about

12°F. *Gelasine uruguaiensis* is supposed to be similar, though my plants haven't bloomed yet.

The genus *Alophia* is best known for its American representative, *Alophia drummondii* or pine woods lily, which inhabits open pine woods and grasslands in the south central United States and northern Mexico. Appearing in early summer, the small, vertically held, tigridia-like blooms are rich violet, marked at the center with specks of yellow, brown, and white. Plants grow very quickly from seed, and flowering can occur within one year of sowing. A delicate plant, *Alophia drummondii* rarely grows taller than 1 foot (30 cm), so it can easily be tucked among other plants where it is unnoticeable when not in bloom.

Another, and to my mind better and showier, species is *Alophia veracruzana* of southern Mexico. It bears blooms of a lovely lilac color through much of the summer on plants up to 14 inches (35 cm) tall. I've grown this only in sun, but I suspect it would do just as well in part shade. The plants emerge very late in the year, often not until June, but once up, they are blooming in no time. In spite of its southerly distribution, I've found *A. veracruzana* completely hardy through recent North Carolina winters, with minimum temperatures between 15° and 20°F here. Another plus is the scent of the blossoms—they smell faintly of artificial grape flavoring.

Mike Chelednik lives and gardens in Greenville, N.C. His interest in gardening includes most bulbous plants. He contributed a chapter on Southern Irids to the NARGS/Timber Press volume *Bulbs of North America*.

Sources

The seed exchanges of the various rock garden societies (AGS, NARGS, and SRGC) and the International Bulb Society usually include many of the plants mentioned. In addition, the following nurseries regularly list a few of them:

Brent & Becky's Bulbs, Brent and Becky Heath, 7463 Heath Trail, Gloucester, VA 23061. Catalog free.

Plant Delights Nursery, Tony Avent, 9241 Sauls Road, Raleigh, N.C. Catalog "10 stamps or a box of chocolates."

Southwestern Native Seeds, Sally Walker, Box 50503, Tucson, AZ 85703. Seeds only. Catalog $2.

Yucca Do Nursery, Carl Schoenfeld, Route 3, Box 104, Hempstead, TX 77445. Catalog $4.

Some Miniature Sempervivums

Jan Noyes

Sempervivums, commonly known as "hens-and-chicks," are familiar to every rock gardener. They have been recorded in cultivation since the 1600s and can be seen in Greek art as far back as the sixth century BCE.

Sempervivum species are native to the mountain regions of eastern Europe, ranging from there through Turkey and as far south as North Africa. Growing in harsh, rocky sites with full exposure to the sun, *Sempervivum* lives up to the meaning of its Latin name: "live-forever." In Europe, sempervivums were once thought to ward off fire and lightning and bring good luck to those in the home because of the longevity implied by their name. They can still be found there today growing on rooftops, as well as fence posts and rock walls. When roofs were made of sod or thatch, the sempervivums would create a thick, solid surface on the roof so sparks from the chimney would not ignite the roofing material. The juice of sempervivum leaves was also used as a soothing ointment for burns and rashes.

Today sempervivums are often seen on walls, in, containers, and in many rock gardens; they can even be established on rough-barked trees. Especially delightful in rock gardens and the troughs that often accompany them are the smallest sempervivums. Some of these are selections or hybrids of *Sempervivum arachnoideum,* with distinctive white spiderweb hairs extending from leaf tip to leaf tip across the heart of the rosette (photo, p. 199). An adaptation to protect the foliage from hot sun, this ornamental feature makes for them favorites with gardeners. The patch of white they form is eye-catching in a mixed planting. Many varieties also bear red to purple coloring on the outer margins and undersides of the leaves, adding to their charm.

Their diminutive scale makes them a perfect "ground" cover for a bonsai pot, tufa garden, or niche in a rock wall, as well as for little pockets in rockwork. Tiny rosettes grow close to the parent plant and creep over the edges of rocks and containers, putting down roots in every crevice and creating a lovely wash of growth.

Sempervivum pumilum and *S. reginae-amaliae* are two particular favorites for their perfect rosette form and tidy growth habit. Carrying a blush of soft purple,

these add a lovely accent to any planting with their tight clumps of rosettes.

Among the smallest is *Jovibarba arenarium*, from a genus very closely related to *Sempervivum* and sometimes lumped within the latter. Familiarly referred to as a "roller," it will begin life with 1/8-inch rosettes and mature to 1/4 inch (about 4 mm). The offsets of light green flushed with red on the backs of the leaves emerge from the center of the parent rosette on a very thin stolon that soon withers in the summer sun. Then the new plant "rolls" off to begin anew wherever it lands. Even if a rosette falls upside down, new roots extend downward and pull the plant to a proper growing position. The "rollers" are particularly nice on a gentle slope, where they can produce a waterfall effect.

Sempervivum octopodes, a gray-green rosette, and *S. octopodes* var. *apetalum*, a beautiful bright green, are not the very smallest, but they are so unique they must be included here. Profuse, tight green rosettes emerge in the spring and extend on thin stolons as much as 4 inches (10 cm) long. This splash of bright spring growth draping over a container planting would surely put a smile on your face.

Sempervivum 'Pacific Red Tide', a hybrid by Gary Gossett of Portland, Oregon, has *S.reginae-amaliae* parentage and is my favorite among the small hybrid sempervivums. Small rosettes form around the parent plant in a perfect, tight circle, showing a lovely soft red to purple color all year. Most sempervivums display their best color in the spring when they begin to push new growth, but as the season heats up, many begin to fade, and by August they can change completely from red to green. 'Pacific Red Tide', however, retains its color throughout all the seasons—a perfect plant for that small pocket.

Sempervivums are actually a short-lived plant. Each rosette is monocarpic, bearing fruit just once and then dying. The typical rosette lives five or six years, but each year it will produce a number of offsets (I have seen as many as eighteen on one parent rosette), so when the parent does bloom and die, it won't be missed at all. At maturity, the parent rosette begins to change shape and color, rising up 3 to 15 inches, depending on the species or cultivar, and completely disappearing into a bloom stalk. Most sempervivum blossoms are pink, with few varieties blooming white; jovibarbas have yellow flowers.

Sempervivums do best in a sunny location and a well-drained growing medium consisting of approximately 40–50 percent coarse grit to open the soil. Being fairly shallow-rooted, they do well in containers as shallow as 2 or 3 inches. Like most succulents, they do not require much watering. The ease of caring for sempervivums is an added advantage to growing these small gems.

Following is a short list of recommended small species and cultivars.

Sempervivum and jovibarba species and selections: *S. arachnoideum* 'Minor', *S. arachnoideum* var. *album*, *S. arachnoideum* var. *bryoides*, *S. arachnoideum* var. *rubrum*, *S.* x *barbulatum* 'Hookeri', *S. octopodes* var. *apetalum, S. pumilum, S. reginae-amaliae, Jovibarba arenaria* (from Murthal).

Cultivars: 'Baby Star', 'Boule de Neige', 'Fredegar', 'Manuel', 'Nouveau Pastel', 'Pacific Mayfair Imp', 'Pacific Red Tide', 'Pixie', 'Silver Cup', 'Silver Olympic', 'Zarubianum'.

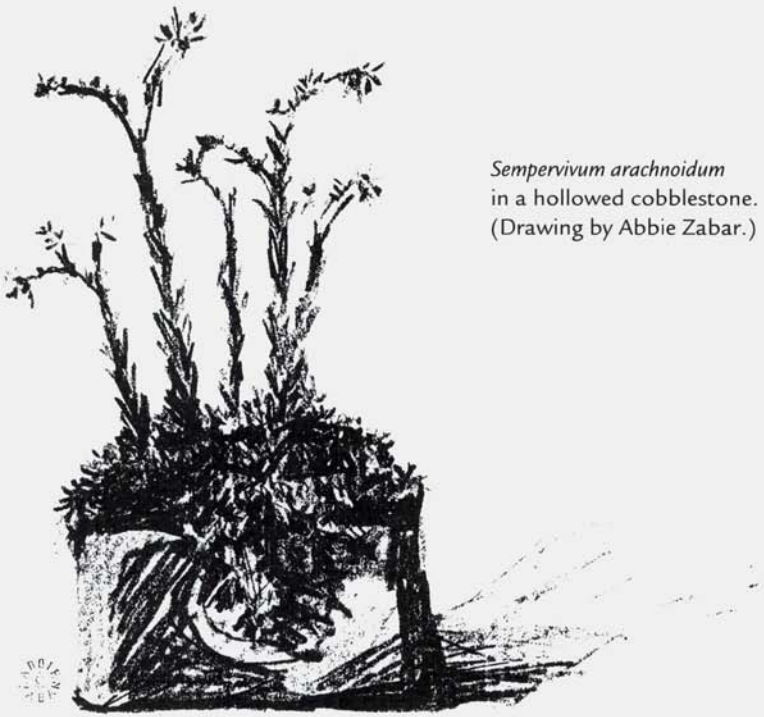
Jan Noyes, her husband, Art, and her mother, Joyce Hoekstra, operated Squaw Mountain Gardens, a specialty mail-order nursery near Portland, Oregon, growing more than 3,500 varieties of succulents. Recently retired, they are writing a book about sempervivums and received a NARGS grant to further their research in 2001.

Sources

Squaw Mountain Gardens, P.O. Box 946, Estacada, OR 97023; 503-630-5458; fax 503-630-5849; <www.squawmountaingardens.com>

Mountain Crest Gardens, P.O. Box 724, Etna, CA 96027; 530-467-3215; catalog $2.00

Alpine Gardens, W. 6615 Smock Valley Rd., Monroe, WI 53566; 608-325-1836



Sempervivum arachnoidum in a hollowed cobblestone. (Drawing by Abbie Zabar.)

Rock Garden Imposters

Compiled by the Editor

The seed exchanges of NARGS and its sister societies are widely regarded as the greatest benefit afforded to members—but a few curmudgeons have been heard to make remarks like "I never order from seed exchanges; so many things are misidentified, you never know what you're going to get." An exaggeration, but it's true that both seed exchanges and commercial catalogs may offer impostors. Once a plant becomes established in gardens under the wrong name, it starts to circulate via exchanges. In a few years, the cognoscenti regard the plant's appearance in lists with a jaundiced eye, while the incognoscenti order it (based on a glowing description in the literature), grow it (it is usually easier to grow than the gem it is impersonating), and pass it on.

Hoping to break some of these vegetable chain letters, I consulted the knowledgeable gardeners who correspond via Alpine-L, the Internet rock gardening forum (Alpine-L@nic.surfnet.nl) to compile anecdotes about frequently misnamed rock garden plants. However helpful print may be, it is most useful to see the different plants where they can be correctly identified. John Good, to whom I am indebted for his review of a draft of this article, comments: "It is often when you actually see 'the real thing' and an impostor side by side that you really appreciate the difference." Unhappily, even botanical garden collections can hold misidentified plants, and the seed they send out is especially likely to contain hybridized material. (In the discussion that follows, a name in roman type and quotation marks refers to an impostor under that name, and a name in the usual italic type refers to the correct identity.)

The *ARGS Bulletin* (precursor to the *Rock Garden Quarterly*) used to publish annual lists of items in previous seed exchanges that proved to be misnamed, a practice that struck terror into my heart when I was a novice contemplating donating seed. One Alpine-L correspondent opined that identifying other people's errors was "at the least discomfiting and at worst unkind and hurtful," and another called it "nitpicking." This article is not meant to hurt past or potential seed donors, but if it *discomfits* them sufficiently that they look on their plants with a critical eye, we will all benefit.

The worst possible result of misnaming seed is the spread of a noxious plant

under a tempting name. Rodger Whitlock of British Columbia comments: "Seed of the pernicious weed *Nothoscordum inodorum* [has been circulated] under the name '**Leucojum trichophyllum**', thereby infesting innumerable gardens with a nearly ineradicable spreader." That solved a mystery for me: I knew I'd never planted *Nothoscordum inodorum*, yet it got into my bulb frame to the extent that I had to remove many wheelbarrow loads of plunging sand to eradicate it, and it still pops up from time to time. It spreads by stolons and minute bulblets, so even yanking out every visible plant does not stop it if a propagule is clinging to the frame boards or the outside of a pot. If you're growing something under the name *Leucojum trichophyllum* (the species name means "thread-leafed") and it has leaves much wider than a stout sewing thread, it's misnamed. Rodger also obtained an impostor under the name "**Leucojum roseum**" from the AGS exchange and thinks it may be a *Sisyrinchium*; if so, it will be more useful in his garden, for *Leucojum roseum* is quite tender, a little fall-blooming "pink snowflake" with a sweet fragrance.

There is a good deal of confusion among gardeners about the naming of species in the genus ***Adenophora***, but since most species are fairly interchangeable for garden purposes, we will not complain unduly. According to one correspondent, however, there is "over 50 percent risk" of ending up with *Campanula rapunculoides* when you order "any species" of *Adenophora*. I think this is an exaggeration, since I've grown a number of undoubted *Adenophora* from exchange seed and never got *C. rapunculoides*, but the desperately thuggish tendencies of the latter should move any grower of a purported "adenophora" to caution before planting out. Flowering them in a pot first is not difficult. *Adenophora* is distinguished from *Campanula* by having a tubular or glandular disk at the base of the style. Another vicious weed that turned up in a seed exchange was *Duchesnea indica* (false strawberry), under the name "**Dalibarda repens**."

"**Gentiana kurroo**" appears on many a catalog page and sale table, but people who have looked up the real thing's description are dubious about the cultivated plant. Josef Niederle of Brno, Czech Republic, writes: "I feel that *Gentiana kurroo* is not in cultivation, at least in Central Europe. This is a rare, large-flowered species from Pakistan and India, growing at rather low altitude. The plants provided under this name are probably one of the many forms of *Gentiana siphonantha*, which is the commonest species of the Cruciata group in cultivation, though it is usually obtained as *G. dahurica, darwinii, kurroo*, or *depressa*. Another commonly cultivated species is *G. cruciata*, the Turkish form of which was once described under the name *G. depressa*, a name properly assigned to a Himalayan gem." The editor has received *G. cruciata* under the names "G. kurroo" and "**G. depressa**." If your plants have long, leafy stems and quite small 4-lobed flowers set among lush bracts, you don't have *G. kurroo*. As for *G. depressa*, the real thing (illustrated in our summer 2001 issue, p. 187) is a miniature plant with tightly imbricated leaves and very large, nearly sessile flowers. Josef's note about the Turkish synonym explains how two such distinct plants could be confused in seedlists.

The genus ***Anemone*** presents a wide range of seedex problems. Most familiar is the appearance of *A. multifida* under various names; correspondents report

G. kurroo, from *The Genus Gentiana* by Josef Halda; drawing by Jarmila Haldová, reprinted by permission of author.

getting it after planting "A. baldensis, A. crinita, A. narcissiflora, A. palmata, A. rupicola," and "A. sherriffii." "A. magellanica" is a synonym of *A. multifida*. The reason for complaint is simple: all the misapplied names are those of more attractive plants with larger flowers. *A. narcissiflora* is easily distinguished in seed because its seeds are not embedded in woolly hairs, unlike the other species mentioned. *A. multifida* is variable in color, but most garden plants have cream or reddish flowers; *A. baldensis* and *A. rupicola* usually have whiter flowers, sometimes flushed pink on the reverse, and usually broader petals; and *A. palmata* has brilliant yellow flowers and fleshy leaves that are lobed but not finely divided.

Hubert Agback of Uppsala, Sweden, remarks: "In my experience, all seed of 'A. rupicola' received from seedexes the last 15 years or so have invariably either turned out to be *A. multifida* or have not germinated. One never loses hope, though." Janet Galpin, who has a major collection of *Anemone* in England, notes the differences among the seeds of the three confused species: "[All] are

silky/woolly-haired. The body of the seed of *A. multifida* is more or less round with a small style going off at an angle and keeping close to the body of the seed but just flicking up a bit. The body of *A. baldensis* seed is quite a bit smaller and slimmer, with a longer style going straight up from one side. I [have never obtained *A. rupicola* seed] but I have Ulbrich's sketches from 1906, which show it to have a flatter top and no discernible style—more a wispy kind of cap." Janet found even commercially offered seed named "A rupicola" to be *A. multifida*. She adds, "Misnamed seed is everywhere. I have had anemone seed from botanic gardens throughout Europe. Some species are reliable but many not, and most woolly seed turns out to be either *A. multifida* or *A. virginiana*." Other correspondents also report receiving the tall *A. virginiana* under various tempting names; its common name, thimbleweed, describes its flowers.

No one rigorous about names ventures into the ***Aquilegia*** section of an exchange list. The word "promiscuous" inevitably occurs in discussions of this genus, and garden seed—even if grown in what seems to be "isolation"—often reflects hybridization. Many garden strains of *A. vulgaris* come fairly true from seed, including the double and spurless forms that some find fascinating and others hideous. The orange-flowered American species *A. formosa* (western) and *A. canadensis* (eastern) cross gleefully with each other and with other species. The numerous items donated as "A. alpina" and "A. flabellata" show a great range of variation in their seedlings; according to the *AGS Encyclopaedia of Alpines*, seed offered as "A. alpina" is "frequently . . . a hybrid of *A. vulgaris*." Some species, however, are reputed to resist hybridization; those mentioned include *A. aurea, A. bertolonii, A. caerulea, A. einseliana,* and *A. viridiflora*. The *AGS Encyclopaedia* regards *A. fragrans* as likely to come true, but it has hybridized with *A. formosa* in my garden, producing pleasing border plants with fragrant pink-and-cream flowers. Some growers report that their strains of *A. flabellata* are quite stable. Garden-grown seed of *A. jonesii* is said often to represent hybrids with *A. saximontana*—not necessarily a bad thing, since both the pretty *A. saximontana* and the hybrids are easier to grow than the fabled *A. jonesii*. The upshot of this for donors? Try to match your plants against a description, but don't sweat your columbines: nobody expects precision here.

Calceolarias, though rather tender, are popular in rock gardens, and none more so than *Calceolaria uniflora*, perhaps better known under its old name, *C. darwinii*. Maybe the renaming resulted in the reported confusion with *C. biflora*. *C. uniflora (darwinii)* is unmistakable with its big, elongated pouch flowers banded in yellow, white, and deep brown, while *C. biflora* has roundish, plain bright yellow flowers, sometimes with a few red spots. Correspondents also report receiving *C. biflora* under its synonym *C. falklandica* and as *C. fothergillii*, which is a smaller, denser plant with spathulate rather than ovate leaves.

Ah, **campanulas**! Easy to grow, easy to harvest the seed (except of the most desirable species), and, it seems, likely to be *Campanula rotundifolia*. If it has tallish flowering stems and seeds all over the garden, it's not *C. excisa, C. raineri,* or *C. tommasiniana*, three names mentioned by disappointed growers. All of them are rather decumbent, flowering near ground level where they are handy for the slugs.

Staying in the bellflower family, the confusion between "**Codonopsis ovata**" and "**C. clematidea**" has long been noted. British sources suggest that the plant grown in most gardens is *C. clematidea*, often under the name "C. ovata," and they imply that the real *C. ovata* is difficult to grow. The flowers of *C. clematidea* are described as "tubby bells" and those of *C. ovata* as "funnel-shaped." *C. clematidea* has an orange zone in the center, while descriptions imply that *C. ovata* does not. Finally, *C. clematidea* usually has strongly reflexed sepals. I actually got both species from exchanges—each under the other one's name; however, only *C. clematidea* has flourished in my garden, while the real *C. ovata* flowered twice and disappeared. Correspondents also report *C. clematidea* arriving under the names "C. bhutanica," "C. bulleyana," "C. meleagris," and "C. mollis."

Few North Americans understand the complexities of the genus ***Dianthus***, so there are a lot of seedlings around under a lot of names, the one array not mapping very well on the other. *Dianthus freynii* is a cushion plant with "gray-green, rigid leaves usually less than 1 mm in width" and "solitary pink flowers 1–1.5 cm across" on rather short stems; however, several other plants, both taller and smaller-flowered, are in circulation under this name. John Good remarks, "It is hardly ever true and until recently was often misrepresented on the show-benches at AGS shows." Dianthus are almost as happy to hybridize as aquilegias, and the same caveat should probably apply to ordering their garden-harvested seed.

The **climbing *Dicentra* species** include *D. macrocapnos* and *D. scandens* from Asia and also *D. chrysantha* from the western U.S. Carrie Thomas of Swansea, Wales, sorts out the two on the basis of the form of the seed capsule: *D. macrocapnos* has "very pointed seedpods, rather like the sheath of a dagger, made of brown tissue-paperlike membrane, and having both sides of the top peeled back to form an open sheath with the seeds inside." *D. scandens* has "more blunt-ended pods that are fleshy." She writes that all the plants she has grown from exchange seed under both names are *D. macrocapnos*.

Anna Leggatt, who takes particular interest in the genus ***Digitalis***, comments: "*Digitalis lutea* and *D. viridiflora* are very close; I believe all mine [received under both names] have been *lutea*. *Viridiflora* corollas should have green veins—but how green? *Flora Europaea* was not much help when I tried to key them out: 'sepals acute' or 'sepals less acute'?" She notes garden confusion among *D. lutea*, *D. grandiflora*, and *D. davisiana*. Loren Russell, who wrote up *D. obscura* (with photos) for the fall 2001 *Quarterly*, says that *D. pauciflora* often arrives under that name.

Several people reported getting the coarse, weedy *Alyssoides utriculata* under the name "**Erysimum kotschyanum**." *Alyssoides* is a tall plant that produces distinctive spherical seed pods; the *Erysimum* is a small, tufted plant with stems no more than 10 cm/4 inches tall, grayish linear leaves, and flattened seed capsules. Zdenek Rehacek in the Czech Republic also reports receiving *Alyssoides* under the name "Linum arboreum." A miniature, mat-forming yellow wallflower was originally distributed in North America under the name "Erysimum kotschyanum" and later as "E. helveticum"—two similar species neither of which this

plant resembles. Alexej Borkovec sorts it out for us: "Already in the 1970s, there was a misnamed 'E. kotschyanum' in the trade. In 1974 I bought from Alpine West a little carpeter with c. 5-mm-wide, 2–3 cm-long, broadly toothed, green leaves and 1-cm-wide yellow flowers on 10-cm stalks. My notes (possibly from the *ARGS Bulletin* a few years later) say that it should be called 'Yellow Delight', a cultivar and possibly a hybrid. It is a cute little plant, and I still have it, after 28 years."

It is a mystery how *Scilla scilloides*, a hardy fall-blooming bulb with pinkish flowers and foliage that emerges deep red, became misidentified in the American nursery trade as "**Scilla numidica**," the name of a rare, frost-tender North African species. The latter can now be obtained as seed from Monocot Nursery in England, but at the time Rice Creek Gardens attached its name to *S. scilloides*, it was grown only in one or two specialist collections in Europe.

Silene hookeri, native to northern California and southern Oregon, is treasured by alpine gardeners for its huge, deeply cleft flowers on a compact plant. Correspondents report that most seed distributed under this name turns out to be *S. flos-jovis*; one batch was even *Lychnis coronaria*, a distinctly weedy tall biennial. ***Silene elisabethae*** is another name often taken in vain, typically turning out to be *S. pendula* or *S. schafta*. The NARGS booklet by Jim Jones on this group of plants should help sort out what we have in the garden.

Where several kinds of tall blue ***Meconopsis*** are grown in proximity, things become muddled rather soon. *M. betonicifolia* and *M. grandis* have hybridized so much that seed offered under one name is just as likely to be the other, or a hybrid of the two. The hybrid has been called *M.* × *sheldonii*, but the authorities have now decided that that name should be reserved for sterile clones, and the fertile ones are called the "Fertile Blue Group"—a view reflected in the latest Scottish Rock Garden Club seedlist. This is probably not something ordinary mortal gardeners need to worry about, though; any blue meconopsis will do for most of us. Also likely to produce hybrid plants is garden seed of ***M. napaulensis, M. regia, M. paniculata,*** and ***M. latifolia,*** which intercross freely. The introduction of several Chinese species very similar to the short, blue-flowered ***M. horridula*** will probably result in similar confusion in short order.

The name ***Paradisea liliastrum*** is enough to make people want to grow it, even without the promise of fragrant, lily-like white flowers. What usually arrives under this name, however, is some species of *Anthericum*, either the tall *A. liliago* or the shorter, branching *A. ramosum*. *Paradisea* has more funnel-shaped flowers with curving stamens, and it is difficult to establish; *Anthericum* has flatter flowers with straight stamens, and it self-sows freely.

Correspondents report frequent confusion among other groups: the species of *Phyteuma*; the western American *Polemonium* species; most *Silene* species; *Townsendia* species, and silver (encrusted) saxifrages.We have not the space here to address these topics. Can someone volunteer a feature article on any of these?

For more on this topic, Internet users can investigate <http://groups.yahoo.com/group/AlpSeed/files/Seedex Errors.txt>.

Plant Portraits

Astragalus barrii and *Oxytropis multiceps*

ANNE SPIEGEL, Wappingers Falls, New York

Rock gardening in the Northeast brings certain challenges because our wet winters and often muggy summers seem to be the antithesis of what is preferred by most of the plants we would like to grow. This becomes strongly apparent when the plants of choice are in my favorite genera: *Astragalus* and *Oxytropis*. Many of these are dryland plants, some are alpine, and all want perfect drainage for their taproots, which are quite vulnerable to rotting. Some of the best candidates for the rock garden may come from areas where 7 inches (18 cm) of rain is a "good" year. There are two of these plants, however, that are reliable and long-lived if you can provide their three basic needs: full sun, perfect drainage, and good air movement.

Astragalus barrii (photo, p. 201) was named for the great plantsman Claude Barr. In his book *Jewels of the Plains*, he gives a wonderful description of his discovery of *A. barrii* while riding on a trail through limestone-capped buttes where the white-flowered *Astragalus gilviflorus* was in full bloom. The soft rose flowers of *A.barrii* beckoned to him, and the plant, after being initially misidentified as *A.tridactylicus*, was eventually named for him. It sounds rare and difficult, but this is actually a good astragalus for the rock garden. The small tripartite, silver-haired leaves form a tight bun. Barr mentioned 20 inches (50 cm) as the limit of its spread, but in my garden, 6 inches (15 cm) has been the maximum width, and that was a five-year-old plant. The flowers are clear rose and are held on very short stems. When in bloom, the bun is covered so that the leaves are barely visible.

I've grown *Astragalus barrii* in dry, lean, lime scree, sand beds, and troughs. All three sites are in full sun facing northwest, exposed to wind. (If you don't have a windy site, you can encourage air movement by making a steep slope in a raised bed.) In a trough, it grows among broken pieces of tufa, with more small pieces of tufa worked into the mix at its feet. It's planted with other drylanders (western phloxes, eriogonums, etc.) that will be happy in the same conditions. The one

problem for me has been its failure to set seed, which I think would be the only reliable means of propagation.

Another gem for the rock garden is *Oxytropis multiceps* (photo, p. 201), which is quite easy from seed. This has been very long-lived for me and is one of the earliest plants to bloom here. If there's no snow, I can see it start to turn silvery green early in April. The leaves look silver because they are covered with silky hairs on both sides. The stems are furred, as is the calyx, which will inflate and act as a "sail" to carry the seed. The plant becomes a silvered pancake covered with bright pink, large (for its size) flowers. The inside of the banner petal is lined with white, making it quite dramatic when seen close up—and this is really the way to look at this plant.

Oxytropis multiceps will grow in scree and sand, but like *Astragalus barrii*, it is seen to its best advantage in a trough, where you can appreciate its miniature perfection. My plants have set seed, but unfortunately not every year. A bonus is that *O. multiceps* is really tough. The deer, who have come to regard my troughs as specially prepared feeding tables, actually pulled out two plants, maybe three or four years old. I found them on top of the gravel beneath the troughs with their taproots exposed. Without much optimism, I replanted them, and they have flowered since as though nothing had happened to them. On a whim, I planted a leftover seedling in a hole in tufa. The flowers are a wonderful contrast to the gray of the stone, and it has increased in size each year.

These plants are particularly beautiful with a dark mulch to contrast with their silver leaves. My mulch is a dark red-brown stone that is slightly alkaline. Although it is probably not an absolute requirement, both plants have responded well to the addition of lime in the form of either tufa chips or oyster shell. The mix ends up with a pH of 8.0.

Both plants are at their best during periods of extended drought and heat. One last warning: try to provide them some protection from winter wet. These western members of the pea family will survive cold and weather changes, but not if combined with winter rain. A promising bun of almost any dryland species will turn to mush in no time under those circumstances, but *Oxytropis multiceps* seems to be able to survive anything. My western troughs are now covered in the winter with a plastic shield devised by Mark Mazur, a fellow Berkshire Chapter member, and the difference has been amazing. The shield arches over the troughs, with the ends left open for air movement. It has the added advantage of completely stymieing the deer.

Erodiums

Pat Tucker, Guelph, Ontario

During the past decade, we have been subjected to some of the warmest summers on record. When I was reviewing my rock garden last summer and comparing it with what it was in the early 1990s, I found that many plants had gone,

including *Phlox* "douglasii" cultivars, *Eunomia oppositifolia* (syn. *Aethionema oppositifolium*) and *Asperula* species. Whether the culprit is drought, water restrictions, or neglect, I am not sure.

If the problem is global warming, we should be looking for more drought-tolerant species in our region. Survivors in my rock garden provide some clues. *Phlox subulata*, a native of southern Ontario, and its cultivars are still with me. *Erodium* species, which have deep root systems and thus drought-tolerance, have survived for over 15 years.

Erodiums belong to the Geraniaceae family and are closely related to the hardy "true" geraniums. The major differences are in the leaves, which are basal and pinnate in *Erodium*, giving them a fernlike appearance. The seed-awns have spiral structures that aid their entry into the soil through a "drilling" mechanism. Many erodiums can be used in well-drained soils and sunny locations, where they thrive. Their attractive foliage and long season of bloom add contrast and late-summer color.

Erodium chrysanthum, grown from seed, is the oldest species I have (photo, p. 202). When transplanting it a few years ago, I was amazed at the size of its root system—as large as a parsnip, but with little fibrous root; only one portion survived. Its foliage is gray, fine and ferny. In this species, the plants are dioecious, with male and female flowers on different plants. Mine is a male, which produces a few pale yellow flowers and sets no seed. The female plants and the hybrid *E.* × *lindavicum* (*E. chrysanthum* × *E. absinthoides* var. *amanum*) are reputedly more floriferous; the hybrid also flowers over a longer period.

Erodium manescavii is easily grown from seed, producing purple flowers slightly smaller than but similar to those of bloody cranesbill (*Geranium sanguineum*). It possesses coarser foliage than *E. chrysanthum*. Seed production is plentiful and it may self-sow in the garden.

Erodium carvifolium and *E. castellanum* are closely related, with finely divided leaves like milfoil (*Achillea millefolium*), providing an excellent contrast with coarse-leaved plants. Nickel-sized purple flowers are produced from June until November. Seedlings appeared nearby last summer and should be transplanted in spring before their deep root systems develop and they become difficult to move.

The *Erodium reichardii* complex comprises compact, floriferous plants very suitable for the small rock garden or for containers. However, they are not reliably hardy in Guelph, in southern Ontario. Where snow cover remains all winter, however, they can survive. I have grown them in the Bruce Peninsula (between Lake Huron and Georgian Bay) for ten years. There, I grow them in a patio of pavers laid on sand, where they bloom all summer in full sun. In Guelph, I transplant the small ones in late October into 4–6-inch (10–15-cm) pots and store them in an unheated covered space between the house and the garage.

Erodium reichardii forms 4-inch (10-cm) clumps topped by 2-inch (5-cm), dime-sized white flowers with pink veins. The leaves are small and simple, similar to those of *Geranium sessiliflorum*. *Erodium reichardii* 'Roseum', with rose-colored single flowers, has larger leaves than the typical form. There also appears

to be a more compact form with smaller leaves and rose flowers, which I know as "Nanum" (photo, p. 202). The last selection I grow is *E. reichardii* 'Flore-pleno', a semi-double white. This is an unstable form that can revert to the typical single, so it should be increased regularly by stem cuttings.

Because most erodiums do not set much seed, they can be increased easily by basal cuttings of the nonflowering stems, taken during the growing season. Set them in coarse sand and do not overwater them. Once they are rooted, transplant into a gritty mixture and place them in the garden in the next growing season.

A version of this article originally appeared in the *Ontario Rock Garden Society Journal*, May 2001; reprinted with permission of the author.

Sources

Siskiyou Rare Plant Nursery, 2825 Cummings Rd., Medford, OR 97501.
<www.siskiyourareplantnursery.com>

Wrightman Alpines, RR#3, 1503 Napperton Dr., Kerwood, Ont. N0M 2BO, Ontario.
<www.wrightmanalpines.com>

Campanula betulifolia and *C. sartorii*

Jane McGary, Estacada, Oregon

Although the word "bluebell" often comes to mind when gardeners encounter the name *Campanula*, the genus also includes members with white and pink flowers. Two white-flowered species, *Campanula betulifolia* and *C. sartorii* (photos, p. 203), can be said to represent the long and short of campanulas' tenure in the garden: *C. betulifolia* is long-lived, and *C. sartorii* is monocarpic. Both, however, are easily grown, well-behaved rock garden subjects.

Campanula betulifolia (sometimes spelled *betulaefolia*) comes from the Anatolian region of Turkey, where, according to the *AGS Encyclopaedia of Alpines*, it grows "in crevices of volcanic and limestone rocks, from 250 [to] 2280 m[eters]." In that brief habitat description is a clue to its willingness as a garden subject, since it is adapted to both acidic and alkaline substrates and has a very wide elevational range from near sea level to 7400 feet. The plant is a moderate-sized clump of lax stems set with shiny, strongly toothed leaves. The oldest ones in my rock garden are about 8 inches (20 cm) across, apparently a typical mature size. It is a deciduous herbaceous perennial, quickly making leaf growth in spring and flowering in early summer here in the maritime Pacific Northwest. The flowers, borne in profusion, are rather large for the size of the plant. They are basically white but look reddish in the bud stage because of the coloration on the reverse; they tend to age pinkish, especially in cool weather—not an unusual occurrence here even in July. Their form is the classic campanula bell.

Campanula betulifolia, though described as a "crevice" plant, is not too particular (perhaps it frequents crevices at home to escape the multitudes of goats

and sheep). I grow it on two raised beds in a typical rock garden soil of gritty clay loam, sharp sand, and gravel. In both parts of the garden where I have it, it receives regular summer irrigation and survives the winter deluge (c. 45 inches of rain between October and June). It has been hardy to 5°F (−15°C) without protection. Seed, common in seed exchanges and in catalogs of Karmic Exotix and other popular seed suppliers, germinates quickly when planted in mid-March in the cool greenhouse, and the seedlings are not difficult to transplant by midsummer of the same year.

Also easy but less permanent is *Campanula sartorii*, one of the many species in this genus that are monocarpic (bloom once and then die) or, at best, short-lived perennials. It is a miniature plant, with delicate-looking, perfectly prostrate stems up to 4 inches (10 cm) long, set with little grayish, hairy, slightly toothed leaves that sometimes wither before the plant flowers. It makes a pleasing lacy tracery over sunny rocks—its preferred habitat in the garden and also in its native Greece. One reads that the half-inch (1.2 cm) flowers can be pink, but all those I have grown have been pure white. As one would expect of a monocarp, it bears many flowers, which face upward and open wide to the sun.

Despite its small size, *C. sartorii* is not difficult to handle as a seedling, grown in a deep 2-inch "rose" pot for its first year and set out the next spring. It usually self-sows here on pockets of very gritty soil in steep drystone retaining walls. Even though it has hairy leaves, I have not found it necessary to protect it from winter rain or summer overhead irrigation.

Campanulas are often destroyed by slugs, but quite a few species seem to be unattractive to these predators, which are famously numerous in the area where I live. Both *C. betulifolia* and *C. sartorii* have survived years of exposure to slugs here without damage. (Unfortunately, another species slugs don't like is *C. rotundifolia*, a pest in my garden.)

Sources

Plants of *Campanula betulifolia* are offered by Siskiyou Rare Plant Nursery, 2825 Cummings Rd., Medford, OR 97501. <www.siskiyourareplantnursery.com>

Seed of both species is usually available from the NARGS Seed Exchange and from commercial suppliers advertising in the *Rock Garden Quarterly*.

Books

Lichens of North America by Irwin M. Brodo, Sylvia Duran Sharnoff, and Stephen Sharnoff. New Haven: Yale University Press, 2001. ISBN 0-300-08249-5. 795 pp. Hardcover, $69.95.

Reviewed by CARLO BALISTRIERI, Oconomowoc, Wisconsin

I love lichens. I freely admit that they, along with mosses and fungi, intrigue me. I must have them in my garden. I invite them in on rocks and wood, in pots and flats. I am not alone: Charles Elliott, in the foreword to Tyler Whittle's *The Plant Hunter*, tells of "Joseph Hooker solving the problem of extricating a hopelessly frozen lichen from a rock on a Patagonian mountainside. He sat on it until it thawed." While Hooker's motives were no doubt high-minded, the fate of this humble lichen is emblematic of the low regard given these fascinating fellow residents of Earth. Recently. Irwin M. Brodo, Sylvia Duran Sharnoff, and Stephen Sharnoff teamed to champion these unpretentious but complex organisms in the singular volume *Lichens of North America*.

In the February 1997 issue of *National Geographic Magazine*, the Sharnoffs published an illustrated article on lichens, a dazzling showcase for their beautiful nature photography. A book mentioned as in the works immediately jumped to the top of my list of eagerly anticipated publications. I called Sharnoff to learn more about the book, haunted web sites, and pestered Yale University Press, but it was half a decade before I saw the finished product. It was worth the wait—and every penny of its price.

The word "lichen" comes from the Greek word for "to lick," and it is as stone-licking decorations that most rock gardeners are familiar with them. If this is your only image of them, *Lichens* will quickly disabuse you of it. "Lichens can stand erect like little shrubs, drape tree limbs like Christmas tinsel, or appear to be little more than a black smudge on a rock." Some roll freely on the ground as "vagrants." Others hitch rides on the backs of tortoises, or, if they want to move faster, insects. In addition to their various natural substrates, they can grow on glass, metal, plastic, and cloth. Colors range from flaming oranges, reds, and yellows to icy blues, grays, black, and every shade of green.

Lichens of North America is a massive work containing two books in one: first, more than 100 pages on lichen biology, ecology, and ethnobotany; and second, an inclusive encyclopedic treatment of hundreds of species, with range maps, keys, and descriptions that include habitat and chemistry information, and commentary. Where genera contain many species, those endemic to North America are favored. Nearly every species listed has a descriptive common name appended to it—some quite colorful. There are more than 900 outstanding color photographs, the great majority shot in the field by the Sharnoff team.

Like its namesake organism, the book straddles kingdoms—science and natural history—providing both an accessible proto-source for gardeners and nature lovers and an invaluable resource for scientists. Instead of the generally dispassionate prose of modern-day science writing, the book is readable, even humorous: "Lichens never grow on washed cars, but if a car remains dirty for some years, anything is possible." While there is enough science to satisfy the most ardent lichenologist, it would be a shame if the book doesn't wind up in the hands of gardeners and amateur naturalists, too.

Lichens are not plants, despite a common perception. They are unique compound organisms composed of a fungus in combination with algae, cyanobacteria, or both. The fungus provides structure for its partners, which photosynthesize to create the food that sustains the organism. Lichens are cosmopolitan, found in every non-aquatic habitat in the world, and they are vital working members of every local ecosystem, as well as important in ethnobotanical terms.

In arctic/alpine environments, where lichens grow with a fascinating association of plants of interest to rock gardeners, they form a "particularly conspicuous part" of the vegetation. Because of their adaptability, the species that live there are generally distributed across not just North America but the entire Northern Hemisphere.

Only one facet of the book disappointed me. Despite a complete chapter on lichens and people (including information on their use in food, clothing, dyes, perfumes, medicines and poisons, models and dried decorations), and a separate, very detailed chapter on collecting and studying lichens, there is no discussion about growing them or using them in the garden. This is a pity, although perhaps not an oversight. While their small size, ease of care, and slow, controlled growth makes them natural complements to rock garden plants, they are rarely considered in the garden palette. A quick perusal of the pages of *Lichens* reveals how myopic this is. Like weathered rock, lichens lend the garden a sense of permanence, the patina of age, a feeling of belonging and naturalness. Their variation in form, texture, and color makes them a valuable addition to any small-space garden.

For cultural advice, readers must turn to George Schenk's classic book *Moss Gardening: Including Lichens, Liverworts and other Miniatures*, where a good deal of detail is devoted the the care and use of lichens and other cryptogams. Schenk is enthusiastic about the use of lichens in gardens: "Despite their smallness, these are plants that, like the true mosses, can be highly effective in garden use. Like mosses, they are garden mood makers, as mystical as any tree."

Although *Lichens of North America* misses the most natural of human/lichen interactions when it neglects their use in garden, it is the first authoritative guidebook to the lichens of North America—and the only one you'll ever need.

Wildflowers of the Western Great Lakes Region by James R. Wells, Frederick W. Case, and T. Lawrence Mellichamp. Cranbrook Institute of Science. 288 pp., color photos throughout. Hardback. (Available from NARGS Book Service.)

Reviewed by HARVEY WRIGHTMAN, Kerrwood, Ontario

Living as I do in the midst of the rich agricultural lands of southwestern Ontario, it's easy for me to overlook the variety and beauty of the native wildflowers. The Great Lakes region has a broad spectrum of habitats, the species number is high, and, best of all, most of it is within a day's drive and the hiking is mostly easy.

Wildflowers of the Western Great Lakes Region is intended as a primer for readers newly interested in botany. About 270 species are described in a straightforward layman's style. Notes on soil conditions, species range, and peculiarities of the plant are included. Each plant is illustrated with one or more color pictures, both close-ups and field shots that silently explain much about the subject and its surroundings.

The book is divided into 11 chapters, organized by habitat. Each habitat is described as to how it has formed and how it changes with time. This is not a field guide, but a background read.

In addition to chapters on rocky outcrop, fens, and mesic prairie, there is the interesting inclusion of "old field and sand prairie." These are orphan lands—marginal agricultural land that lies fallow and reverts to prairie, but with lots of introduced species that are loathed equally by farmer and preservationist, for different reasons: one because they lack productivity, the other because they lack purity.

Thinking about topics like that is part of the aim of this book, which tries to provoke thought as well as observation. Put it on the library shelf, and I'm sure some unsuspecting browser will become interested.

The Genus Daphne by Josef J. Halda. Illustrated by Jarmila Haldová. Privately printed, 2001. ISBN 80-86483-00-2. 231 pages, 32 color plates. 9"×12½, hardcover. (NARGS Book Service, $55.)

Reviewed by TONY REZNICEK, Ann Arbor, Michigan

The smaller daphnes rank among the finest of all rock garden shrubs, and the larger species are important for the shrub border, as accent plants, and even as greenhouse subjects in colder climates. Some daphnes are among the earliest

shrubs to bloom, others have extremely long blooming seasons, many have wonderfully fragrant flowers, some have ornamental red or yellow fruits, and a few are among the hardiest of broad-leaved evergreens. A number have produced variegated cultivars. Altogether a wonderful genus—and Josef Halda is among the most eminent and most knowledgeable plant explorers in the world, so this book starts with an unbeatable combination.

It is also timely. Many newer hybrids are becoming more available, and there is a new Daphne Society in North America, but until now there was no recent, comprehensive treatment of the genus worldwide. The most recent publication from a horticultural standpoint was the 1976 Alpine Garden Society guide *Daphne: The Genus in the Wild and in Cultivation,* by Christopher D. Brickell and Brian Mathew, but it is not fully comprehensive. The 2001 AGS booklet *The Smaller Daphne* is even more selective, though it contains much useful information.

Halda's book is indeed meant to be comprehensive. Halda views the genus *Daphne* broadly, including species formerly in the primarily Asian and subtropical and tropical genus *Wikstroemia*, familiar to gardeners through the hardy Japanese *D.* (*Wikstroemea*) *trichotoma*. This greatly increases the number of species, and it is to Halda's credit that he treats them all. Almost all of the book is a concise species-by-species description of the genus *Daphne,* organized by taxonomic groups. There are small sections at the end on the myth of Daphne, daphnes in old botanical literature, and the cultivation of species and hybrids, but basically this is a botanical monograph.

Gardening books, even "encyclopedias" and those that focus on one group, typically include only the frequently cultivated species, though their information on cultivars and cultivation may be extensive. Rock gardeners, however, often seek out the unusual and may find their plants not "in the book," or barely mentioned. Botanical monographs, in contrast, aim to be complete but are often rather dry affairs, focused on keys with fairly impenetrable terminology, synonymy, detailed descriptions, seemingly arcane justifications for taxonomic decisions, hierarchical classifications, phylogenies, detailed specimen citations, and perhaps maps and concise ecological data on the occurrence of a species in the wild. Illustrations are often lacking or few, and information on horticultural hybrids and cultivars sparse. This reflects differing audiences and patterns of use. Gardeners usually look up plants in reference books to find out what they look like, how hardy they are, how to grow them, and so on. Botanists often use monographs for identification and as a base for floras and other synthetic works. Both, however, are interested in using the correct names and having the most accurate taxonomic classification. Halda nobly aims at a book to suit both: complete botanically, and supplying illustrations and useful information to gardeners, similar to such wonderful recent books such as Fred and Roberta Case's *Trilliums* and Christopher Grey-Wilson's *Cyclamen*. The book follows the format of Halda's previous monographs on the genera *Primula* and *Gentiana*.

Does it succeed in being a horticulturally useful botanical monograph? Only to a degree. Beautiful drawings and paintings by Halda's wife, Jarmila Haldová, sumptuously illustrate every species. (An example is reproduced on p. 204 of

this issue.) I must say the book is worth buying for these alone. May all our Daphnes look as beautiful as her illustrations! Information about cultivation and hardiness is often present, but always quite sketchy, which limits the horticultural usefulness of the book. From a botanical perspective, the lack of a key even to the subgenera hampers its usefulness. Halda's gentian book includes a key to subgenera of *Gentiana* and to related genera, and his *Primula* book includes a key to the species, but *Daphne* lacks identification aids. If you don't know what a plant is, it would be tough to use this book to find out, despite the wonderful illustrations. Even a numerical summary of the subgenera and sections and the species included in each would be some help. Numbering the species would also have been nice. Moreover, modern botanical monographs (though not "classical" ones) typically provide evidence and justification for taxonomic decisions, as well as an evolutionary context.

What did I find out from this book? That is always the final measure of a book's usefulness. A number of things, with one reading. I learned that plants I have been cultivating as *D. kosaninii* are actually *D. dominii*. The real *D. kosaninii* actually looks much better! I also learned that I should be cutting my daphnes back drastically to keep them vigorous, though I'm not sure I'll have the will to do it. But most important, this book is basically the only source of information on a number of showy hybrid daphnes, especially the yellow and orange ones, as well as lovely selections of known species and beautiful species as yet little known in cultivation.

Some of the hybrids are newly developed by Halda, and I hope they become available soon. It was a true delight to see illustrations of such striking plants as *Daphne aurantiaca* 'Little Gem,' *D. holosericea*, *D.* x *macbeathii* 'Golden Prague,' *D.* × *macbeathii* 'Susan,' *D.* x *pilatii* 'Peach Beauty,' and *D. rosmarinifolia*, among others. The first nursery to offer these should not have any trouble selling the plants.

Many of the problems of the book stem from its having been privately printed and written in the author's second language. The text badly needed a thorough editorial pass before publication. The number of typos, grammatical errors, misused words, and inconsistencies and other editorial problems is considerable, sometimes resulting in disconcerting reading. The writing style is dry and idiosyncratic. The taxonomic structure was apparently fluid until the end, since there are inconsistencies in the rank at which certain plants are recognized between different sections of the book. All these problems a good editor and careful proofreading would have cured. In addition, the treatments of the species are quite compressed and offer too little information.

My overall conclusion? Buy this book in spite of the problems. It won't help you much in growing daphnes, nor in identifying them, but it attempts to be complete, so you will at least have some information about every species. It is beautifully illustrated. And it provides information on and illustrations of a number of new hybrids and cultivars that we hope will become available soon.

The Cyclamen of Turkey by Brian Mathew and Neriman Özhatay. Bexleyheath, Kent: The Cyclamen Society, 2001. 32 pp., color throughout. Paperback, £4.50 from Richard Bailey, 5 Dower Ave., Wallington, Surrey SM6 0RG, England.

Reviewed by JANE MCGARY, Estacada, Oregon

Ten of the 21 species of *Cyclamen* occur natively in Turkey, six of them in small areas of Anatolia. This well-illustrated booklet offers the cyclamen fancier (and what rock gardener does not fancy them?) good descriptions of their natural habitats and clues to identifying species, illustrated with photos of plants in the wild as well as details of the foliage and flowers. The botanically inclined visitor to Turkey will enjoy having a copy of this booklet for two more of its features: a list of distribution and flowering times of the various species, and a clear full-color distribution map.

Commercial digging, agriculture, and grazing have severely affected wild cyclamen populations in Turkey, and this booklet includes a note on conservation. Its explanation of CITES regulation and the obtaining of permits for field botanical studies is informative. Another useful chapter is on cultivation in a wide range of climatic regions. There is a note on the Cyclamen Society and a bibliography.

NARGS Coming Events

Eastern Winter Study Weekend: "Lost in the Woods" (the shady rock garden), Jan. 24–26, 2003, Ann Arbor, Michigan. Host: Great Lakes Chapter. Contact: Michael Kaericher, 8171 Brookville Rd., Plymouth, MI 48170 <mkaericher@alum.mit.edu>

Western Winter Study Weekend: "Treasures of the Plant Hunters," Feb. 28–Mar. 2, 2003, Vancouver, British Columbia. Host: Alpine Garden Club of British Columbia. Contact: Moya Drummond, 3307 W. 6th Ave., Vancouver, BC V6R 1T2 <moyadrummond@show.ca>

2003 NARGS Annual Meeting: "Rush to the Rockies" at Beaver Run Resort, Breckinridge, Colorado, July 8–13, 2003, hosted by the Rocky Mountain Chapter. Contact: Mary Komodore, 1153 Bergen Parkway #113, Evergreen CO 80439 <alohakukla@hotmail.com>

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Bulbs of North America, Jane McGary, ed. Each chapter written by an expert. Timber Press. 308 pp., 101 color photos.
..... $28.00 includes shipping
(Chapters, check for special price on group orders.) **Received a 2002 American Horticultural Society book award in recognition of its merit and significant contribution to the literature available for American gardeners.**

Snowdrops: A Monograph of Cultivated Galanthus. Matt Bishop, Aaron Davis, and John Grimshaw. Griffin Press (UK). 312 pp., over 200 color photos. $55.00

The Genus Daphne, Josef Halda, 231 pp., color plates and line drawings. $55.00

Plan now for seed collecting and ordering with these books

The Bernard C Harkness Seedlist Handbook, 2d ed., Mabel G. Harkness. 506 pp. traditional favorite reference. $24.00

Garden Flowers from Seed, Christopher Lloyd and Graham Rice, Timber Press, 276 pp. $18.50

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ROCK GARDEN QUARTERLY (ISSN 1081-0765; USPS no. 0072-960) is published in January, April, July, and October by the North American Rock Garden Society, a tax-exempt, non-profit organization incorporated under the laws of the State of New Jersey. Submissions should reach the Editor by the first of Feb., May, Aug., or Nov. Periodical postage is paid in Millwood, New York, and additional offices. Address editorial matters pertaining to the Quarterly to the the Editor, Jane McGary, 33993 SE Doyle Rd., Estacada, OR 97023. Advertising matters should be addressed to the Advertising Manager, 6915 Hilldale Dr., Pittsburgh, PA 15236. Postmaster: Send address changes, report lost or damaged issues to: Rock Garden Quarterly, PO Box 67, Millwood, NY 10546.

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